2018 CFA® PROGRAM CURRICULUM LEVEL III VOLUMES 1–6

CFA Institute®
CFA Program

WILEY

Photography courtesy of Hector Emanuel.

© 2017, 2016, 2015, 2014, 2013, 2012, 2011, 2010, 2009, 2008, 2007, 2006 by CFA Institute. All rights reserved.

This copyright covers material written expressly for this volume by the editor/s as well as the compilation itself. It does not cover the individual selections herein that first appeared elsewhere. Permission to reprint these has been obtained by CFA Institute for this edition only. Further reproductions by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval systems, must be arranged with the individual copyright holders noted.

CFA®, Chartered Financial Analyst®, AIMR-PPS®, and GIPS® are just a few of the trademarks owned by CFA Institute. To view a list of CFA Institute trademarks and the Guide for Use of CFA Institute Marks, please visit our website at www.cfainstitute.org.

This publication is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional should be sought.

All trademarks, service marks, registered trademarks, and registered service marks are the property of their respective owners and are used herein for identification purposes only.

ISBN 978-1-119396-72-7 (ebk)

10 9 8 7 6 5 4 3 2 1

Please visit our website at
www.WileyGlobalFinance.com.

WILEY

CFA Institute®
CFA Program

ETHICAL AND PROFESSIONAL STANDARDS

CFA® Program Curriculum
2018 • LEVEL III • VOLUME 1

WILEY

CONTENTS

How to Use the CFA Program Curriculum v

Curriculum Development Process v
Organization of the Curriculum vi
Features of the Curriculum vi
Designing Your Personal Study Program viii
Feedback ix

Ethical and Professional Standards

Study Session 1 **Code of Ethics and Standards of Professional Conduct** 3

Reading 1 **Code of Ethics and Standards of Professional Conduct** 5
Preface 5
Evolution of the CFA Institute Code of Ethics and Standards of Professional Conduct 6
Standards of Practice Handbook 6
Summary of Changes in the Eleventh Edition 7
CFA Institute Professional Conduct Program 9
Adoption of the Code and Standards 10
Acknowledgments 10
Ethics and the Investment Industry 11
Why Ethics Matters 11
CFA Institute Code of Ethics and Standards of Professional Conduct 15
Preamble 15
The Code of Ethics 15
Standards of Professional Conduct 16

Reading 2 **Guidance for Standards I–VII** 21
Standard I: Professionalism 21
Standard I(A) Knowledge of the Law 21
Guidance 21
Recommended Procedures for Compliance 26
Application of the Standard 27
Standard I(B) Independence and Objectivity 30
Guidance 30
Recommended Procedures for Compliance 35
Application of the Standard 36
Standard I(C) Misrepresentation 43
Guidance 43
Recommended Procedures for Compliance 46
Application of the Standard 48
Standard I(D) Misconduct 53
Guidance 53
Recommended Procedures for Compliance 54
Application of the Standard 54

◘ indicates an optional segment

Standard II: Integrity of Capital Markets 56
Standard II(A) Material Nonpublic Information 56
Guidance 56
Recommended Procedures for Compliance 60
Application of the Standard 63
Standard II(B) Market Manipulation 68
Guidance 68
Application of the Standard 69
Standard III: Duties to Clients 73
Standard III(A) Loyalty, Prudence, and Care 73
Guidance 73
Recommended Procedures for Compliance 77
Application of the Standard 78
Standard III(B) Fair Dealing 82
Guidance 82
Recommended Procedures for Compliance 84
Application of the Standard 86
Standard III(C) Suitability 90
Guidance 90
Recommended Procedures for Compliance 93
Application of the Standard 94
Standard III(D) Performance Presentation 97
Guidance 97
Recommended Procedures for Compliance 98
Application of the Standard 98
Standard III(E) Preservation of Confidentiality 101
Guidance 101
Recommended Procedures for Compliance 103
Application of the Standard 103
Standard IV: Duties to Employers 105
Standard IV(A) Loyalty 105
Guidance 105
Recommended Procedures for Compliance 109
Application of the Standard 109
Standard IV(B) Additional Compensation Arrangements 116
Guidance 116
Recommended Procedures for Compliance 116
Application of the Standard 116
Standard IV(C) Responsibilities of Supervisors 118
Guidance 118
Recommended Procedures for Compliance 120
Application of the Standard 122
Standard V: Investment Analysis, Recommendations, and Actions 126
Standard V(A) Diligence and Reasonable Basis 126
Guidance 126
Recommended Procedures for Compliance 130
Application of the Standard 130
Standard V(B) Communication with Clients and Prospective Clients 137
Guidance 138

Recommended Procedures for Compliance 140
Application of the Standard 141
Standard V(C) Record Retention 146
Guidance 146
Recommended Procedures for Compliance 147
Application of the Standard 148
Standard VI: Conflicts of Interest 149
Standard VI(A) Disclosure of Conflicts 149
Guidance 149
Recommended Procedures for Compliance 152
Application of the Standard 152
Standard VI(B) Priority of Transactions 157
Guidance 157
Recommended Procedures for Compliance 158
Application of the Standard 160
Standard VI(C) Referral Fees 162
Guidance 162
Recommended Procedures for Compliance 162
Application of the Standard 162
Standard VII: Responsibilities as a CFA Institute Member or CFA Candidate 165
Standard VII(A) Conduct as Participants in CFA Institute Programs 165
Guidance 165
Application of the Standard 167
Standard VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program 170
Guidance 170
Recommended Procedures for Compliance 174
Application of the Standard 174
Practice Problems 177
Solutions 187

Study Session 2 **Ethical and Professional Standards in Practice** 195

Reading 3 **Application of the Code and Standards** 197
Introduction 197
The Consultant 198
Mark Vernley 198
The Consulting Contract 199
Evaluation of the Situation 199
Pearl Investment Management (A) 202
Knowledge of the Law and Obligation to Obey 203
Responsibilities of Supervisors 204
Trading for Personal Accounts 204
Maintaining Confidential Client Information 205
Pearl Investment Management (B) 206
Responsibility of Candidates to Comply with the Code and Standards 206
Dealing with Clients 207
Errors in Client Accounts 208

Pearl Investment Management (C) 208
Proper Care and Independent Judgment 210
Use of Insider Information 210
Using the Research of Others 211
Reasonable Basis for a Research Opinion 211
Relevant Factors and Fact versus Opinion in Research Reports 212
Misrepresentation of Services and Performance Presentation 212
Practice Problems 214
Solutions 231

Reading 4 **Asset Manager Code of Professional Conduct** 239
Introduction 239
Adopting the Code and Claiming Compliance 241
Acknowledgement of Claim of Compliance to CFA Institute 241
General Principles of Conduct 241
Asset Manager Code of Professional Conduct 242
Loyalty to Clients 242
Investment Process and Actions 242
Trading 242
Risk Management, Compliance, and Support 243
Performance and Valuation 243
Disclosures 243
Appendix 6—Recommendations and Guidance 244
Loyalty to Clients 244
Investment Process and Actions 245
Trading 248
Risk Management, Compliance, and Support 250
Performance and Valuation 254
Disclosures 255
Practice Problems 259
Solutions 264

Glossary G-1
Index I-1

How to Use the CFA Program Curriculum

Congratulations on reaching Level III of the Chartered Financial Analyst® (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities it develops. Your commitment to the CFA Program should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. The CFA Program represents the first step toward a career-long commitment to professional education.

The CFA examination measures your mastery of the core skills required to succeed as an investment professional. These core skills are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major topic areas covered in the CFA Program (www.cfainstitute.org/cbok);
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/level_III);
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- The CFA Program curriculum, which contains the readings and end-of-reading questions, that candidates receive upon exam registration.

Therefore, the key to your success on the CFA examinations is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, and tips for developing an effective study program.

CURRICULUM DEVELOPMENT PROCESS

The CFA Program is grounded in the practice of the investment profession. Beginning with the Global Body of Investment Knowledge (GBIK), CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the knowledge, skills, and abilities (competencies) that are relevant to the profession. Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback from the GBIK collaborative website. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

© 2017 CFA Institute. All rights reserved.

The Education Advisory Committee, consisting of practicing charterholders, in conjunction with CFA Institute staff, designs the CFA Program curriculum in order to deliver the CBOK to candidates. The examinations, also written by charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit www.cfainstitute.org.

ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into 10 topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected.

Each topic area is then divided into one or more study sessions. These study sessions—18 sessions in the Level III curriculum—should form the basic structure of your reading and preparation.

Each study session includes a statement of its structure and objective and is further divided into specific reading assignments. An outline illustrating the organization of these 18 study sessions can be found at the front of each volume of the curriculum.

The readings and end-of-reading questions are the basis for all examination questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK. These readings are drawn from content commissioned by CFA Institute, textbook chapters, professional journal articles, research analyst reports, and cases. All readings include problems and solutions to help you understand and master the topic areas.

Reading-specific Learning Outcome Statements (LOS) are listed at the beginning of each reading. These LOS indicate what you should be able to accomplish after studying the reading. The LOS, the reading, and the end-of-reading questions are dependent on each other, with the reading and questions providing context for understanding the scope of the LOS.

You should use the LOS to guide and focus your study because each examination question is based on the assigned readings and one or more LOS. The readings provide context for the LOS and enable you to apply a principle or concept in a variety of scenarios. The candidate is responsible for the entirety of the required material in a study session, which includes the assigned readings as well as the end-of-reading questions and problems.

We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfaprogram/courseofstudy/Pages/study_sessions.aspx), including the descriptions of LOS "command words" (www.cfainstitute.org/programs/Documents/cfa_and_cipm_los_command_words.pdf).

FEATURES OF THE CURRICULUM

OPTIONAL SEGMENT

Required vs. Optional Segments You should read all of an assigned reading. In some cases, though, we have reprinted an entire chapter or article and marked certain parts of the reading as "optional." The CFA examination is based only on the required segments, and the optional segments are included only when it is determined that they might help you to better understand the required segments (by seeing the required material in its full context). When an optional segment begins, you will see an icon and a dashed

vertical bar in the outside margin that will continue until the optional segment ends, accompanied by another icon. *Unless the material is specifically marked as optional, you should assume it is required.* You should rely on the required segments and the reading-specific LOS in preparing for the examination.

END OPTIONAL SEGMENT

End-of-Reading Problems/Solutions *All problems in the readings as well as their solutions (which are provided directly following the problems) are part of the curriculum and are required material for the exam.* When appropriate, we have included problems within and after the readings to demonstrate practical application and reinforce your understanding of the concepts presented. The problems are designed to help you learn these concepts and may serve as a basis for exam questions. Many of these questions are adapted from past CFA examinations.

Glossary and Index For your convenience, we have printed a comprehensive glossary in each volume. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the glossary. The curriculum eBook is searchable, but we also publish an index that can be found on the CFA Institute website with the Level III study sessions.

LOS Self-Check We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

Source Material The authorship, publisher, and copyright owners are given for each reading for your reference. We recommend that you use the CFA Institute curriculum rather than the original source materials because the curriculum may include only selected pages from outside readings, updated sections within the readings, and problems and solutions tailored to the CFA Program. Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*®, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and 11 Nobel laureates have contributed a total of 45 articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this practice-oriented publication. Candidates have full online access to the *Financial Analysts Journal* and associated resources. All you need is to log in on www.cfapubs.org using your candidate credentials.

DESIGNING YOUR PERSONAL STUDY PROGRAM

Create a Schedule An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all reading assignments and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skill, or ability described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

As you prepare for your exam, we will e-mail you important exam updates, testing policies, and study tips. Be sure to read these carefully. Curriculum errata are periodically updated and posted on the study session page at www.cfainstitute.org.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience. For each level of the curriculum, there are 18 study sessions. So, a good plan is to devote 15–20 hours per week for 18 weeks to studying the material. Use the final four to six weeks before the exam to review what you have learned and practice with topic tests and mock exams. This recommendation, however, may underestimate the hours needed for appropriate examination preparation depending on your individual circumstances, relevant experience, and academic background. You will undoubtedly adjust your study time to conform to your own strengths and weaknesses and to your educational and professional background.

You will probably spend more time on some study sessions than on others, but on average you should plan on devoting 15–20 hours per study session. You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

An interactive study planner is available in the candidate resources area of our website to help you plan your study time. The interactive study planner recommends completion dates for each topic of the curriculum. Dates are determined based on study time available, exam topic weights, and curriculum weights. As you progress through the curriculum, the interactive study planner dynamically adjusts your study plan when you are running off schedule to help you stay on track for completion prior to the examination.

CFA Institute Topic Tests The CFA Institute topic tests are intended to assess your mastery of individual topic areas as you progress through your studies. After each test, you will receive immediate feedback noting the correct responses and indicating the relevant assigned reading so you can identify areas of weakness for further study. For more information on the topic tests, please visit www.cfainstitute.org.

CFA Institute Mock Exams The three-hour mock exams simulate the morning and afternoon sessions of the actual CFA examination, and are intended to be taken after you complete your study of the full curriculum so you can test your understanding of the curriculum and your readiness for the exam. You will receive feedback at the end of the mock exam, noting the correct responses and indicating the relevant assigned readings so you can assess areas of weakness for further study during your review period. We recommend that you take mock exams during the final stages of your preparation for the actual CFA examination. For more information on the mock examinations, please visit www.cfainstitute.org.

Preparatory Providers After you enroll in the CFA Program, you may receive numerous solicitations for preparatory courses and review materials. When considering a prep course, make sure the provider is in compliance with the CFA Institute Approved

Prep Provider Program (www.cfainstitute.org/utility/examprep/Pages/index.aspx). Just remember, there are no shortcuts to success on the CFA examinations; reading and studying the CFA curriculum is the key to success on the examination. The CFA examinations reference only the CFA Institute assigned curriculum—no preparatory course or review course materials are consulted or referenced.

SUMMARY

Every question on the CFA examination is based on the content contained in the required readings and on one or more LOS. Frequently, an examination question is based on a specific example highlighted within a reading or on a specific end-of-reading question and/or problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the examination except for occasional sections marked as optional. You may read optional pages as background, but you will not be tested on them.
2. All questions, problems, and their solutions—found at the end of readings—are part of the curriculum and are required study material for the examination.
3. You should make appropriate use of the topic tests and mock examinations and other resources available at www.cfainstitute.org.
4. Use the interactive study planner to create a schedule and commit sufficient study time to cover the 18 study sessions, review the materials, and take topic tests and mock examinations.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and member feedback as we work to incorporate content, design, and packaging improvements. You can be assured that we will continue to listen to your suggestions. Please send any comments or feedback to info@cfainstitute.org. Ongoing improvements in the curriculum will help you prepare for success on the upcoming examinations and for a lifetime of learning as a serious investment professional.

CUSTOMER SERVICE

68

Ethical and Professional Standards

STUDY SESSIONS

Study Session 1	Code of Ethics and Standards of Professional Conduct
Study Session 2	Ethical and Professional Standards in Practice

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to demonstrate a thorough knowledge of the CFA Institute Code of Ethics and Standards of Professional Conduct, including the rules and sanctions relating to disciplinary proceedings.

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

ETHICAL AND PROFESSIONAL STANDARDS

STUDY SESSION

1

Code of Ethics and Standards of Professional Conduct

CFA Institute members and CFA Program candidates continually face situations requiring professional and ethical judgement. By acting in a manner consistent with the CFA Institute Code of Ethics and Standards of Professional Conduct (Code and Standards), members and candidates help build greater levels of trust in the investment profession.

This study session provides a framework for ethical conduct in the investment profession. The principles and guidance presented in the CFA Institute *Standards of Practice Handbook* (*Handbook*) form the basis for the CFA Institute self-regulatory program to maintain the highest professional standards among investment practitioners. A clear understanding of the CFA Institute Code and Standards (both found in the *Handbook*) should allow practitioners to identify and appropriately resolve ethical conflicts, leading to a reputation for integrity that benefits both the individual and the profession. Material under "Guidance" in the *Handbook* addresses the practical application of the Code and Standards. The guidance for each standard reviews its purpose and scope, presents recommended procedures for compliance, and provides examples of the standard in practice.

READING ASSIGNMENTS

Reading 1	Code of Ethics and Standards of Professional Conduct *Standards of Practice Handbook,* Eleventh Edition
Reading 2	Guidance for Standards I–VII *Standards of Practice Handbook*, Eleventh Edition

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

1

Code of Ethics and Standards of Professional Conduct

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe the structure of the CFA Institute Professional Conduct Program and the disciplinary review process for the enforcement of the Code of Ethics and Standards of Professional Conduct;
☐	**b.** explain the ethical responsibilities required by the Code of Ethics and the Standards of Professional Conduct, including the subsections of each standard.

PREFACE

The *Standards of Practice Handbook* (*Handbook*) provides guidance to the people who grapple with real ethical dilemmas in the investment profession on a daily basis; the *Handbook* addresses the professional intersection where theory meets practice and where the concept of ethical behavior crosses from the abstract to the concrete. The *Handbook* is intended for a diverse and global audience: CFA Institute members navigating ambiguous ethical situations; supervisors and direct/indirect reports determining the nature of their responsibilities to each other, to existing and potential clients, and to the broader financial markets; and candidates preparing for the Chartered Financial Analyst (CFA) examinations.

Recent events in the global financial markets have tested the ethical mettle of financial market participants, including CFA Institute members. The standards taught in the CFA Program and by which CFA Institute members and candidates must abide represent timeless ethical principles and professional conduct for all market conditions. Through adherence to these standards, which continue to serve as the model for ethical behavior in the investment professional globally, each market participant does his or her part to improve the integrity and efficient operations of the financial markets.

The *Handbook* provides guidance in understanding the interconnectedness of the aspirational and practical principles and provisions of the Code of Ethics and Standards of Professional Conduct (Code and Standards). The Code contains high-level aspirational ethical principles that drive members and candidates to create a positive and reputable investment profession. The Standards contain practical ethical principles of conduct that members and candidates must follow to achieve the broader

© 2014 CFA Institute. All rights reserved.

industry expectations. However, applying the principles individually may not capture the complexity of ethical requirements related to the investment industry. The Code and Standards should be viewed and interpreted as an interwoven tapestry of ethical requirements. Through members' and candidates' adherence to these principles as a whole, the integrity of and trust in the capital markets are improved.

Evolution of the CFA Institute Code of Ethics and Standards of Professional Conduct

Generally, changes to the Code and Standards over the years have been minor. CFA Institute has revised the language of the Code and Standards and occasionally added a new standard to address a prominent issue of the day. For instance, in 1992, CFA Institute added the standard addressing performance presentation to the existing list of standards.

Major changes came in 2005 with the ninth edition of the *Handbook*. CFA Institute adopted new standards, revised some existing standards, and reorganized the standards. The revisions were intended to clarify the requirements of the Code and Standards and effectively convey to its global membership what constitutes "best practice" in a number of areas relating to the investment profession.

The Code and Standards must be regularly reviewed and updated if they are to remain effective and continue to represent the highest ethical standards in the global investment industry. CFA Institute strongly believes that revisions of the Code and Standards are not undertaken for cosmetic purposes but to add value by addressing legitimate concerns and improving comprehension.

Changes to the Code and Standards have far-reaching implications for the CFA Institute membership, the CFA Program, and the investment industry as a whole. CFA Institute members and candidates are *required* to adhere to the Code and Standards. In addition, the Code and Standards are increasingly being adopted, in whole or in part, by firms and regulatory authorities. Their relevance goes well beyond CFA Institute members and candidates.

Standards of Practice Handbook

The periodic revisions of the Code and Standards have come in conjunction with updates of the *Standards of Practice Handbook*. The *Handbook* is the fundamental element of the ethics education effort of CFA Institute and the primary resource for guidance in interpreting and implementing the Code and Standards. The *Handbook* seeks to educate members and candidates on how to apply the Code and Standards to their professional lives and thereby benefit their clients, employers, and the investing public in general. The *Handbook* explains the purpose of the Code and Standards and how they apply in a variety of situations. The sections discuss and amplify each standard and suggest procedures to prevent violations.

Examples in the "Application of the Standard" sections are meant to illustrate how the standard applies to hypothetical but factual situations. The names contained in the examples are fictional and are not meant to refer to any actual person or entity. Unless otherwise stated (e.g., one or more people specifically identified), individuals in each example are CFA Institute members and holders of the CFA designation. Because factual circumstances vary so widely and often involve gray areas, the explanatory material and examples are not intended to be all inclusive. Many examples set forth in the application sections involve standards that have legal counterparts; ***members are strongly urged to discuss with their supervisors and legal and compliance departments the content of the Code and Standards and the members' general obligations under the Code and Standards***.

CFA Institute recognizes that the presence of any set of ethical standards may create a false sense of security unless the documents are fully understood, enforced, and made a meaningful part of everyday professional activities. The *Handbook* is intended to provide a useful frame of reference that suggests ethical professional behavior in the investment decision-making process. This book cannot cover every contingency or circumstance, however, and it does not attempt to do so. The development and interpretation of the Code and Standards are evolving processes; the Code and Standards will be subject to continuing refinement.

Summary of Changes in the Eleventh Edition

The comprehensive review of the Code and Standards in 2005 resulted in principle requirements that remain applicable today. The review carried out for the eleventh edition focused on market practices that have evolved since the tenth edition. Along with updates to the guidance and examples within the *Handbook*, the eleventh edition includes an update to the Code of Ethics that embraces the members' role of maintaining the social contract between the industry and investors. Additionally, there are three changes to the Standards of Professional Conduct, which recognize the importance of proper supervision, clear communications with clients, and the expanding educational programs of CFA Institute.

Inclusion of Updated CFA Institute Mission

The CFA Institute Board of Governors approved an updated mission for the organization that is included in the Preamble to the Code and Standards. The new mission conveys the organization's conviction in the investment industry's role in the betterment of society at large.

> ***Mission:***
>
> To lead the investment profession globally by promoting the highest standards of ethics, education, and professional excellence for the ultimate benefit of society.

Updated Code of Ethics Principle

One of the bullets in the Code of Ethics was updated to reflect the role that the capital markets have in the greater society. As members work to promote and maintain the integrity of the markets, their actions should also help maintain the social contract with investors.

> ***Old:***
>
> Promote the integrity of and uphold the rules governing capital markets.
>
> ***New:***
>
> Promote the integrity and viability of the global capital markets for the ultimate benefit of society.

New Standard Regarding Responsibilities of Supervisors [IV(C)]

The standard for members and candidates with supervision or authority over others within their firms was updated to bring about improvements in preventing illegal and unethical actions from occurring. The prior version of Standard IV(C) focused

on the detection and prevention of violations. The updated version stresses broader compliance expectations, which include the detection and prevention aspects of the original version.

Old:

Members and Candidates must make reasonable efforts to detect and prevent violations of applicable laws, rules, regulations, and the Code and Standards by anyone subject to their supervision or authority.

New:

Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

Additional Requirement under the Standard for Communication with Clients and Prospective Clients [V(B)]

Given the constant development of new and exotic financial instruments and strategies, the standard regarding communicating with clients now includes an implicit requirement to discuss the risks and limitations of recommendations being made to clients. The new principle and related guidance take into account the fact that levels of disclosure will differ between products and services. Members and candidates, along with their firms, must determine the specific disclosures their clients should receive while ensuring appropriate transparency of the individual firms' investment processes.

Addition:

Disclose to clients and prospective clients significant limitations and risks associated with the investment process.

Modification to Standard VII(A)

Since this standard was developed, CFA Institute has launched additional educational programs. The updated standard not only maintains the integrity of the CFA Program but also expands the same ethical considerations when members or candidates participate in such programs as the CIPM Program and the Claritas Investment Certificate. Whether participating as a member assisting with the curriculum or an examination or as a sitting candidate within a program, we expect them to engage in these programs as they would participate in the CFA Program.

Old:

Conduct as Members and Candidates in the CFA Program

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of the CFA examinations.

New:

Conduct as Participants in CFA Institute Programs

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.

General Guidance and Example Revision

The guidance and examples were updated to reflect practices and scenarios applicable to today's investment industry. Two concepts that appear frequently in the updates in this edition relate to the increased use of social media for business communications and the use of and reliance on the output of quantitative models. The use of social media platforms has increased significantly since the publication of the tenth edition. And although financial modeling is not new to the industry, this update reflects upon actions that are viewed as possible contributing factors to the financial crises of the past decade.

CFA Institute Professional Conduct Program

All CFA Institute members and candidates enrolled in the CFA Program are required to comply with the Code and Standards. The CFA Institute Board of Governors maintains oversight and responsibility for the Professional Conduct Program (PCP), which, in conjunction with the Disciplinary Review Committee (DRC), is responsible for enforcement of the Code and Standards. The DRC is a volunteer committee of CFA charterholders who serve on panels to review conduct and partner with Professional Conduct staff to establish and review professional conduct policies. The CFA Institute Bylaws and Rules of Procedure for Professional Conduct (Rules of Procedure) form the basic structure for enforcing the Code and Standards. The Professional Conduct division is also responsible for enforcing testing policies of other CFA Institute education programs as well as the professional conduct of Certificate in Investment Performance Measurement (CIPM) certificants.

Professional Conduct inquiries come from a number of sources. First, members and candidates must self-disclose on the annual Professional Conduct Statement all matters that question their professional conduct, such as involvement in civil litigation or a criminal investigation or being the subject of a written complaint. Second, written complaints received by Professional Conduct staff can bring about an investigation. Third, CFA Institute staff may become aware of questionable conduct by a member or candidate through the media, regulatory notices, or another public source. Fourth, candidate conduct is monitored by proctors who complete reports on candidates suspected to have violated testing rules on exam day. Lastly, CFA Institute may also conduct analyses of scores and exam materials after the exam, as well as monitor online and social media to detect disclosure of confidential exam information.

When an inquiry is initiated, the Professional Conduct staff conducts an investigation that may include requesting a written explanation from the member or candidate; interviewing the member or candidate, complaining parties, and third parties; and collecting documents and records relevant to the investigation. Upon reviewing the material obtained during the investigation, the Professional Conduct staff may conclude the inquiry with no disciplinary sanction, issue a cautionary letter, or continue proceedings to discipline the member or candidate. If the Professional Conduct staff believes a violation of the Code and Standards or testing policies has occurred, the member or candidate has the opportunity to reject or accept any charges and the proposed sanctions.

If the member or candidate does not accept the charges and proposed sanction, the matter is referred to a panel composed of DRC members. Panels review materials and presentations from Professional Conduct staff and from the member or candidate. The panel's task is to determine whether a violation of the Code and Standards or testing policies occurred and, if so, what sanction should be imposed.

Sanctions imposed by CFA Institute may have significant consequences; they include public censure, suspension of membership and use of the CFA designation, and revocation of the CFA charter. Candidates enrolled in the CFA Program who have violated the Code and Standards or testing policies may be suspended or prohibited from further participation in the CFA Program.

Adoption of the Code and Standards

The Code and Standards apply to individual members of CFA Institute and candidates in the CFA Program. CFA Institute does encourage firms to adopt the Code and Standards, however, as part of their code of ethics. Those who claim compliance should fully understand the requirements of each of the principles of the Code and Standards.

Once a party—nonmember or firm—ensures its code of ethics meets the principles of the Code and Standards, that party should make the following statement whenever claiming compliance:

> "[Insert name of party] claims compliance with the CFA Institute Code of Ethics and Standards of Professional Conduct. This claim has not been verified by CFA Institute."

CFA Institute welcomes public acknowledgement, when appropriate, that firms are complying with the CFA Institute Code of Ethics and Standards of Professional Conduct and encourages firms to notify us of the adoption plans. For firms that would like to distribute the Code and Standards to clients and potential clients, attractive one-page copies of the Code and Standards, including translations, are available on the CFA Institute website (www.cfainstitute.org).

CFA Institute has also published the Asset Manager Code of Professional Conduct, which is designed, in part, to help asset managers comply with the regulations mandating codes of ethics for investment advisers. Whereas the Code and Standards are aimed at individual investment professionals who are members of CFA Institute or candidates in the CFA Program, the Asset Manager Code was drafted specifically for firms. The Asset Manager Code provides specific, practical guidelines for asset managers in six areas: loyalty to clients, the investment process, trading, compliance, performance evaluation, and disclosure. The Asset Manager Code and the appropriate steps to acknowledge adoption or compliance can be found on the CFA Institute website (www.cfainstitute.org).

Acknowledgments

CFA Institute is a not-for-profit organization that is heavily dependent on the expertise and intellectual contributions of member volunteers. Members devote their time because they share a mutual interest in the organization's mission to promote and achieve ethical practice in the investment profession. CFA Institute owes much to the volunteers' abundant generosity and energy in extending ethical integrity.

The CFA Institute Standards of Practice Council (SPC), a group consisting of CFA charterholder volunteers from many different countries, is charged with maintaining and interpreting the Code and Standards and ensuring that they are effective. The SPC draws its membership from a broad spectrum of organizations in the securities field, including brokers, investment advisers, banks, and insurance companies. In most instances, the SPC members have important supervisory responsibilities within their firms.

The SPC continually evaluates the Code and Standards, as well as the guidance in the *Handbook*, to ensure that they are

- representative of high standards of professional conduct,
- relevant to the changing nature of the investment profession,
- globally applicable,
- sufficiently comprehensive, practical, and specific,
- enforceable, and
- testable for the CFA Program.

The SPC has spent countless hours reviewing and discussing revisions to the Code and Standards and updates to the guidance that make up the eleventh edition of the *Handbook*. Following is a list of the current and former members of the SPC who generously donated their time and energy to this effort.

James E. Hollis III, CFA, Chair
Rik Albrecht, CFA
Terence E. Burns, CFA
Laura Dagan, CFA
Samuel B. Jones, Jr., CFA
Ulrike Kaiser-Boeing, CFA
Jinliang (Jack) Li, CFA
Christopher C. Loop, CFA,
James M. Meeth, CFA
Guy G. Rutherfurd, Jr., CFA
Edouard Senechal, CFA
Wenliang (Richard) Wang, CFA
Peng Lian Wee, CFA

ETHICS AND THE INVESTMENT INDUSTRY

Society ultimately benefits from efficient markets where capital can freely flow to the most productive or innovative destination. Well-functioning capital markets efficiently match those needing capital with those seeking to invest their assets in revenue-generating ventures. In order for capital markets to be efficient, investors must be able to trust that the markets are fair and transparent and offer them the opportunity to be rewarded for the risk they choose to take. Laws, regulations, and enforcement play a vital role but are insufficient alone to guarantee fair and transparent markets. The markets depend on an ethical foundation to guide participants' judgment and behavior. CFA Institute maintains and promotes the Code of Ethics and Standards of Professional Conduct in order to create a culture of ethics for the ultimate benefit of society.

Why Ethics Matters

Ethics can be defined as a set of moral principles or rules of conduct that provide guidance for our behavior when it affects others. Widely acknowledged fundamental ethical principles include honesty, fairness, diligence, and care and respect for others. Ethical conduct follows those principles and balances self-interest with both the direct and the indirect consequences of that behavior for other people.

Not only does unethical behavior by individuals have serious personal consequences—ranging from job loss and reputational damage to fines and even jail—but unethical conduct from market participants, investment professionals, and those who service investors can damage investor trust and thereby impair the sustainability of the global capital markets as a whole. Unfortunately, there seems to be an unending parade of stories bringing to light accounting frauds and manipulations, Ponzi schemes, insider-trading scandals, and other misdeeds. Not surprisingly, this has led to erosion

in public confidence in investment professionals. Empirical evidence from numerous surveys documents the low standing in the eyes of the investing public of banks and financial services firms—the very institutions that are entrusted with the economic well-being and retirement security of society.

Governments and regulators have historically tried to combat misconduct in the industry through regulatory reform, with various levels of success. Global capital markets are highly regulated to protect investors and other market participants. However, compliance with regulation alone is insufficient to fully earn investor trust. Individuals and firms must develop a "culture of integrity" that permeates all levels of operations and promotes the ethical principles of stewardship of investor assets and working in the best interests of clients, above and beyond strict compliance with the law. A strong ethical culture that helps honest, ethical people engage in ethical behavior will foster the trust of investors, lead to robust global capital markets, and ultimately benefit society. That is why ethics matters.

Ethics, Society, and the Capital Markets

CFA Institute recently added the concept "for the ultimate benefit of society" to its mission. The premise is that we want to live in a socially, politically, and financially stable society that fosters individual well-being and welfare of the public. A key ingredient for this goal is global capital markets that facilitate the efficient allocation of resources so that the available capital finds its way to places where it most benefits that society. These investments are then used to produce goods and services, to fund innovation and jobs, and to promote improvements in standards of living. Indeed, such a function serves the interests of the society. Efficient capital markets, in turn, provide a host of benefits to those providing the investment capital. Investors are provided the opportunity to transfer and transform risk because the capital markets serve as an information exchange, create investment products, provide liquidity, and limit transaction costs.

However, a well-functioning and efficient capital market system is dependent on trust of the participants. If investors believe that capital market participants—investment professionals and firms—cannot be trusted with their financial assets or that the capital markets are unfair such that only insiders can be successful, they will be unlikely to invest or, at the very least, will require a higher risk premium. Decreased investment capital can reduce innovation and job creation and hurt the economy and society as a whole. Reduced trust in capital markets can also result in a less vibrant, if not smaller, investment industry.

Ethics for a global investment industry should be universal and ultimately support trust and integrity above acceptable local or regional customs and culture. Universal ethics for a global industry strongly supports the efficiency, values, and mission of the industry as a whole. Different countries may be at different stages of development in establishing standards of practice, but the end goal must be to achieve rules, regulations, and standards that support and promote fundamental ethical principles on a global basis.

Capital Market Sustainability and the Actions of One

Individuals and firms also have to look at the indirect impacts of their actions on the broader investment community. The increasingly interconnected nature of global finance brings to the fore an added consideration of market sustainability that was, perhaps, less appreciated in years past. In addition to committing to the highest levels of ethical behavior, today's investment professionals and their employers should consider the long-term health of the market as a whole.

As recent events have demonstrated, apparently isolated and unrelated decisions, however innocuous when considered on an individual basis, in aggregate can precipitate a market crisis. In an interconnected global economy and marketplace, each

participant should strive to be aware of how his or her actions or the products he or she distributes may have an impact on capital market participants in other regions or countries.

Investment professionals should consider how their investment decision-making processes affect the global financial markets in the broader context of how they apply their ethical and professional obligations. Those in positions of authority have a special responsibility to consider the broader context of market sustainability in their development and approval of corporate policies, particularly those involving risk management and product development. In addition, corporate compensation strategies should not encourage otherwise ethically sound individuals to engage in unethical or questionable conduct for financial gain. Ethics, sustainability, and properly functioning capital markets are components of the same concept of protecting the best interests of all. To always place the interests of clients ahead of both investment professionals' own interests and those of their employer remains a key ethos.

The Relationship between Ethics and Regulations

Some equate ethical behavior with legal behavior: If you are following the law, you must be acting appropriately. Ethical principles, like laws and regulations, prescribe appropriate constraints on our natural tendency to pursue self-interest that could harm the interests of others. Laws and regulations often attempt to guide people toward ethical behavior, but they do not cover all unethical behavior. Ethical behavior is often distinguished from legal conduct by describing legal behavior as what is required and ethical behavior as conduct that is morally correct. Ethical principles go beyond that which is legally sufficient and encompass what is the right thing to do.

Given many regulators' lack of sufficient resources to enforce well-conceived rules and regulations, relying on a regulatory framework to lead the charge in establishing ethical behavior has its challenges. Therefore, reliance on compliance with laws and regulation alone is insufficient to ensure ethical behavior of investment professionals or to create a truly ethical culture in the industry.

The recent past has shown us that some individuals will succeed at circumventing the regulatory rules for their personal gain. Only the application of strong ethical principles, at both the individual level and the firm level, will limit abuses. Knowing the rules or regulations to apply in a particular situation, although important, may not be sufficient to ensure ethical conduct. Individuals must be able both to recognize areas that are prone to ethical pitfalls and to identify and process those circumstances and influences that can impair ethical judgment.

Applying an Ethical Framework

Laws, regulations, professional standards, and codes of ethics can guide ethical behavior, but individual judgment is a critical ingredient in making principled choices and engaging in appropriate conduct. When faced with an ethical dilemma, individuals must have a well-developed set of principles; otherwise, their thought processes can lead to, at best, equivocation and indecision and, at worst, fraudulent conduct and destruction of the public trust. Establishing an ethical framework for an internal thought process prior to deciding to act is a crucial step in engaging in ethical conduct.

Most investment professionals are used to making decisions from a business (profit/loss) outlook. But given the importance of ethical behavior in carrying out professional responsibilities, it is critical to also analyze decisions and potential conduct from an ethical perspective. Utilizing a framework for ethical decision making will help investment professionals effectively examine their conduct in the context of conflicting interests common to their professional obligations (e.g., researching and gathering information, developing investment recommendations, and managing money for others). Such a framework will allow investment professionals to analyze their conduct in a way that meets high standards of ethical behavior.

An ethical decision-making framework can come in many forms but should provide investment professionals with a tool for following the principles of the firm's code of ethics. Through analyzing the particular circumstances of each decision, investment professionals are able to determine the best course of action to fulfill their responsibilities in an ethical manner.

Commitment to Ethics by Firms

A firm's code of ethics risks becoming a largely ignored, dusty compilation if it is not truly integrated into the fabric of the business. The ability to relate an ethical decision-making framework to a firm's code of ethics allows investment professionals to bring the aspirations and principles of the code of ethics to life—transforming it from a compliance exercise to something that is at the heart of a firm's culture.

An investment professional's natural desire to "do the right thing" must be reinforced by building a culture of integrity in the workplace. Development, maintenance, and demonstration of a strong culture of integrity within the firm by senior management may be the single most important factor in promoting ethical behavior among the firm's employees. Adopting a code that clearly lays out the ethical principles that guide the thought processes and conduct the firm expects from its employees is a critical first step. But a code of ethics, while necessary, is insufficient.

Simply nurturing an inclination to do right is no match for the multitude of daily decisions that investment managers make. We need to exercise ethical decision-making skills to develop the muscle memory necessary for fundamentally ethical people to make good decisions despite the reality of agent conflicts. Just as coaching and practice transform our natural ability to run across a field into the technique and endurance required to run a race, teaching, reinforcing, and practicing ethical decision-making skills prepare us to confront the hard issues effectively. It is good for business, individuals, firms, the industry, and the markets, as well as society as a whole, to engage in the investment management profession in a highly ethical manner.

Ethical Commitment of CFA Institute

An important goal of CFA Institute is to ensure that the organization and its members and candidates develop, promote, and follow the highest ethical standards in the investment industry. The CFA Institute Code of Ethics (Code) and Standards of Professional Conduct (Standards) are the foundation supporting the organization's quest to uphold the industry's highest standards of individual and corporate practice and to help serve the greater good. The Code is a set of principles that define the overarching conduct CFA Institute expects from its members and CFA Program candidates. The Code works in tandem with the Standards, which outline professional conduct that constitutes fair and ethical business practices.

For more than 50 years, CFA Institute members and candidates have been required to abide by the organization's Code and Standards. Periodically, CFA Institute has revised and updated its Code and Standards to ensure that they remain relevant to the changing nature of the investment profession and representative of the highest standard of professional conduct. Within this *Handbook*, CFA Institute addresses ethical principles for the profession, including individual professionalism; responsibilities to capital markets, clients, and employers; ethics involved in investment analysis, recommendations, and actions; and possible conflicts of interest. Although the investment world has become a far more complex place since the first publication of the *Standard of Practice Handbook*, distinguishing right from wrong remains the paramount principle of the Code and Standards.

New challenges will continually arise for members and candidates in applying the Code and Standards because many decisions are not unambiguously right or wrong. The dilemma exists because the choice between right and wrong is not always clear.

Even well-intentioned investment professionals can find themselves in circumstances that may tempt them to cut corners. Situational influences can overpower the best of intentions.

CFA Institute has made a significant commitment to providing members and candidates with the resources to extend and deepen their understanding of how to appropriately apply the principles of the Code and Standards. The product offerings from CFA Institute offer a wealth of material. Through publications, conferences, webcasts, and podcasts, the ethical challenges of investment professionals are brought to light. Archived issues of these items are available on the CFA Institute website (www.cfainstitute.org).

By reviewing these resources and discussing with their peers, market participants can further enhance their abilities to apply an effective ethical decision-making framework. In time, this should help restore some of the trust recently lost by investors.

Markets function to an important extent on trust. Recent events have shown the fragility of this foundation and the devastating consequences that can ensue when it is fundamentally questioned. Investment professionals should remain mindful of the long-term health of financial markets and incorporate this concern for the market's sustainability in their investment decision making. CFA Institute and the Standards of Practice Council hope this edition of the *Handbook* will assist and guide investment professionals in meeting the ethical demands of the highly interconnected global capital markets for the ultimate benefit of society.

CFA INSTITUTE CODE OF ETHICS AND STANDARDS OF PROFESSIONAL CONDUCT

Preamble

The CFA Institute Code of Ethics and Standards of Professional Conduct are fundamental to the values of CFA Institute and essential to achieving its mission to lead the investment profession globally by promoting the highest standards of ethics, education, and professional excellence for the ultimate benefit of society. High ethical standards are critical to maintaining the public's trust in financial markets and in the investment profession. Since their creation in the 1960s, the Code and Standards have promoted the integrity of CFA Institute members and served as a model for measuring the ethics of investment professionals globally, regardless of job function, cultural differences, or local laws and regulations. All CFA Institute members (including holders of the Chartered Financial Analyst [CFA] designation) and CFA candidates have the personal responsibility to embrace and uphold the provisions of the Code and Standards and are encouraged to notify their employer of this responsibility. Violations may result in disciplinary sanctions by CFA Institute. Sanctions can include revocation of membership, revocation of candidacy in the CFA Program, and revocation of the right to use the CFA designation.

The Code of Ethics

Members of CFA Institute (including CFA charterholders) and candidates for the CFA designation ("Members and Candidates") must:

- Act with integrity, competence, diligence, and respect and in an ethical manner with the public, clients, prospective clients, employers, employees, colleagues in the investment profession, and other participants in the global capital markets.

- Place the integrity of the investment profession and the interests of clients above their own personal interests.
- Use reasonable care and exercise independent professional judgment when conducting investment analysis, making investment recommendations, taking investment actions, and engaging in other professional activities.
- Practice and encourage others to practice in a professional and ethical manner that will reflect credit on themselves and the profession.
- Promote the integrity and viability of the global capital markets for the ultimate benefit of society.
- Maintain and improve their professional competence and strive to maintain and improve the competence of other investment professionals.

Standards of Professional Conduct

I. PROFESSIONALISM

A Knowledge of the Law

Members and Candidates must understand and comply with all applicable laws, rules, and regulations (including the CFA Institute Code of Ethics and Standards of Professional Conduct) of any government, regulatory organization, licensing agency, or professional association governing their professional activities. In the event of conflict, Members and Candidates must comply with the more strict law, rule, or regulation. Members and Candidates must not knowingly participate or assist in and must dissociate from any violation of such laws, rules, or regulations.

B Independence and Objectivity

Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another's independence and objectivity.

C Misrepresentation

Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities.

D Misconduct

Members and Candidates must not engage in any professional conduct involving dishonesty, fraud, or deceit or commit any act that reflects adversely on their professional reputation, integrity, or competence.

II. INTEGRITY OF CAPITAL MARKETS

A Material Nonpublic Information

Members and Candidates who possess material nonpublic information that could affect the value of an investment must not act or cause others to act on the information.

B Market Manipulation

Members and Candidates must not engage in practices that distort prices or artificially inflate trading volume with the intent to mislead market participants.

III. DUTIES TO CLIENTS

A Loyalty, Prudence, and Care

Members and Candidates have a duty of loyalty to their clients and must act with reasonable care and exercise prudent judgment. Members and Candidates must act for the benefit of their clients and place their clients' interests before their employer's or their own interests.

B Fair Dealing

Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.

C Suitability

1 When Members and Candidates are in an advisory relationship with a client, they must:

a Make a reasonable inquiry into a client's or prospective client's investment experience, risk and return objectives, and financial constraints prior to making any investment recommendation or taking investment action and must reassess and update this information regularly.

b Determine that an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment action.

c Judge the suitability of investments in the context of the client's total portfolio.

2 When Members and Candidates are responsible for managing a portfolio to a specific mandate, strategy, or style, they must make only investment recommendations or take only investment actions that are consistent with the stated objectives and constraints of the portfolio.

D Performance Presentation

When communicating investment performance information, Members and Candidates must make reasonable efforts to ensure that it is fair, accurate, and complete.

E Preservation of Confidentiality

Members and Candidates must keep information about current, former, and prospective clients confidential unless:

1 The information concerns illegal activities on the part of the client or prospective client,

2 Disclosure is required by law, or

3 The client or prospective client permits disclosure of the information.

IV. DUTIES TO EMPLOYERS

A Loyalty

In matters related to their employment, Members and Candidates must act for the benefit of their employer and not deprive their employer of the advantage of their skills and abilities, divulge confidential information, or otherwise cause harm to their employer.

B Additional Compensation Arrangements

Members and Candidates must not accept gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest unless they obtain written consent from all parties involved.

C Responsibilities of Supervisors

Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

V. INVESTMENT ANALYSIS, RECOMMENDATIONS, AND ACTIONS

A Diligence and Reasonable Basis

Members and Candidates must:

1 Exercise diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions.

2 Have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis, recommendation, or action.

B Communication with Clients and Prospective Clients

Members and Candidates must:

1 Disclose to clients and prospective clients the basic format and general principles of the investment processes they use to analyze investments, select securities, and construct portfolios and must promptly disclose any changes that might materially affect those processes.

2 Disclose to clients and prospective clients significant limitations and risks associated with the investment process.

3 Use reasonable judgment in identifying which factors are important to their investment analyses, recommendations, or actions and include those factors in communications with clients and prospective clients.

4 Distinguish between fact and opinion in the presentation of investment analysis and recommendations.

C Record Retention

Members and Candidates must develop and maintain appropriate records to support their investment analyses, recommendations, actions, and other investment-related communications with clients and prospective clients.

VI. CONFLICTS OF INTEREST

A Disclosure of Conflicts

Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively.

B Priority of Transactions

Investment transactions for clients and employers must have priority over investment transactions in which a Member or Candidate is the beneficial owner.

C Referral Fees

Members and Candidates must disclose to their employer, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received from or paid to others for the recommendation of products or services.

VII. RESPONSIBILITIES AS A CFA INSTITUTE MEMBER OR CFA CANDIDATE

A Conduct as Participants in CFA Institute Programs

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.

B Reference to CFA Institute, the CFA Designation, and the CFA Program

When referring to CFA Institute, CFA Institute membership, the CFA designation, or candidacy in the CFA Program, Members and Candidates must not misrepresent or exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA Program.

CUSTOMER SERVICE

68

READING

2

Guidance for Standards I–VII

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** demonstrate a thorough knowledge of the Code of Ethics and Standards of Professional Conduct by interpreting the Code and Standards in various situations involving issues of professional integrity;
☐	**b.** recommend practices and procedures designed to prevent violations of the Code of Ethics and Standards of Professional Conduct.

STANDARD I: PROFESSIONALISM

Standard I(A) Knowledge of the Law

Members and Candidates must understand and comply with all applicable laws, rules, and regulations (including the CFA Institute Code of Ethics and Standards of Professional Conduct) of any government, regulatory organization, licensing agency, or professional association governing their professional activities. In the event of conflict, Members and Candidates must comply with the more strict law, rule, or regulation. Members and Candidates must not knowingly participate or assist in and must dissociate from any violation of such laws, rules, or regulations.

Guidance

Highlights:

- *Relationship between the Code and Standards and Applicable Law*
- *Participation in or Association with Violations by Others*
- *Investment Products and Applicable Laws*

© 2014 CFA Institute. All rights reserved.

Members and candidates must understand the applicable laws and regulations of the countries and jurisdictions where they engage in professional activities. These activities may include, but are not limited to, trading of securities or other financial instruments, providing investment advice, conducting research, or performing other investment services. On the basis of their reasonable and good faith understanding, members and candidates must comply with the laws and regulations that directly govern their professional activities and resulting outcomes and that protect the interests of the clients.

When questions arise, members and candidates should know their firm's policies and procedures for accessing compliance guidance. This standard does not require members and candidates to become experts, however, in compliance. Additionally, members and candidates are not required to have detailed knowledge of or be experts on all the laws that could potentially govern their activities.

During times of changing regulations, members and candidates must remain vigilant in maintaining their knowledge of the requirements for their professional activities. New financial products and processes, along with uncovered ethical missteps, create an environment for recurring and potentially wide-ranging regulatory changes. Members and candidates are also continually provided improved and enhanced methods of communicating with both clients and potential clients, such as mobile applications and web-based social networking platforms. As new local, regional, and global requirements are updated to address these and other changes, members, candidates, and their firms must adjust their procedures and practices to remain in compliance.

Relationship between the Code and Standards and Applicable Law

Some members or candidates may live, work, or provide investment services to clients living in a country that has no law or regulation governing a particular action or that has laws or regulations that differ from the requirements of the Code and Standards. When applicable law and the Code and Standards require different conduct, members and candidates must follow the more strict of the applicable law or the Code and Standards.

"Applicable law" is the law that governs the member's or candidate's conduct. Which law applies will depend on the particular facts and circumstances of each case. The "more strict" law or regulation is the law or regulation that imposes greater restrictions on the action of the member or candidate or calls for the member or candidate to exert a greater degree of action that protects the interests of investors. For example, applicable law or regulation may not require members and candidates to disclose referral fees received from or paid to others for the recommendation of investment products or services. Because the Code and Standards impose this obligation, however, members and candidates must disclose the existence of such fees.

Members and candidates must adhere to the following principles:

- Members and candidates must comply with applicable laws or regulations related to their professional activities.
- Members and candidates must not engage in conduct that constitutes a violation of the Code and Standards, even though it may otherwise be legal.
- In the absence of any applicable law or regulation or when the Code and Standards impose a higher degree of responsibility than applicable laws and regulations, members and candidates must adhere to the Code and Standards. Applications of these principles are outlined in Exhibit 1.

The applicable laws governing the responsibilities of a member or candidate should be viewed as the minimal threshold of acceptable actions. When members and candidates take actions that exceed the minimal requirements, they further support the conduct required of Standard I(A).

CFA Institute members are obligated to abide by the CFA Institute Articles of Incorporation, Bylaws, Code of Ethics, Standards of Professional Conduct, Rules of Procedure, Membership Agreement, and other applicable rules promulgated by CFA Institute, all as amended periodically. CFA candidates who are not members must also abide by these documents (except for the Membership Agreement) as well as rules and regulations related to the administration of the CFA examination, the Candidate Responsibility Statement, and the Candidate Pledge.

Participation in or Association with Violations by Others

Members and candidates are responsible for violations in which they *knowingly* participate or assist. Although members and candidates are presumed to have knowledge of all applicable laws, rules, and regulations, CFA Institute acknowledges that members may not recognize violations if they are not aware of all the facts giving rise to the violations. Standard I(A) applies when members and candidates know or should know that their conduct may contribute to a violation of applicable laws, rules, or regulations or the Code and Standards.

If a member or candidate has reasonable grounds to believe that imminent or ongoing client or employer activities are illegal or unethical, the member or candidate must dissociate, or separate, from the activity. In extreme cases, dissociation may require a member or candidate to leave his or her employment. Members and candidates may take the following intermediate steps to dissociate from ethical violations of others when direct discussions with the person or persons committing the violation are unsuccessful. The first step should be to attempt to stop the behavior by bringing it to the attention of the employer through a supervisor or the firm's compliance department. If this attempt is unsuccessful, then members and candidates have a responsibility to step away and dissociate from the activity. Dissociation practices will differ on the basis of the member's or candidate's role in the investment industry. It may include removing one's name from written reports or recommendations, asking for a different assignment, or refusing to accept a new client or continue to advise a current client. Inaction combined with continuing association with those involved in illegal or unethical conduct may be construed as participation or assistance in the illegal or unethical conduct.

CFA Institute strongly encourages members and candidates to report potential violations of the Code and Standards committed by fellow members and candidates. Although a failure to report is less likely to be construed as a violation than a failure to dissociate from unethical conduct, the impact of inactivity on the integrity of capital markets can be significant. Although the Code and Standards do not compel members and candidates to report violations to their governmental or regulatory organizations unless such disclosure is mandatory under applicable law (voluntary reporting is often referred to as whistleblowing), such disclosure may be prudent under certain circumstances. Members and candidates should consult their legal and compliance advisers for guidance.

Additionally, CFA Institute encourages members, nonmembers, clients, and the investing public to report violations of the Code and Standards by CFA Institute members or CFA candidates by submitting a complaint in writing to the CFA Institute Professional Conduct Program via e-mail (pcprogram@cfainstitute.org) or the CFA Institute website (www.cfainstitute.org).

Investment Products and Applicable Laws

Members and candidates involved in creating or maintaining investment services or investment products or packages of securities and/or derivatives should be mindful of where these products or packages will be sold as well as their places of origination. The applicable laws and regulations of the countries or regions of origination and expected sale should be understood by those responsible for the supervision of

the services or creation and maintenance of the products or packages. Members or candidates should make reasonable efforts to review whether associated firms that are distributing products or services developed by their employing firm also abide by the laws and regulations of the countries and regions of distribution. Members and candidates should undertake the necessary due diligence when transacting cross-border business to understand the multiple applicable laws and regulations in order to protect the reputation of their firm and themselves.

Given the complexity that can arise with business transactions in today's market, there may be some uncertainty surrounding which laws or regulations are considered applicable when activities are being conducted in multiple jurisdictions. Members and candidates should seek the appropriate guidance, potentially including the firm's compliance or legal departments and legal counsel outside the organization, to gain a reasonable understanding of their responsibilities and how to implement them appropriately.

Exhibit 1 Global Application of the Code and Standards

Members and candidates who practice in multiple jurisdictions may be subject to varied securities laws and regulations. If applicable law is stricter than the requirements of the Code and Standards, members and candidates must adhere to applicable law; otherwise, they must adhere to the Code and Standards. The following chart provides illustrations involving a member who may be subject to the securities laws and regulations of three different types of countries:

NS: country with no securities laws or regulations

LS: country with ***less*** strict securities laws and regulations than the Code and Standards

MS: country with ***more*** strict securities laws and regulations than the Code and Standards

Applicable Law	Duties	Explanation
Member resides in NS country, does business in LS country; LS law applies.	Member must adhere to the Code and Standards.	Because applicable law is less strict than the Code and Standards, the member must adhere to the Code and Standards.
Member resides in NS country, does business in MS country; MS law applies.	Member must adhere to the law of MS country.	Because applicable law is stricter than the Code and Standards, member must adhere to the more strict applicable law.
Member resides in LS country, does business in NS country; LS law applies.	Member must adhere to the Code and Standards.	Because applicable law is less strict than the Code and Standards, member must adhere to the Code and Standards.
Member resides in LS country, does business in MS country; MS law applies.	Member must adhere to the law of MS country.	Because applicable law is stricter than the Code and Standards, member must adhere to the more strict applicable law.

Exhibit 1 (Continued)

Applicable Law	Duties	Explanation
Member resides in LS country, does business in NS country; LS law applies, but it states that law of locality where business is conducted governs.	Member must adhere to the Code and Standards.	Because applicable law states that the law of the locality where the business is conducted governs and there is no local law, the member must adhere to the Code and Standards.
Member resides in LS country, does business in MS country; LS law applies, but it states that law of locality where business is conducted governs.	Member must adhere to the law of MS country.	Because applicable law of the locality where the business is conducted governs and local law is stricter than the Code and Standards, member must adhere to the more strict applicable law.
Member resides in MS country, does business in LS country; MS law applies.	Member must adhere to the law of MS country.	Because applicable law is stricter than the Code and Standards, member must adhere to the more strict applicable law.
Member resides in MS country, does business in LS country; MS law applies, but it states that law of locality where business is conducted governs.	Member must adhere to the Code and Standards.	Because applicable law states that the law of the locality where the business is conducted governs and local law is less strict than the Code and Standards, member must adhere to the Code and Standards.
Member resides in MS country, does business in LS country with a client who is a citizen of LS country; MS law applies, but it states that the law of the client's home country governs.	Member must adhere to the Code and Standards.	Because applicable law states that the law of the client's home country governs (which is less strict than the Code and Standards), member must adhere to the Code and Standards.
Member resides in MS country, does business in LS country with a client who is a citizen of MS country; MS law applies, but it states that the law of the client's home country governs.	Member must adhere to the law of MS country.	Because applicable law states that the law of the client's home country governs and the law of the client's home country is stricter than the Code and Standards, the member must adhere to the more strict applicable law.

Recommended Procedures for Compliance

Members and Candidates

Suggested methods by which members and candidates can acquire and maintain understanding of applicable laws, rules, and regulations include the following:

- *Stay informed*: Members and candidates should establish or encourage their employers to establish a procedure by which employees are regularly informed about changes in applicable laws, rules, regulations, and case law. In many instances, the employer's compliance department or legal counsel can provide such information in the form of memorandums distributed to employees in the organization. Also, participation in an internal or external continuing education program is a practical method of staying current.
- *Review procedures*: Members and candidates should review, or encourage their employers to review, the firm's written compliance procedures on a regular basis to ensure that the procedures reflect current law and provide adequate guidance to employees about what is permissible conduct under the law and/or the Code and Standards. Recommended compliance procedures for specific items of the Code and Standards are discussed in this *Handbook* in the "Guidance" sections associated with each standard.
- *Maintain current files*: Members and candidates should maintain or encourage their employers to maintain readily accessible current reference copies of applicable statutes, rules, regulations, and important cases.

Distribution Area Laws

Members and candidates should make reasonable efforts to understand the applicable laws—both country and regional—for the countries and regions where their investment products are developed and are most likely to be distributed to clients.

Legal Counsel

When in doubt about the appropriate action to undertake, it is recommended that a member or candidate seek the advice of compliance personnel or legal counsel concerning legal requirements. If a potential violation is being committed by a fellow employee, it may also be prudent for the member or candidate to seek the advice of the firm's compliance department or legal counsel.

Dissociation

When dissociating from an activity that violates the Code and Standards, members and candidates should document the violation and urge their firms to attempt to persuade the perpetrator(s) to cease such conduct. To dissociate from the conduct, a member or candidate may have to resign his or her employment.

Firms

The formality and complexity of compliance procedures for firms depend on the nature and size of the organization and the nature of its investment operations. Members and candidates should encourage their firms to consider the following policies and procedures to support the principles of Standard I(A):

- *Develop and/or adopt a code of ethics*: The ethical culture of an organization starts at the top. Members and candidates should encourage their supervisors or managers to adopt a code of ethics. Adhering to a code of ethics facilitates solutions when people face ethical dilemmas and can prevent the need for employees to resort to a "whistleblowing" solution publicly alleging

concealed misconduct. CFA Institute has published the *Asset Manager Code of Professional Conduct*, which firms may adopt or use as the basis for their codes (visit www.cfainstitute.org).

- *Provide information on applicable laws*: Pertinent information that highlights applicable laws and regulations might be distributed to employees or made available in a central location. Information sources might include primary information developed by the relevant government, governmental agencies, regulatory organizations, licensing agencies, and professional associations (e.g., from their websites); law firm memorandums or newsletters; and association memorandums or publications (e.g., *CFA Institute Magazine*).
- *Establish procedures for reporting violations*: Firms might provide written protocols for reporting suspected violations of laws, regulations, or company policies.

Application of the Standard

Example 1 (Notification of Known Violations):

Michael Allen works for a brokerage firm and is responsible for an underwriting of securities. A company official gives Allen information indicating that the financial statements Allen filed with the regulator overstate the issuer's earnings. Allen seeks the advice of the brokerage firm's general counsel, who states that it would be difficult for the regulator to prove that Allen has been involved in any wrongdoing.

> *Comment*: Although it is recommended that members and candidates seek the advice of legal counsel, the reliance on such advice does not absolve a member or candidate from the requirement to comply with the law or regulation. Allen should report this situation to his supervisor, seek an independent legal opinion, and determine whether the regulator should be notified of the error.

Example 2 (Dissociating from a Violation):

Lawrence Brown's employer, an investment banking firm, is the principal underwriter for an issue of convertible debentures by the Courtney Company. Brown discovers that the Courtney Company has concealed severe third-quarter losses in its foreign operations. The preliminary prospectus has already been distributed.

> *Comment*: Knowing that the preliminary prospectus is misleading, Brown should report his findings to the appropriate supervisory persons in his firm. If the matter is not remedied and Brown's employer does not dissociate from the underwriting, Brown should sever all his connections with the underwriting. Brown should also seek legal advice to determine whether additional reporting or other action should be taken.

Example 3 (Dissociating from a Violation):

Kamisha Washington's firm advertises its past performance record by showing the 10-year return of a composite of its client accounts. Washington discovers, however, that the composite omits the performance of accounts that have left the firm during the 10-year period, whereas the description of the composite indicates the inclusion of all firm accounts. This omission has led to an inflated performance figure. Washington is asked to use promotional material that includes the erroneous performance number when soliciting business for the firm.

Comment: Misrepresenting performance is a violation of the Code and Standards. Although she did not calculate the performance herself, Washington would be assisting in violating Standard I(A) if she were to use the inflated performance number when soliciting clients. She must dissociate herself from the activity. If discussing the misleading number with the person responsible is not an option for correcting the problem, she can bring the situation to the attention of her supervisor or the compliance department at her firm. If her firm is unwilling to recalculate performance, she must refrain from using the misleading promotional material and should notify the firm of her reasons. If the firm insists that she use the material, she should consider whether her obligation to dissociate from the activity requires her to seek other employment.

Example 4 (Following the Highest Requirements):

James Collins is an investment analyst for a major Wall Street brokerage firm. He works in a developing country with a rapidly modernizing economy and a growing capital market. Local securities laws are minimal—in form and content—and include no punitive prohibitions against insider trading.

Comment: Collins must abide by the requirements of the Code and Standards, which might be more strict than the rules of the developing country. He should be aware of the risks that a small market and the absence of a fairly regulated flow of information to the market represent to his ability to obtain information and make timely judgments. He should include this factor in formulating his advice to clients. In handling material nonpublic information that accidentally comes into his possession, he must follow Standard II(A)–Material Nonpublic Information.

Example 5 (Following the Highest Requirements):

Laura Jameson works for a multinational investment adviser based in the United States. Jameson lives and works as a registered investment adviser in the tiny, but wealthy, island nation of Karramba. Karramba's securities laws state that no investment adviser registered and working in that country can participate in initial public offerings (IPOs) for the adviser's personal account. Jameson, believing that, as a US citizen working for a US-based company, she should comply only with US law, has ignored this Karrambian law. In addition, Jameson believes that as a charterholder, as long as she adheres to the Code and Standards requirement that she disclose her participation in any IPO to her employer and clients when such ownership creates a conflict of interest, she is meeting the highest ethical requirements.

Comment: Jameson is in violation of Standard I(A). As a registered investment adviser in Karramba, Jameson is prevented by Karrambian securities law from participating in IPOs regardless of the law of her home country. In addition, because the law of the country where she is working is stricter than the Code and Standards, she must follow the stricter requirements of the local law rather than the requirements of the Code and Standards.

Example 6 (Laws and Regulations Based on Religious Tenets):

Amanda Janney is employed as a fixed-income portfolio manager for a large international firm. She is on a team within her firm that is responsible for creating and managing a fixed-income hedge fund to be sold throughout the firm's distribution centers to high-net-worth clients. Her firm receives expressions of interest from potential clients from the Middle East who are seeking investments that comply with Islamic

law. The marketing and promotional materials for the fixed-income hedge fund do not specify whether or not the fund is a suitable investment for an investor seeking compliance with Islamic law. Because the fund is being distributed globally, Janney is concerned about the reputation of the fund and the firm and believes disclosure of whether or not the fund complies with Islamic law could help minimize potential mistakes with placing this investment.

> *Comment*: As the financial market continues to become globalized, members and candidates will need to be aware of the differences between cultural and religious laws and requirements as well as the different governmental laws and regulations. Janney and the firm could be proactive in their efforts to acknowledge areas where the new fund may not be suitable for clients.

Example 7 (Reporting Potential Unethical Actions):

Krista Blume is a junior portfolio manager for high-net-worth portfolios at a large global investment manager. She observes a number of new portfolios and relationships coming from a country in Europe where the firm did not have previous business and is told that a broker in that country is responsible for this new business. At a meeting on allocation of research resources to third-party research firms, Blume notes that this broker has been added to the list and is allocated payments for research. However, she knows the portfolios do not invest in securities in the broker's country, and she has not seen any research come from this broker. Blume asks her supervisor about the name being on the list and is told that someone in marketing is receiving the research and that the name being on the list is OK. She believes that what may be going on is that the broker is being paid for new business through the inappropriate research payments, and she wishes to dissociate from the misconduct.

> *Comment*: Blume should follow the firm's policies and procedures for reporting potential unethical activity, which may include discussions with her supervisor or someone in a designated compliance department. She should communicate her concerns appropriately while advocating for disclosure between the new broker relationship and the research payments.

Example 8 (Failure to Maintain Knowledge of the Law):

Colleen White is excited to use new technology to communicate with clients and potential clients. She recently began posting investment information, including performance reports and investment opinions and recommendations, to her Facebook page. In addition, she sends out brief announcements, opinions, and thoughts via her Twitter account (for example, "Prospects for future growth of XYZ company look good! #makingmoney4U"). Prior to White's use of these social media platforms, the local regulator had issued new requirements and guidance governing online electronic communication. White's communications appear to conflict with the recent regulatory announcements.

> *Comment*: White is in violation of Standard I(A) because her communications do not comply with the existing guidance and regulation governing use of social media. White must be aware of the evolving legal requirements pertaining to new and dynamic areas of the financial services industry that are applicable to her. She should seek guidance from appropriate, knowledgeable, and reliable sources, such as her firm's compliance department, external service providers, or outside counsel, unless she diligently follows legal and regulatory trends affecting her professional responsibilities.

Standard I(B) Independence and Objectivity

Members and Candidates must use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Members and Candidates must not offer, solicit, or accept any gift, benefit, compensation, or consideration that reasonably could be expected to compromise their own or another's independence and objectivity.

Guidance

Highlights:

- *Buy-Side Clients*
- *Fund Manager and Custodial Relationships*
- *Investment Banking Relationships*
- *Performance Measurement and Attribution*
- *Public Companies*
- *Credit Rating Agency Opinions*
- *Influence during the Manager Selection/Procurement Process*
- *Issuer-Paid Research*
- *Travel Funding*

Standard I(B) states the responsibility of CFA Institute members and candidates in the CFA Program to maintain independence and objectivity so that their clients will have the benefit of their work and opinions unaffected by any potential conflict of interest or other circumstance adversely affecting their judgment. Every member and candidate should endeavor to avoid situations that could cause or be perceived to cause a loss of independence or objectivity in recommending investments or taking investment action.

External sources may try to influence the investment process by offering analysts and portfolio managers a variety of benefits. Corporations may seek expanded research coverage, issuers and underwriters may wish to promote new securities offerings, brokers may want to increase commission business, and independent rating agencies may be influenced by the company requesting the rating. Benefits may include gifts, invitations to lavish functions, tickets, favors, or job referrals. One type of benefit is the allocation of shares in oversubscribed IPOs to investment managers for their personal accounts. This practice affords managers the opportunity to make quick profits that may not be available to their clients. Such a practice is prohibited under Standard I(B). Modest gifts and entertainment are acceptable, but special care must be taken by members and candidates to resist subtle and not-so-subtle pressures to act in conflict with the interests of their clients. Best practice dictates that members and candidates reject any offer of gift or entertainment that could be expected to threaten their independence and objectivity.

Receiving a gift, benefit, or consideration from a *client* can be distinguished from gifts given by entities seeking to influence a member or candidate to the detriment of other clients. In a client relationship, the client has already entered some type of compensation arrangement with the member, candidate, or his or her firm. A gift from a client could be considered supplementary compensation. The potential for obtaining influence to the detriment of other clients, although present, is not as great

as in situations where no compensation arrangement exists. When possible, prior to accepting "bonuses" or gifts from clients, members and candidates should disclose to their employers such benefits offered by clients. If notification is not possible prior to acceptance, members and candidates must disclose to their employer benefits previously accepted from clients. Disclosure allows the employer of a member or candidate to make an independent determination about the extent to which the gift may affect the member's or candidate's independence and objectivity.

Members and candidates may also come under pressure from their own firms to, for example, issue favorable research reports or recommendations for certain companies with potential or continuing business relationships with the firm. The situation may be aggravated if an executive of the company sits on the bank or investment firm's board and attempts to interfere in investment decision making. Members and candidates acting in a sales or marketing capacity must be especially mindful of their objectivity in promoting appropriate investments for their clients.

Left unmanaged, pressures that threaten independence place research analysts in a difficult position and may jeopardize their ability to act independently and objectively. One of the ways that research analysts have coped with these pressures in the past is to use subtle and ambiguous language in their recommendations or to temper the tone of their research reports. Such subtleties are lost on some investors, however, who reasonably expect research reports and recommendations to be straightforward and transparent and to communicate clearly an analyst's views based on unbiased analysis and independent judgment.

Members and candidates are personally responsible for maintaining independence and objectivity when preparing research reports, making investment recommendations, and taking investment action on behalf of clients. Recommendations must convey the member's or candidate's true opinions, free of bias from internal or external pressures, and be stated in clear and unambiguous language.

Members and candidates also should be aware that some of their professional or social activities within CFA Institute or its member societies may subtly threaten their independence or objectivity. When seeking corporate financial support for conventions, seminars, or even weekly society luncheons, the members or candidates responsible for the activities should evaluate both the actual effect of such solicitations on their independence and whether their objectivity might be perceived to be compromised in the eyes of their clients.

Buy-Side Clients

One source of pressure on sell-side analysts is buy-side clients. Institutional clients are traditionally the primary users of sell-side research, either directly or with soft dollar brokerage. Portfolio managers may have significant positions in the security of a company under review. A rating downgrade may adversely affect the portfolio's performance, particularly in the short term, because the sensitivity of stock prices to ratings changes has increased in recent years. A downgrade may also affect the manager's compensation, which is usually tied to portfolio performance. Moreover, portfolio performance is subject to media and public scrutiny, which may affect the manager's professional reputation. Consequently, some portfolio managers implicitly or explicitly support sell-side ratings inflation.

Portfolio managers have a responsibility to respect and foster the intellectual honesty of sell-side research. Therefore, it is improper for portfolio managers to threaten or engage in retaliatory practices, such as reporting sell-side analysts to the covered company in order to instigate negative corporate reactions. Although most portfolio managers do not engage in such practices, the perception by the research analyst that a reprisal is possible may cause concern and make it difficult for the analyst to maintain independence and objectivity.

Fund Manager and Custodial Relationships

Research analysts are not the only people who must be concerned with maintaining their independence. Members and candidates who are responsible for hiring and retaining outside managers and third-party custodians should not accepts gifts, entertainment, or travel funding that may be perceived as impairing their decisions. The use of secondary fund managers has evolved into a common practice to manage specific asset allocations. The use of third-party custodians is common practice for independent investment advisory firms and helps them with trading capabilities and reporting requirements. Primary and secondary fund managers, as well as third-party custodians, often arrange educational and marketing events to inform others about their business strategies, investment process, or custodial services. Members and candidates must review the merits of each offer individually in determining whether they may attend yet maintain their independence.

Investment Banking Relationships

Some sell-side firms may exert pressure on their analysts to issue favorable research reports on current or prospective investment banking clients. For many of these firms, income from investment banking has become increasingly important to overall firm profitability because brokerage income has declined as a result of price competition. Consequently, firms offering investment banking services work hard to develop and maintain relationships with investment banking clients and prospects. These companies are often covered by the firm's research analysts because companies often select their investment banks on the basis of the reputation of their research analysts, the quality of their work, and their standing in the industry.

In some countries, research analysts frequently work closely with their investment banking colleagues to help evaluate prospective investment banking clients. In other countries, because of past abuses in managing the obvious conflicts of interest, regulators have established clear rules prohibiting the interaction of these groups. Although collaboration between research analysts and investment banking colleagues may benefit the firm and enhance market efficiency (e.g., by allowing firms to assess risks more accurately and make better pricing assumptions), it requires firms to carefully balance the conflicts of interest inherent in the collaboration. Having analysts work with investment bankers is appropriate only when the conflicts are adequately and effectively managed and disclosed. Firm managers have a responsibility to provide an environment in which analysts are neither coerced nor enticed into issuing research that does not reflect their true opinions. Firms should require public disclosure of actual conflicts of interest to investors.

Members, candidates, and their firms must adopt and follow perceived best practices in maintaining independence and objectivity in the corporate culture and protecting analysts from undue pressure by their investment banking colleagues. The "firewalls" traditionally built between these two functions must be managed to minimize conflicts of interest; indeed, enhanced firewall policies may go as far as prohibiting all communications between these groups. A key element of an enhanced firewall is separate reporting structures for personnel on the research side and personnel on the investment banking side. For example, investment banking personnel should not have any authority to approve, disapprove, or make changes to research reports or recommendations. Another element should be a compensation arrangement that minimizes the pressures on research analysts and rewards objectivity and accuracy. Compensation arrangements should not link analyst remuneration directly to investment banking assignments in which the analyst may participate as a team member. Firms should also regularly review their policies and procedures to determine whether

analysts are adequately safeguarded and to improve the transparency of disclosures relating to conflicts of interest. The highest level of transparency is achieved when disclosures are prominent and specific rather than marginalized and generic.

Performance Measurement and Attribution

Members and candidates working within a firm's investment performance measurement department may also be presented with situations that challenge their independence and objectivity. As performance analysts, their analyses may reveal instances where managers may appear to have strayed from their mandate. Additionally, the performance analyst may receive requests to alter the construction of composite indices owing to negative results for a selected account or fund. The member or candidate must not allow internal or external influences to affect their independence and objectivity as they faithfully complete their performance calculation and analysis-related responsibilities.

Public Companies

Analysts may be pressured to issue favorable reports and recommendations by the companies they follow. Not every stock is a "buy," and not every research report is favorable—for many reasons, including the cyclical nature of many business activities and market fluctuations. For instance, a "good company" does not always translate into a "good stock" rating if the current stock price is fully valued. In making an investment recommendation, the analyst is responsible for anticipating, interpreting, and assessing a company's prospects and stock price performance in a factual manner. Many company managers, however, believe that their company's stock is undervalued, and these managers may find it difficult to accept critical research reports or ratings downgrades. Company managers' compensation may also be dependent on stock performance.

Due diligence in financial research and analysis involves gathering information from a wide variety of sources, including public disclosure documents (such as proxy statements, annual reports, and other regulatory filings) and also company management and investor-relations personnel, suppliers, customers, competitors, and other relevant sources. Research analysts may justifiably fear that companies will limit their ability to conduct thorough research by denying analysts who have "negative" views direct access to company managers and/or barring them from conference calls and other communication venues. Retaliatory practices include companies bringing legal action against analysts personally and/or their firms to seek monetary damages for the economic effects of negative reports and recommendations. Although few companies engage in such behavior, the perception that a reprisal is possible is a reasonable concern for analysts. This concern may make it difficult for them to conduct the comprehensive research needed to make objective recommendations. For further information and guidance, members and candidates should refer to the CFA Institute publication *Best Practice Guidelines Governing Analyst/Corporate Issuer Relations* (www.cfainstitute.org).

Credit Rating Agency Opinions

Credit rating agencies provide a service by grading the fixed-income products offered by companies. Analysts face challenges related to incentives and compensation schemes that may be tied to the final rating and successful placement of the product. Members and candidates employed at rating agencies should ensure that procedures and processes at the agencies prevent undue influences from a sponsoring company during the analysis. Members and candidates should abide by their agencies' and the industry's standards of conduct regarding the analytical process and the distribution of their reports.

The work of credit rating agencies also raises concerns similar to those inherent in investment banking relationships. Analysts may face pressure to issue ratings at a specific level because of other services the agency offers companies—namely, advising on the development of structured products. The rating agencies need to develop the necessary firewalls and protections to allow the independent operations of their different business lines.

When using information provided by credit rating agencies, members and candidates should be mindful of the potential conflicts of interest. And because of the potential conflicts, members and candidates may need to independently validate the rating granted.

Influence during the Manager Selection/Procurement Process

Members and candidates may find themselves on either side of the manager selection process. An individual may be on the hiring side as a representative of a pension organization or an investment committee member of an endowment or a charitable organization. Additionally, other members may be representing their organizations in attempts to earn new investment allocation mandates. The responsibility of members and candidates to maintain their independence and objectivity extends to the hiring or firing of those who provide business services beyond investment management.

When serving in a hiring capacity, members and candidates should not solicit gifts, contributions, or other compensation that may affect their independence and objectivity. Solicitations do not have to benefit members and candidates personally to conflict with Standard I(B). Requesting contributions to a favorite charity or political organization may also be perceived as an attempt to influence the decision-making process. Additionally, members and candidates serving in a hiring capacity should refuse gifts, donations, and other offered compensation that may be perceived to influence their decision-making process.

When working to earn a new investment allocation, members and candidates should not offer gifts, contributions, or other compensation to influence the decision of the hiring representative. The offering of these items with the intent to impair the independence and objectivity of another person would not comply with Standard I(B). Such prohibited actions may include offering donations to a charitable organization or political candidate referred by the hiring representative.

A clear example of improperly influencing hiring representatives was displayed in the "pay-to-play" scandal involving government-sponsored pension funds in the United States. Managers looking to gain lucrative allocations from the large funds made requested donations to the political campaigns of individuals directly responsible for the hiring decisions. This scandal and other similar events have led to new laws requiring additional reporting concerning political contributions and bans on hiring—or hiring delays for—managers that made campaign contributions to representatives associated with the decision-making process.

Issuer-Paid Research

In light of the recent reduction of sell-side research coverage, many companies, seeking to increase visibility both in the financial markets and with potential investors, have hired analysts to produce research reports analyzing their companies. These reports bridge the gap created by the lack of coverage and can be an effective method of communicating with investors.

Issuer-paid research conducted by independent analysts, however, is fraught with potential conflicts. Depending on how the research is written and distributed, investors may be misled into believing that the research is from an independent source when, in reality, it has been paid for by the subject company.

Members and candidates must adhere to strict standards of conduct that govern how the research is to be conducted and what disclosures must be made in the report. Analysts must engage in thorough, independent, and unbiased analysis and must fully disclose potential conflicts of interest, including the nature of their compensation. Otherwise, analysts risk misleading investors.

Investors need clear, credible, and thorough information about companies, and they need research based on independent thought. At a minimum, issuer-paid research should include a thorough analysis of the company's financial statements based on publicly disclosed information, benchmarking within a peer group, and industry analysis. Analysts must exercise diligence, independence, and thoroughness in conducting their research in an objective manner. Analysts must distinguish between fact and opinion in their reports. Conclusions must have a reasonable and adequate basis and must be supported by appropriate research.

Independent analysts must also strictly limit the type of compensation that they accept for conducting issuer-paid research. Otherwise, the content and conclusions of the reports could reasonably be expected to be determined or affected by compensation from the sponsoring companies. Compensation that might influence the research report could be direct, such as payment based on the conclusions of the report, or indirect, such as stock warrants or other equity instruments that could increase in value on the basis of positive coverage in the report. In such instances, the independent analyst has an incentive to avoid including negative information or making negative conclusions. Best practice is for independent analysts, prior to writing their reports, to negotiate only a flat fee for their work that is not linked to their conclusions or recommendations.

Travel Funding

The benefits related to accepting paid travel extend beyond the cost savings to the member or candidate and his firm, such as the chance to talk exclusively with the executives of a company or learning more about the investment options provided by an investment organization. Acceptance also comes with potential concerns; for example, members and candidates may be influenced by these discussions when flying on a corporate or chartered jet or attending sponsored conferences where many expenses, including airfare and lodging, are covered. To avoid the appearance of compromising their independence and objectivity, best practice dictates that members and candidates always use commercial transportation at their expense or at the expense of their firm rather than accept paid travel arrangements from an outside company. Should commercial transportation be unavailable, members and candidates may accept modestly arranged travel to participate in appropriate information-gathering events, such as a property tour.

Recommended Procedures for Compliance

Members and candidates should adhere to the following practices and should encourage their firms to establish procedures to avoid violations of Standard I(B):

- *Protect the integrity of opinions*: Members, candidates, and their firms should establish policies stating that every research report concerning the securities of a corporate client should reflect the unbiased opinion of the analyst. Firms should also design compensation systems that protect the integrity of the investment decision process by maintaining the independence and objectivity of analysts.

- *Create a restricted list*: If the firm is unwilling to permit dissemination of adverse opinions about a corporate client, members and candidates should encourage the firm to remove the controversial company from the research universe and put it on a restricted list so that the firm disseminates only factual information about the company.
- *Restrict special cost arrangements*: When attending meetings at an issuer's headquarters, members and candidates should pay for commercial transportation and hotel charges. No corporate issuer should reimburse members or candidates for air transportation. Members and candidates should encourage issuers to limit the use of corporate aircraft to situations in which commercial transportation is not available or in which efficient movement could not otherwise be arranged. Members and candidates should take particular care that when frequent meetings are held between an individual issuer and an individual member or candidate, the issuer should not always host the member or candidate.
- *Limit gifts*: Members and candidates must limit the acceptance of gratuities and/or gifts to token items. Standard I(B) does not preclude customary, ordinary business-related entertainment as long as its purpose is not to influence or reward members or candidates. Firms should consider a strict value limit for acceptable gifts that is based on the local or regional customs and should address whether the limit is per gift or an aggregate annual value.
- *Restrict investments*: Members and candidates should encourage their investment firms to develop formal policies related to employee purchases of equity or equity-related IPOs. Firms should require prior approval for employee participation in IPOs, with prompt disclosure of investment actions taken following the offering. Strict limits should be imposed on investment personnel acquiring securities in private placements.
- *Review procedures*: Members and candidates should encourage their firms to implement effective supervisory and review procedures to ensure that analysts and portfolio managers comply with policies relating to their personal investment activities.
- *Independence policy*: Members, candidates, and their firms should establish a formal written policy on the independence and objectivity of research and implement reporting structures and review procedures to ensure that research analysts do not report to and are not supervised or controlled by any department of the firm that could compromise the independence of the analyst. More detailed recommendations related to a firm's policies regarding research objectivity are set forth in the CFA Institute statement *Research Objectivity Standards* (www.cfainstitute.org).
- *Appointed officer*: Firms should appoint a senior officer with oversight responsibilities for compliance with the firm's code of ethics and all regulations concerning its business. Firms should provide every employee with the procedures and policies for reporting potentially unethical behavior, violations of regulations, or other activities that may harm the firm's reputation.

Application of the Standard

Example 1 (Travel Expenses):

Steven Taylor, a mining analyst with Bronson Brokers, is invited by Precision Metals to join a group of his peers in a tour of mining facilities in several western US states. The company arranges for chartered group flights from site to site and for accommodations in Spartan Motels, the only chain with accommodations near the mines,

for three nights. Taylor allows Precision Metals to pick up his tab, as do the other analysts, with one exception—John Adams, an employee of a large trust company who insists on following his company's policy and paying for his hotel room himself.

> *Comment*: The policy of the company where Adams works complies closely with Standard I(B) by avoiding even the appearance of a conflict of interest, but Taylor and the other analysts were not necessarily violating Standard I(B). In general, when allowing companies to pay for travel and/or accommodations in these circumstances, members and candidates must use their judgment. They must be on guard that such arrangements not impinge on a member's or candidate's independence and objectivity. In this example, the trip was strictly for business and Taylor was not accepting irrelevant or lavish hospitality. The itinerary required chartered flights, for which analysts were not expected to pay. The accommodations were modest. These arrangements are not unusual and did not violate Standard I(B) as long as Taylor's independence and objectivity were not compromised. In the final analysis, members and candidates should consider both whether they can remain objective and whether their integrity might be perceived by their clients to have been compromised.

Example 2 (Research Independence):

Susan Dillon, an analyst in the corporate finance department of an investment services firm, is making a presentation to a potential new business client that includes the promise that her firm will provide full research coverage of the potential client.

> *Comment*: Dillon may agree to provide research coverage, but she must not commit her firm's research department to providing a favorable recommendation. The firm's recommendation (favorable, neutral, or unfavorable) must be based on an independent and objective investigation and analysis of the company and its securities.

Example 3 (Research Independence and Intrafirm Pressure):

Walter Fritz is an equity analyst with Hilton Brokerage who covers the mining industry. He has concluded that the stock of Metals & Mining is overpriced at its current level, but he is concerned that a negative research report will hurt the good relationship between Metals & Mining and the investment banking division of his firm. In fact, a senior manager of Hilton Brokerage has just sent him a copy of a proposal his firm has made to Metals & Mining to underwrite a debt offering. Fritz needs to produce a report right away and is concerned about issuing a less-than-favorable rating.

> *Comment*: Fritz's analysis of Metals & Mining must be objective and based solely on consideration of company fundamentals. Any pressure from other divisions of his firm is inappropriate. This conflict could have been eliminated if, in anticipation of the offering, Hilton Brokerage had placed Metals & Mining on a restricted list for its sales force.

Example 4 (Research Independence and Issuer Relationship Pressure):

As in Example 3, Walter Fritz has concluded that Metals & Mining stock is overvalued at its current level, but he is concerned that a negative research report might jeopardize a close rapport that he has nurtured over the years with Metals & Mining's CEO, chief finance officer, and investment relations officer. Fritz is concerned that a negative report might result also in management retaliation—for instance, cutting him off from participating in conference calls when a quarterly earnings release is made,

denying him the ability to ask questions on such calls, and/or denying him access to top management for arranging group meetings between Hilton Brokerage clients and top Metals & Mining managers.

> *Comment*: As in Example 3, Fritz's analysis must be objective and based solely on consideration of company fundamentals. Any pressure from Metals & Mining is inappropriate. Fritz should reinforce the integrity of his conclusions by stressing that his investment recommendation is based on relative valuation, which may include qualitative issues with respect to Metals & Mining's management.

Example 5 (Research Independence and Sales Pressure):

As support for the sales effort of her corporate bond department, Lindsey Warner offers credit guidance to purchasers of fixed-income securities. Her compensation is closely linked to the performance of the corporate bond department. Near the quarter's end, Warner's firm has a large inventory position in the bonds of Milton, Ltd., and has been unable to sell the bonds because of Milton's recent announcement of an operating problem. Salespeople have asked her to contact large clients to push the bonds.

> *Comment*: Unethical sales practices create significant potential violations of the Code and Standards. Warner's opinion of the Milton bonds must not be affected by internal pressure or compensation. In this case, Warner must refuse to push the Milton bonds unless she is able to justify that the market price has already adjusted for the operating problem.

Example 6 (Research Independence and Prior Coverage):

Jill Jorund is a securities analyst following airline stocks and a rising star at her firm. Her boss has been carrying a "buy" recommendation on International Airlines and asks Jorund to take over coverage of that airline. He tells Jorund that under no circumstances should the prevailing buy recommendation be changed.

> *Comment*: Jorund must be independent and objective in her analysis of International Airlines. If she believes that her boss's instructions have compromised her, she has two options: She can tell her boss that she cannot cover the company under these constraints, or she can take over coverage of the company, reach her own independent conclusions, and if they conflict with her boss's opinion, share the conclusions with her boss or other supervisors in the firm so that they can make appropriate recommendations. Jorund must issue only recommendations that reflect her independent and objective opinion.

Example 7 (Gifts and Entertainment from Related Party):

Edward Grant directs a large amount of his commission business to a New York–based brokerage house. In appreciation for all the business, the brokerage house gives Grant two tickets to the World Cup in South Africa, two nights at a nearby resort, several meals, and transportation via limousine to the game. Grant fails to disclose receiving this package to his supervisor.

> *Comment*: Grant has violated Standard I(B) because accepting these substantial gifts may impede his independence and objectivity. Every member and candidate should endeavor to avoid situations that might cause or be perceived to cause a loss of independence or objectivity in recommending

investments or taking investment action. By accepting the trip, Grant has opened himself up to the accusation that he may give the broker favored treatment in return.

Example 8 (Gifts and Entertainment from Client):

Theresa Green manages the portfolio of Ian Knowlden, a client of Tisbury Investments. Green achieves an annual return for Knowlden that is consistently better than that of the benchmark she and the client previously agreed to. As a reward, Knowlden offers Green two tickets to Wimbledon and the use of Knowlden's flat in London for a week. Green discloses this gift to her supervisor at Tisbury.

Comment: Green is in compliance with Standard I(B) because she disclosed the gift from one of her clients in accordance with the firm's policies. Members and candidates may accept bonuses or gifts from clients as long as they disclose them to their employer because gifts in a client relationship are deemed less likely to affect a member's or candidate's objectivity and independence than gifts in other situations. Disclosure is required, however, so that supervisors can monitor such situations to guard against employees favoring a gift-giving client to the detriment of other fee-paying clients (such as by allocating a greater proportion of IPO stock to the gift-giving client's portfolio).

Best practices for monitoring include comparing the transaction costs of the Knowlden account with the costs of other accounts managed by Green and other similar accounts within Tisbury. The supervisor could also compare the performance returns with the returns of other clients with the same mandate. This comparison will assist in determining whether a pattern of favoritism by Green is disadvantaging other Tisbury clients or the possibility that this favoritism could affect her future behavior.

Example 9 (Travel Expenses from External Manager):

Tom Wayne is the investment manager of the Franklin City Employees Pension Plan. He recently completed a successful search for a firm to manage the foreign equity allocation of the plan's diversified portfolio. He followed the plan's standard procedure of seeking presentations from a number of qualified firms and recommended that his board select Penguin Advisors because of its experience, well-defined investment strategy, and performance record. The firm claims compliance with the Global Investment Performance Standards (GIPS) and has been verified. Following the selection of Penguin, a reporter from the *Franklin City Record* calls to ask if there was any connection between this action and the fact that Penguin was one of the sponsors of an "investment fact-finding trip to Asia" that Wayne made earlier in the year. The trip was one of several conducted by the Pension Investment Academy, which had arranged the itinerary of meetings with economic, government, and corporate officials in major cities in several Asian countries. The Pension Investment Academy obtains support for the cost of these trips from a number of investment managers, including Penguin Advisors; the Academy then pays the travel expenses of the various pension plan managers on the trip and provides all meals and accommodations. The president of Penguin Advisors was also one of the travelers on the trip.

Comment: Although Wayne can probably put to good use the knowledge he gained from the trip in selecting portfolio managers and in other areas of managing the pension plan, his recommendation of Penguin Advisors may be tainted by the possible conflict incurred when he participated in a trip partly paid for by Penguin Advisors and when he was in the daily company of the president of Penguin Advisors. To avoid violating Standard I(B),

Wayne's basic expenses for travel and accommodations should have been paid by his employer or the pension plan; contact with the president of Penguin Advisors should have been limited to informational or educational events only; and the trip, the organizer, and the sponsor should have been made a matter of public record. Even if his actions were not in violation of Standard I(B), Wayne should have been sensitive to the public perception of the trip when reported in the newspaper and the extent to which the subjective elements of his decision might have been affected by the familiarity that the daily contact of such a trip would encourage. This advantage would probably not be shared by firms competing with Penguin Advisors.

Example 10 (Research Independence and Compensation Arrangements):

Javier Herrero recently left his job as a research analyst for a large investment adviser. While looking for a new position, he was hired by an investor-relations firm to write a research report on one of its clients, a small educational software company. The investor-relations firm hopes to generate investor interest in the technology company. The firm will pay Herrero a flat fee plus a bonus if any new investors buy stock in the company as a result of Herrero's report.

Comment: If Herrero accepts this payment arrangement, he will be in violation of Standard I(B) because the compensation arrangement can reasonably be expected to compromise his independence and objectivity. Herrero will receive a bonus for attracting investors, which provides an incentive to draft a positive report regardless of the facts and to ignore or play down any negative information about the company. Herrero should accept only a flat fee that is not tied to the conclusions or recommendations of the report. Issuer-paid research that is objective and unbiased can be done under the right circumstances as long as the analyst takes steps to maintain his or her objectivity and includes in the report proper disclosures regarding potential conflicts of interest.

Example 11 (Recommendation Objectivity and Service Fees):

Two years ago, Bob Wade, trust manager for Central Midas Bank, was approached by Western Funds about promoting its family of funds, with special interest in the service-fee class of funds. To entice Central to promote this class, Western Funds offered to pay the bank a service fee of 0.25%. Without disclosing the fee being offered to the bank, Wade asked one of the investment managers to review Western's funds to determine whether they were suitable for clients of Central Midas Bank. The manager completed the normal due diligence review and determined that the new funds were fairly valued in the market with fee structures on a par with competitors. Wade decided to accept Western's offer and instructed the team of portfolio managers to exclusively promote these funds and the service-fee class to clients seeking to invest new funds or transfer from their current investments.

Now, two years later, the funds managed by Western begin to underperform their peers. Wade is counting on the fees to reach his profitability targets and continues to push these funds as acceptable investments for Central's clients.

Comment: Wade is violating Standard I(B) because the fee arrangement has affected the objectivity of his recommendations. Wade is relying on the fee as a component of the department's profitability and is unwilling to offer other products that may affect the fees received.

See also Standard VI(A)–Disclosure of Conflicts.

Example 12 (Recommendation Objectivity):

Bob Thompson has been doing research for the portfolio manager of the fixed-income department. His assignment is to do sensitivity analysis on securitized subprime mortgages. He has discussed with the manager possible scenarios to use to calculate expected returns. A key assumption in such calculations is housing price appreciation (HPA) because it drives "prepays" (prepayments of mortgages) and losses. Thompson is concerned with the significant appreciation experienced over the previous five years as a result of the increased availability of funds from subprime mortgages. Thompson insists that the analysis should include a scenario run with –10% for Year 1, –5% for Year 2, and then (to project a worst-case scenario) 0% for Years 3 through 5. The manager replies that these assumptions are too dire because there has never been a time in their available database when HPA was negative.

Thompson conducts his research to better understand the risks inherent in these securities and evaluates these securities in the worst-case scenario, an unlikely but possible environment. Based on the results of the enhanced scenarios, Thompson does not recommend the purchase of the securitization. Against the general market trends, the manager follows Thompson's recommendation and does not invest. The following year, the housing market collapses. In avoiding the subprime investments, the manager's portfolio outperforms its peer group that year.

> *Comment*: Thompson's actions in running the worst-case scenario against the protests of the portfolio manager are in alignment with the principles of Standard I(B). Thompson did not allow his research to be pressured by the general trends of the market or the manager's desire to limit the research to historical norms.
>
> See also Standard V(A)–Diligence and Reasonable Basis.

Example 13 (Influencing Manager Selection Decisions):

Adrian Mandel, CFA, is a senior portfolio manager for ZZYY Capital Management who oversees a team of investment professionals who manage labor union pension funds. A few years ago, ZZYY sought to win a competitive asset manager search to manage a significant allocation of the pension fund of the United Doughnut and Pretzel Bakers Union (UDPBU). UDPBU's investment board is chaired by a recognized key decision maker and long-time leader of the union, Ernesto Gomez. To improve ZZYY's chances of winning the competition, Mandel made significant monetary contributions to Gomez's union reelection campaign fund. Even after ZZYY was hired as a primary manager of the pension, Mandel believed that his firm's position was not secure. Mandel continued to contribute to Gomez's reelection campaign chest as well as to entertain lavishly the union leader and his family at top restaurants on a regular basis. All of Mandel's outlays were routinely handled as marketing expenses reimbursed by ZZYY's expense accounts and were disclosed to his senior management as being instrumental in maintaining a strong close relationship with an important client.

> *Comment*: Mandel not only offered but actually gave monetary gifts, benefits, and other considerations that reasonably could be expected to compromise Gomez's objectivity. Therefore, Mandel was in violation of Standard I(B).

Example 14 (Influencing Manager Selection Decisions):

Adrian Mandel, CFA, had heard about the manager search competition for the UDPBU Pension Fund through a broker/dealer contact. The contact told him that a well-known retired professional golfer, Bobby "The Bear" Finlay, who had become a licensed broker/dealer serving as a pension consultant, was orchestrating the UDPBU manager search. Finlay had gained celebrity status with several labor union pension

fund boards by entertaining their respective board members and regaling them with colorful stories of fellow pro golfers' antics in clubhouses around the world. Mandel decided to improve ZZYY's chances of being invited to participate in the search competition by befriending Finlay to curry his favor. Knowing Finlay's love of entertainment, Mandel wined and dined Finlay at high-profile bistros where Finlay could glow in the fan recognition lavished on him by all the other patrons. Mandel's endeavors paid off handsomely when Finlay recommended to the UDPBU board that ZZYY be entered as one of three finalist asset management firms in its search.

> *Comment*: Similar to Example 13, Mandel lavished gifts, benefits, and other considerations in the form of expensive entertainment that could reasonably be expected to influence the consultant to recommend the hiring of his firm. Therefore, Mandel was in violation of Standard I(B).

Example 15 (Fund Manager Relationships):

Amie Scott is a performance analyst within her firm with responsibilities for analyzing the performance of external managers. While completing her quarterly analysis, Scott notices a change in one manager's reported composite construction. The change concealed the bad performance of a particularly large account by placing that account into a new residual composite. This change allowed the manager to remain at the top of the list of manager performance. Scott knows her firm has a large allocation to this manager, and the fund's manager is a close personal friend of the CEO. She needs to deliver her final report but is concerned with pointing out the composite change.

> *Comment*: Scott would be in violation of Standard I(B) if she did not disclose the change in her final report. The analysis of managers' performance should not be influenced by personal relationships or the size of the allocation to the outside managers. By not including the change, Scott would not be providing an independent analysis of the performance metrics for her firm.

Example 16 (Intrafirm Pressure):

Jill Stein is head of performance measurement for her firm. During the last quarter, many members of the organization's research department were removed because of the poor quality of their recommendations. The subpar research caused one larger account holder to experience significant underperformance, which resulted in the client withdrawing his money after the end of the quarter. The head of sales requests that Stein remove this account from the firm's performance composite because the performance decline can be attributed to the departed research team and not the client's adviser.

> *Comment*: Pressure from other internal departments can create situations that cause a member or candidate to violate the Code and Standards. Stein must maintain her independence and objectivity and refuse to exclude specific accounts from the firm's performance composites to which they belong. As long as the client invested under a strategy similar to that of the defined composite, it cannot be excluded because of the poor stock selections that led to the underperformance and asset withdrawal.

Standard I(C) Misrepresentation

Members and Candidates must not knowingly make any misrepresentations relating to investment analysis, recommendations, actions, or other professional activities.

Guidance

Highlights:

- *Impact on Investment Practice*
- *Performance Reporting*
- *Social Media*
- *Omissions*
- *Plagiarism*
- *Work Completed for Employer*

Trust is the foundation of the investment profession. Investors must be able to rely on the statements and information provided to them by those with whom the investors have trusted their financial well-being. Investment professionals who make false or misleading statements not only harm investors but also reduce the level of investor confidence in the investment profession and threaten the integrity of capital markets as a whole.

A misrepresentation is any untrue statement or omission of a fact or any statement that is otherwise false or misleading. A member or candidate must not knowingly omit or misrepresent information or give a false impression of a firm, organization, or security in the member's or candidate's oral representations, advertising (whether in the press or through brochures), electronic communications, or written materials (whether publicly disseminated or not). In this context, "knowingly" means that the member or candidate either knows or should have known that the misrepresentation was being made or that omitted information could alter the investment decision-making process.

Written materials include, but are not limited to, research reports, underwriting documents, company financial reports, market letters, newspaper columns, and books. Electronic communications include, but are not limited to, internet communications, webpages, mobile applications, and e-mails. Members and candidates who use webpages should regularly monitor materials posted on these sites to ensure that they contain current information. Members and candidates should also ensure that all reasonable precautions have been taken to protect the site's integrity and security and that the site does not misrepresent any information and does provide full disclosure.

Standard I(C) prohibits members and candidates from guaranteeing clients any specific return on volatile investments. Most investments contain some element of risk that makes their return inherently unpredictable. For such investments, guaranteeing either a particular rate of return or a guaranteed preservation of investment capital (e.g., "I can guarantee that you will earn 8% on equities this year" or "I can guarantee that you will not lose money on this investment") is misleading to investors. Standard I(C) does not prohibit members and candidates from providing clients with information on investment products that have guarantees built into the structure of the products themselves or for which an institution has agreed to cover any losses.

Impact on Investment Practice

Members and candidates must not misrepresent any aspect of their practice, including (but not limited to) their qualifications or credentials, the qualifications or services provided by their firm, their performance record and the record of their firm, and the characteristics of an investment. Any misrepresentation made by a member or candidate relating to the member's or candidate's professional activities is a breach of this standard.

Members and candidates should exercise care and diligence when incorporating third-party information. Misrepresentations resulting from the use of the credit ratings, research, testimonials, or marketing materials of outside parties become the responsibility of the investment professional when it affects that professional's business practices.

Investing through outside managers continues to expand as an acceptable method of investing in areas outside a firm's core competencies. Members and candidates must disclose their intended use of external managers and must not represent those managers' investment practices as their own. Although the level of involvement of outside managers may change over time, appropriate disclosures by members and candidates are important in avoiding misrepresentations, especially if the primary activity is to invest directly with a single external manager. Standard V(B)–Communication with Clients and Prospective Clients discusses in further detail communicating the firm's investment practices.

Performance Reporting

The performance benchmark selection process is another area where misrepresentations may occur. Members and candidates may misrepresent the success of their performance record through presenting benchmarks that are not comparable to their strategies. Further, clients can be misled if the benchmark's results are not reported on a basis comparable to that of the fund's or client's results. Best practice is selecting the most appropriate available benchmark from a universe of available options. The transparent presentation of appropriate performance benchmarks is an important aspect in providing clients with information that is useful in making investment decisions.

However, Standard I(C) does not require that a benchmark always be provided in order to comply. Some investment strategies may not lend themselves to displaying an appropriate benchmark because of the complexity or diversity of the investments included. Furthermore, some investment strategies may use reference indices that do not reflect the opportunity set of the invested assets—for example, a hedge fund comparing its performance with a "cash plus" basis. When such a benchmark is used, members and candidates should make reasonable efforts to ensure that they disclose the reasons behind the use of this reference index to avoid misrepresentations of their performance. Members and candidates should discuss with clients on a continuous basis the appropriate benchmark to be used for performance evaluations and related fee calculations.

Reporting misrepresentations may also occur when valuations for illiquid or nontraded securities are available from more than one source. When different options are available, members and candidates may be tempted to switch providers to obtain higher security valuations. The process of shopping for values may misrepresent a security's worth, lead to misinformed decisions to sell or hold an investment, and result in overcharging clients advisory fees.

Members and candidates should take reasonable steps to provide accurate and reliable security pricing information to clients on a consistent basis. Changing pricing providers should not be based solely on the justification that the new provider reports a higher current value of a security. Consistency in the reported information

will improve the perception of the valuation process for illiquid securities. Clients will likely have additional confidence that they were able to make an informed decision about continuing to hold these securities in their portfolios.

Social Media

The advancement of online discussion forums and communication platforms, commonly referred to as "social media," is placing additional responsibilities on members and candidates. When communicating through social media channels, members and candidates should provide only the same information they are allowed to distribute to clients and potential clients through other traditional forms of communication. The online or interactive aspects of social media do not remove the need to be open and honest about the information being distributed.

Along with understanding and following existing and newly developing rules and regulations regarding the allowed use of social media, members and candidates should also ensure that all communications in this format adhere to the requirements of the Code and Standards. The perceived anonymity granted through these platforms may entice individuals to misrepresent their qualifications or abilities or those of their employer. Actions undertaken through social media that knowingly misrepresent investment recommendations or professional activities are considered a violation of Standard I(C).

Omissions

The omission of a fact or outcome can be misleading, especially given the growing use of models and technical analysis processes. Many members and candidates rely on such models and processes to scan for new investment opportunities, to develop investment vehicles, and to produce investment recommendations and ratings. When inputs are knowingly omitted, the resulting outcomes may provide misleading information to those who rely on it for making investment decisions. Additionally, the outcomes from models shall not be presented as fact because they represent the expected results based on the inputs and analysis process incorporated.

Omissions in the performance measurement and attribution process can also misrepresent a manager's performance and skill. Members and candidates should encourage their firms to develop strict policies for composite development to prevent cherry picking—situations in which selected accounts are presented as representative of the firm's abilities. The omission of any accounts appropriate for the defined composite may misrepresent to clients the success of the manager's implementation of its strategy.

Plagiarism

Standard I(C) also prohibits plagiarism in the preparation of material for distribution to employers, associates, clients, prospects, or the general public. Plagiarism is defined as copying or using in substantially the same form materials prepared by others without acknowledging the source of the material or identifying the author and publisher of such material. Members and candidates must not copy (or represent as their own) original ideas or material without permission and must acknowledge and identify the source of ideas or material that is not their own.

The investment profession uses a myriad of financial, economic, and statistical data in the investment decision-making process. Through various publications and presentations, the investment professional is constantly exposed to the work of others and to the temptation to use that work without proper acknowledgment.

Misrepresentation through plagiarism in investment management can take various forms. The simplest and most flagrant example is to take a research report or study done by another firm or person, change the names, and release the material as one's

own original analysis. This action is a clear violation of Standard I(C). Other practices include (1) using excerpts from articles or reports prepared by others either verbatim or with only slight changes in wording without acknowledgment, (2) citing specific quotations as attributable to "leading analysts" and "investment experts" without naming the specific references, (3) presenting statistical estimates of forecasts prepared by others and identifying the sources but without including the qualifying statements or caveats that may have been used, (4) using charts and graphs without stating their sources, and (5) copying proprietary computerized spreadsheets or algorithms without seeking the cooperation or authorization of their creators.

In the case of distributing third-party, outsourced research, members and candidates may use and distribute such reports as long as they do not represent themselves as the report's authors. Indeed, the member or candidate may add value for the client by sifting through research and repackaging it for clients. In such cases, clients should be fully informed that they are paying for the ability of the member or candidate to find the best research from a wide variety of sources. Members and candidates must not misrepresent their abilities, the extent of their expertise, or the extent of their work in a way that would mislead their clients or prospective clients. Members and candidates should disclose whether the research being presented to clients comes from another source—from either within or outside the member's or candidate's firm. This allows clients to understand who has the expertise behind the report or whether the work is being done by the analyst, other members of the firm, or an outside party.

Standard I(C) also applies to plagiarism in oral communications, such as through group meetings; visits with associates, clients, and customers; use of audio/video media (which is rapidly increasing); and telecommunications, including electronic data transfer and the outright copying of electronic media.

One of the most egregious practices in violation of this standard is the preparation of research reports based on multiple sources of information without acknowledging the sources. Examples of information from such sources include ideas, statistical compilations, and forecasts combined to give the appearance of original work. Although there is no monopoly on ideas, members and candidates must give credit where it is clearly due. Analysts should not use undocumented forecasts, earnings projections, asset values, and so on. Sources must be revealed to bring the responsibility directly back to the author of the report or the firm involved.

Work Completed for Employer

The preceding paragraphs address actions that would constitute a violation of Standard I(C). In some situations, however, members or candidates may use research conducted or models developed by others within the same firm without committing a violation. The most common example relates to the situation in which one (or more) of the original analysts is no longer with the firm. Research and models developed while employed by a firm are the property of the firm. The firm retains the right to continue using the work completed after a member or candidate has left the organization. The firm may issue future reports without providing attribution to the prior analysts. A member or candidate cannot, however, reissue a previously released report solely under his or her name.

Recommended Procedures for Compliance

Factual Presentations

Members and candidates can prevent unintentional misrepresentations of their qualifications or the services they or their firms provide if each member and candidate understands the limit of the firm's or individual's capabilities and the need to be accurate and complete in presentations. Firms can provide guidance for employees who make

written or oral presentations to clients or potential clients by providing a written list of the firm's available services and a description of the firm's qualifications. This list should suggest ways of describing the firm's services, qualifications, and compensation that are both accurate and suitable for client or customer presentations. Firms can also help prevent misrepresentation by specifically designating which employees are authorized to speak on behalf of the firm. Regardless of whether the firm provides guidance, members and candidates should make certain that they understand the services the firm can perform and its qualifications.

Qualification Summary

In addition, to ensure accurate presentations to clients, each member and candidate should prepare a summary of his or her own qualifications and experience and a list of the services the member or candidate is capable of performing. Firms can assist member and candidate compliance by periodically reviewing employee correspondence and documents that contain representations of individual or firm qualifications.

Verify Outside Information

When providing information to clients from a third party, members and candidates share a responsibility for the accuracy of the marketing and distribution materials that pertain to the third party's capabilities, services, and products. Misrepresentation by third parties can damage the member's or candidate's reputation, the reputation of the firm, and the integrity of the capital markets. Members and candidates should encourage their employers to develop procedures for verifying information of third-party firms.

Maintain Webpages

Members and candidates who publish a webpage should regularly monitor materials posted on the site to ensure that the site contains current information. Members and candidates should also ensure that all reasonable precautions have been taken to protect the site's integrity, confidentiality, and security and that the site does not misrepresent any information and provides full disclosure.

Plagiarism Policy

To avoid plagiarism in preparing research reports or conclusions of analysis, members and candidates should take the following steps:

- *Maintain copies*: Keep copies of all research reports, articles containing research ideas, material with new statistical methodologies, and other materials that were relied on in preparing the research report.
- *Attribute quotations*: Attribute to their sources any direct quotations, including projections, tables, statistics, model/product ideas, and new methodologies prepared by persons other than recognized financial and statistical reporting services or similar sources.
- *Attribute summaries*: Attribute to their sources any paraphrases or summaries of material prepared by others. For example, to support his analysis of Brown Company's competitive position, the author of a research report on Brown might summarize another analyst's report on Brown's chief competitor, but the author of the Brown report must acknowledge in his own report the reliance on the other analyst's report.

Application of the Standard

Example 1 (Disclosure of Issuer-Paid Research):

Anthony McGuire is an issuer-paid analyst hired by publicly traded companies to electronically promote their stocks. McGuire creates a website that promotes his research efforts as a seemingly independent analyst. McGuire posts a profile and a strong buy recommendation for each company on the website indicating that the stock is expected to increase in value. He does not disclose the contractual relationships with the companies he covers on his website, in the research reports he issues, or in the statements he makes about the companies in internet chat rooms.

> *Comment*: McGuire has violated Standard I(C) because the website is misleading to potential investors. Even if the recommendations are valid and supported with thorough research, his omissions regarding the true relationship between himself and the companies he covers constitute a misrepresentation. McGuire has also violated Standard VI(A)–Disclosure of Conflicts by not disclosing the existence of an arrangement with the companies through which he receives compensation in exchange for his services.

Example 2 (Correction of Unintentional Errors):

Hijan Yao is responsible for the creation and distribution of the marketing materials for his firm, which claims compliance with the GIPS standards. Yao creates and distributes a presentation of performance by the firm's Asian equity composite that states the composite has ¥350 billion in assets. In fact, the composite has only ¥35 billion in assets, and the higher figure on the presentation is a result of a typographical error. Nevertheless, the erroneous material is distributed to a number of clients before Yao catches the mistake.

> *Comment*: Once the error is discovered, Yao must take steps to cease distribution of the incorrect material and correct the error by informing those who have received the erroneous information. Because Yao did not knowingly make the misrepresentation, however, he did not violate Standard I(C). Because his firm claims compliance with the GIPS standards, it must also comply with the GIPS Guidance Statement on Error Correction in relation to the error.

Example 3 (Noncorrection of Known Errors):

Syed Muhammad is the president of an investment management firm. The promotional material for the firm, created by the firm's marketing department, incorrectly claims that Muhammad has an advanced degree in finance from a prestigious business school in addition to the CFA designation. Although Muhammad attended the school for a short period of time, he did not receive a degree. Over the years, Muhammad and others in the firm have distributed this material to numerous prospective clients and consultants.

> *Comment*: Even though Muhammad may not have been directly responsible for the misrepresentation of his credentials in the firm's promotional material, he used this material numerous times over an extended period and should have known of the misrepresentation. Thus, Muhammad has violated Standard I(C).

Example 4 (Plagiarism):

Cindy Grant, a research analyst for a Canadian brokerage firm, has specialized in the Canadian mining industry for the past 10 years. She recently read an extensive research report on Jefferson Mining, Ltd., by Jeremy Barton, another analyst. Barton provided extensive statistics on the mineral reserves, production capacity, selling rates, and marketing factors affecting Jefferson's operations. He also noted that initial drilling results on a new ore body, which had not been made public, might show the existence of mineral zones that could increase the life of Jefferson's main mines, but Barton cited no specific data as to the initial drilling results. Grant called an officer of Jefferson, who gave her the initial drilling results over the telephone. The data indicated that the expected life of the main mines would be tripled. Grant added these statistics to Barton's report and circulated it within her firm as her own report.

> *Comment*: Grant plagiarized Barton's report by reproducing large parts of it in her own report without acknowledgment.

Example 5 (Misrepresentation of Information):

When Ricki Marks sells mortgage-backed derivatives called "interest-only strips" (IOs) to public pension plan clients, she describes them as "guaranteed by the US government." Purchasers of the IOs are entitled only to the interest stream generated by the mortgages, however, not the notional principal itself. One particular municipality's investment policies and local law require that securities purchased by its public pension plans be guaranteed by the US government. Although the underlying mortgages are guaranteed, neither the investor's investment nor the interest stream on the IOs is guaranteed. When interest rates decline, causing an increase in prepayment of mortgages, interest payments to the IOs' investors decline, and these investors lose a portion of their investment.

> *Comment*: Marks violated Standard I(C) by misrepresenting the terms and character of the investment.

Example 6 (Potential Information Misrepresentation):

Khalouck Abdrabbo manages the investments of several high-net-worth individuals in the United States who are approaching retirement. Abdrabbo advises these individuals that a portion of their investments be moved from equity to bank-sponsored certificates of deposit and money market accounts so that the principal will be "guaranteed" up to a certain amount. The interest is not guaranteed.

> *Comment*: Although there is risk that the institution offering the certificates of deposits and money market accounts could go bankrupt, in the United States, these accounts are insured by the US government through the Federal Deposit Insurance Corporation. Therefore, using the term "guaranteed" in this context is not inappropriate as long as the amount is within the government-insured limit. Abdrabbo should explain these facts to the clients.

Example 7 (Plagiarism):

Steve Swanson is a senior analyst in the investment research department of Ballard and Company. Apex Corporation has asked Ballard to assist in acquiring the majority ownership of stock in the Campbell Company, a financial consulting firm, and to prepare a report recommending that stockholders of Campbell agree to the acquisition. Another investment firm, Davis and Company, had already prepared a report for Apex analyzing both Apex and Campbell and recommending an exchange ratio. Apex has

given the Davis report to Ballard officers, who have passed it on to Swanson. Swanson reviews the Davis report and other available material on Apex and Campbell. From his analysis, he concludes that the common stocks of Campbell and Apex represent good value at their current prices; he believes, however, that the Davis report does not consider all the factors a Campbell stockholder would need to know to make a decision. Swanson reports his conclusions to the partner in charge, who tells him to "use the Davis report, change a few words, sign your name, and get it out."

> *Comment*: If Swanson does as requested, he will violate Standard I(C). He could refer to those portions of the Davis report that he agrees with if he identifies Davis as the source; he could then add his own analysis and conclusions to the report before signing and distributing it.

Example 8 (Plagiarism):

Claude Browning, a quantitative analyst for Double Alpha, Inc., returns from a seminar in great excitement. At that seminar, Jack Jorrely, a well-known quantitative analyst at a national brokerage firm, discussed one of his new models in great detail, and Browning is intrigued by the new concepts. He proceeds to test the model, making some minor mechanical changes but retaining the concepts, until he produces some very positive results. Browning quickly announces to his supervisors at Double Alpha that he has discovered a new model and that clients and prospective clients should be informed of this positive finding as ongoing proof of Double Alpha's continuing innovation and ability to add value.

> *Comment*: Although Browning tested Jorrely's model on his own and even slightly modified it, he must still acknowledge the original source of the idea. Browning can certainly take credit for the final, practical results; he can also support his conclusions with his own test. The credit for the innovative thinking, however, must be awarded to Jorrely.

Example 9 (Plagiarism):

Fernando Zubia would like to include in his firm's marketing materials some "plain-language" descriptions of various concepts, such as the price-to-earnings (P/E) multiple and why standard deviation is used as a measure of risk. The descriptions come from other sources, but Zubia wishes to use them without reference to the original authors. Would this use of material be a violation of Standard I(C)?

> *Comment*: Copying verbatim any material without acknowledgement, including plain-language descriptions of the P/E multiple and standard deviation, violates Standard I(C). Even though these concepts are general, best practice would be for Zubia to describe them in his own words or cite the sources from which the descriptions are quoted. Members and candidates would be violating Standard I(C) if they either were responsible for creating marketing materials without attribution or knowingly use plagiarized materials.

Example 10 (Plagiarism):

Through a mainstream media outlet, Erika Schneider learns about a study that she would like to cite in her research. Should she cite both the mainstream intermediary source as well as the author of the study itself when using that information?

> *Comment*: In all instances, a member or candidate must cite the actual source of the information. Best practice for Schneider would be to obtain the information directly from the author and review it before citing it in

a report. In that case, Schneider would not need to report how she found out about the information. For example, suppose Schneider read in the *Financial Times* about a study issued by CFA Institute; best practice for Schneider would be to obtain a copy of the study from CFA Institute, review it, and then cite it in her report. If she does not use any interpretation of the report from the *Financial Times* and the newspaper does not add value to the report itself, the newspaper is merely a conduit of the original information and does not need to be cited. If she does not obtain the report and review the information, Schneider runs the risk of relying on second-hand information that may misstate facts. If, for example, the *Financial Times* erroneously reported some information from the original CFA Institute study and Schneider copied that erroneous information without acknowledging CFA Institute, she could be the object of complaints. Best practice would be either to obtain the complete study from its original author and cite only that author or to use the information provided by the intermediary and cite both sources.

Example 11 (Misrepresentation of Information):

Paul Ostrowski runs a two-person investment management firm. Ostrowski's firm subscribes to a service from a large investment research firm that provides research reports that can be repackaged by smaller firms for those firms' clients. Ostrowski's firm distributes these reports to clients as its own work.

Comment: Ostrowski can rely on third-party research that has a reasonable and adequate basis, but he cannot imply that he is the author of such research. If he does, Ostrowski is misrepresenting the extent of his work in a way that misleads the firm's clients or prospective clients.

Example 12 (Misrepresentation of Information):

Tom Stafford is part of a team within Appleton Investment Management responsible for managing a pool of assets for Open Air Bank, which distributes structured securities to offshore clients. He becomes aware that Open Air is promoting the structured securities as a much less risky investment than the investment management policy followed by him and the team to manage the original pool of assets. Also, Open Air has procured an independent rating for the pool that significantly overstates the quality of the investments. Stafford communicates his concerns to his supervisor, who responds that Open Air owns the product and is responsible for all marketing and distribution. Stafford's supervisor goes on to say that the product is outside of the US regulatory regime that Appleton follows and that all risks of the product are disclosed at the bottom of page 184 of the prospectus.

Comment: As a member of the investment team, Stafford is qualified to recognize the degree of accuracy of the materials that characterize the portfolio, and he is correct to be worried about Appleton's responsibility for a misrepresentation of the risks. Thus, he should continue to pursue the issue of Open Air's inaccurate promotion of the portfolio according to the firm's policies and procedures.

The Code and Standards stress protecting the reputation of the firm and the sustainability and integrity of the capital markets. Misrepresenting the quality and risks associated with the investment pool may lead to negative consequences for others well beyond the direct investors.

Example 13 (Avoiding a Misrepresentation):

Trina Smith is a fixed-income portfolio manager at a pension fund. She has observed that the market for highly structured mortgages is the focus of salespeople she meets and that these products represent a significant number of trading opportunities. In discussions about this topic with her team, Smith learns that calculating yields on changing cash flows within the deal structure requires very specialized vendor software. After more research, they find out that each deal is unique and that deals can have more than a dozen layers and changing cash flow priorities. Smith comes to the conclusion that, because of the complexity of these securities, the team cannot effectively distinguish between potentially good and bad investment options. To avoid misrepresenting their understanding, the team decides that the highly structured mortgage segment of the securitized market should not become part of the core of the fund's portfolio; they will allow some of the less complex securities to be part of the core.

> *Comment*: Smith is in compliance with Standard I(C) by not investing in securities that she and her team cannot effectively understand. Because she is not able to describe the risk and return profile of the securities to the pension fund beneficiaries and trustees, she appropriately limits the fund's exposure to this sector.

Example 14 (Misrepresenting Composite Construction):

Robert Palmer is head of performance for a fund manager. When asked to provide performance numbers to fund rating agencies, he avoids mentioning that the fund manager is quite liberal in composite construction. The reason accounts are included/excluded is not fully explained. The performance values reported to the rating agencies for the composites, although accurate for the accounts shown each period, may not present a true representation of the fund manager's ability.

> *Comment*: "Cherry picking" accounts to include in either published reports or information provided to rating agencies conflicts with Standard I(C). Moving accounts into or out of a composite to influence the overall performance results materially misrepresents the reported values over time. Palmer should work with his firm to strengthen its reporting practices concerning composite construction to avoid misrepresenting the firm's track record or the quality of the information being provided.

Example 15 (Presenting Out-of-Date Information):

David Finch is a sales director at a commercial bank, where he directs the bank's client advisers in the sale of third-party mutual funds. Each quarter, he holds a division-wide training session where he provides fact sheets on investment funds the bank is allowed to offer to clients. These fact sheets, which can be redistributed to potential clients, are created by the fund firms and contain information about the funds, including investment strategy and target distribution rates.

Finch knows that some of the fact sheets are out of date; for example, one long-only fund approved the use of significant leverage last quarter as a method to enhance returns. He continues to provide the sheets to the sales team without updates because the bank has no control over the marketing material released by the mutual fund firms.

> *Comment*: Finch is violating Standard I(C) by providing information that misrepresents aspects of the funds. By not providing the sales team and, ultimately, the clients with the updated information, he is misrepresenting the potential risks associated with the funds with outdated fact sheets. Finch

can instruct the sales team to clarify the deficiencies in the fact sheets with clients and ensure they have the most recent fund prospectus document before accepting orders for investing in any fund.

Example 16 (Overemphasis of Firm Results):

Bob Anderson is chief compliance officer for Optima Asset Management Company, a firm currently offering eight funds to clients. Seven of the eight had 10-year returns below the median for their respective sectors. Anderson approves a recent advertisement, which includes this statement: "Optima Asset Management is achieving excellent returns for its investors. The Optima Emerging Markets Equity fund, for example, has 10-year returns that exceed the sector median by more than 10%."

Comment: From the information provided it is difficult to determine whether a violation has occurred as long as the sector outperformance is correct. Anderson may be attempting to mislead potential clients by citing the performance of the sole fund that achieved such results. Past performance is often used to demonstrate a firm's skill and abilities in comparison to funds in the same sectors.

However, if all the funds outperformed their respective benchmarks, then Anderson's assertion that the company "is achieving excellent returns" may be factual. Funds may exhibit positive returns for investors, exceed benchmarks, and yet have returns below the median in their sectors.

Members and candidates need to ensure that their marketing efforts do not include statements that misrepresent their skills and abilities to remain compliant with Standard I(C). Unless the returns of a single fund reflect the performance of a firm as a whole, the use of a singular fund for performance comparisons should be avoided.

Standard I(D) Misconduct

Members and Candidates must not engage in any professional conduct involving dishonesty, fraud, or deceit or commit any act that reflects adversely on their professional reputation, integrity, or competence.

Guidance

Whereas Standard I(A) addresses the obligation of members and candidates to comply with applicable law that governs their professional activities, Standard I(D) addresses *all* conduct that reflects poorly on the professional integrity, good reputation, or competence of members and candidates. Any act that involves lying, cheating, stealing, or other dishonest conduct is a violation of this standard if the offense reflects adversely on a member's or candidate's professional activities. Although CFA Institute discourages any sort of unethical behavior by members and candidates, the Code and Standards are primarily aimed at conduct and actions related to a member's or candidate's professional life.

Conduct that damages trustworthiness or competence may include behavior that, although not illegal, nevertheless negatively affects a member's or candidate's ability to perform his or her responsibilities. For example, abusing alcohol during business hours might constitute a violation of this standard because it could have a detrimental effect

on the member's or candidate's ability to fulfill his or her professional responsibilities. Personal bankruptcy may not reflect on the integrity or trustworthiness of the person declaring bankruptcy, but if the circumstances of the bankruptcy involve fraudulent or deceitful business conduct, the bankruptcy may be a violation of this standard.

In some cases, the absence of appropriate conduct or the lack of sufficient effort may be a violation of Standard I(D). The integrity of the investment profession is built on trust. A member or candidate—whether an investment banker, rating or research analyst, or portfolio manager—is expected to conduct the necessary due diligence to properly understand the nature and risks of an investment before making an investment recommendation. By not taking these steps and, instead, relying on someone else in the process to perform them, members or candidates may violate the trust their clients have placed in them. This loss of trust may have a significant impact on the reputation of the member or candidate and the operations of the financial market as a whole.

Individuals may attempt to abuse the CFA Institute Professional Conduct Program by actively seeking CFA Institute enforcement of the Code and Standards, and Standard I(D) in particular, as a method of settling personal, political, or other disputes unrelated to professional ethics. CFA Institute is aware of this issue, and appropriate disciplinary policies, procedures, and enforcement mechanisms are in place to address misuse of the Code and Standards and the Professional Conduct Program in this way.

Recommended Procedures for Compliance

In addition to ensuring that their own behavior is consistent with Standard I(D), to prevent general misconduct, members and candidates should encourage their firms to adopt the following policies and procedures to support the principles of Standard I(D):

- *Code of ethics*: Develop and/or adopt a code of ethics to which every employee must subscribe, and make clear that any personal behavior that reflects poorly on the individual involved, the institution as a whole, or the investment industry will not be tolerated.
- *List of violations*: Disseminate to all employees a list of potential violations and associated disciplinary sanctions, up to and including dismissal from the firm.
- *Employee references*: Check references of potential employees to ensure that they are of good character and not ineligible to work in the investment industry because of past infractions of the law.

Application of the Standard

Example 1 (Professionalism and Competence):

Simon Sasserman is a trust investment officer at a bank in a small affluent town. He enjoys lunching every day with friends at the country club, where his clients have observed him having numerous drinks. Back at work after lunch, he clearly is intoxicated while making investment decisions. His colleagues make a point of handling any business with Sasserman in the morning because they distrust his judgment after lunch.

> *Comment*: Sasserman's excessive drinking at lunch and subsequent intoxication at work constitute a violation of Standard I(D) because this conduct has raised questions about his professionalism and competence. His behavior reflects poorly on him, his employer, and the investment industry.

Example 2 (Fraud and Deceit):

Howard Hoffman, a security analyst at ATZ Brothers, Inc., a large brokerage house, submits reimbursement forms over a two-year period to ATZ's self-funded health insurance program for more than two dozen bills, most of which have been altered to increase the amount due. An investigation by the firm's director of employee benefits uncovers the inappropriate conduct. ATZ subsequently terminates Hoffman's employment and notifies CFA Institute.

> *Comment*: Hoffman violated Standard I(D) because he engaged in intentional conduct involving fraud and deceit in the workplace that adversely reflected on his integrity.

Example 3 (Fraud and Deceit):

Jody Brink, an analyst covering the automotive industry, volunteers much of her spare time to local charities. The board of one of the charitable institutions decides to buy five new vans to deliver hot lunches to low-income elderly people. Brink offers to donate her time to handle purchasing agreements. To pay a long-standing debt to a friend who operates an automobile dealership—and to compensate herself for her trouble—she agrees to a price 20% higher than normal and splits the surcharge with her friend. The director of the charity ultimately discovers the scheme and tells Brink that her services, donated or otherwise, are no longer required.

> *Comment*: Brink engaged in conduct involving dishonesty, fraud, and misrepresentation and has violated Standard I(D).

Example 4 (Personal Actions and Integrity):

Carmen Garcia manages a mutual fund dedicated to socially responsible investing. She is also an environmental activist. As the result of her participation in nonviolent protests, Garcia has been arrested on numerous occasions for trespassing on the property of a large petrochemical plant that is accused of damaging the environment.

> *Comment*: Generally, Standard I(D) is not meant to cover legal transgressions resulting from acts of civil disobedience in support of personal beliefs because such conduct does not reflect poorly on the member's or candidate's professional reputation, integrity, or competence.

Example 5 (Professional Misconduct):

Meredith Rasmussen works on a buy-side trading desk of an investment management firm and concentrates on in-house trades for a hedge fund subsidiary managed by a team at the investment management firm. The hedge fund has been very successful and is marketed globally by the firm. From her experience as the trader for much of the activity of the fund, Rasmussen has become quite knowledgeable about the hedge fund's strategy, tactics, and performance. When a distinct break in the market occurs and many of the securities involved in the hedge fund's strategy decline markedly in value, Rasmussen observes that the reported performance of the hedge fund does not reflect this decline. In her experience, the lack of effect is a very unlikely occurrence. She approaches the head of trading about her concern and is told that she should not ask any questions and that the fund is big and successful and is not her concern. She is fairly sure something is not right, so she contacts the compliance officer, who also tells her to stay away from the issue of the hedge fund's reporting.

> *Comment*: Rasmussen has clearly come across an error in policies, procedures, and compliance practices within the firm's operations. According to the firm's procedures for reporting potentially unethical activity, she

should pursue the issue by gathering some proof of her reason for doubt. Should all internal communications within the firm not satisfy her concerns, Rasmussen should consider reporting the potential unethical activity to the appropriate regulator.

See also Standard IV(A) for guidance on whistleblowing and Standard IV(C) for the duties of a supervisor.

STANDARD II: INTEGRITY OF CAPITAL MARKETS

Standard II(A) Material Nonpublic Information

Members and Candidates who possess material nonpublic information that could affect the value of an investment must not act or cause others to act on the information.

Guidance

Highlights:

- *What Is "Material" Information?*
- *What Constitutes "Nonpublic" Information?*
- *Mosaic Theory*
- *Social Media*
- *Using Industry Experts*
- *Investment Research Reports*

Trading or inducing others to trade on material nonpublic information erodes confidence in capital markets, institutions, and investment professionals by supporting the idea that those with inside information and special access can take unfair advantage of the general investing public. Although trading on inside information may lead to short-term profits, in the long run, individuals and the profession as a whole suffer from such trading. These actions have caused and will continue to cause investors to avoid capital markets because the markets are perceived to be "rigged" in favor of the knowledgeable insider. When the investing public avoids capital markets, the markets and capital allocation become less efficient and less supportive of strong and vibrant economies. Standard II(A) promotes and maintains a high level of confidence in market integrity, which is one of the foundations of the investment profession.

The prohibition on using this information goes beyond the direct buying and selling of individual securities or bonds. Members and candidates must not use material nonpublic information to influence their investment actions related to derivatives (e.g., swaps or option contracts), mutual funds, or other alternative investments. *Any* trading based on material nonpublic information constitutes a violation of Standard II(A). The expansion of financial products and the increasing interconnectivity of financial markets globally have resulted in new potential opportunities for trading on material nonpublic information.

What Is "Material" Information?

Information is "material" if its disclosure would probably have an impact on the price of a security or if reasonable investors would want to know the information before making an investment decision. In other words, information is material if it would significantly alter the total mix of information currently available about a security in such a way that the price of the security would be affected.

The specificity of the information, the extent of its difference from public information, its nature, and its reliability are key factors in determining whether a particular piece of information fits the definition of material. For example, material information may include, but is not limited to, information on the following:

- earnings;
- mergers, acquisitions, tender offers, or joint ventures;
- changes in assets or asset quality;
- innovative products, processes, or discoveries (e.g., new product trials or research efforts);
- new licenses, patents, registered trademarks, or regulatory approval/rejection of a product;
- developments regarding customers or suppliers (e.g., the acquisition or loss of a contract);
- changes in management;
- change in auditor notification or the fact that the issuer may no longer rely on an auditor's report or qualified opinion;
- events regarding the issuer's securities (e.g., defaults on senior securities, calls of securities for redemption, repurchase plans, stock splits, changes in dividends, changes to the rights of security holders, and public or private sales of additional securities);
- bankruptcies;
- significant legal disputes;
- government reports of economic trends (employment, housing starts, currency information, etc.);
- orders for large trades before they are executed; and
- new or changing equity or debt ratings issued by a third party (e.g., sell-side recommendations and credit ratings).

In addition to the substance and specificity of the information, the source or relative reliability of the information also determines materiality. The less reliable a source, the less likely the information provided would be considered material. For example, factual information from a corporate insider regarding a significant new contract for a company is likely to be material, whereas an assumption based on speculation by a competitor about the same contract is likely to be less reliable and, therefore, not material. Additionally, information about trials of a new drug, product, or service under development from qualified personnel involved in the trials is likely to be material, whereas educated conjecture by subject experts not connected to the trials is unlikely to be material.

Also, the more ambiguous the effect of the information on price, the less material that information is considered. If it is unclear whether and to what extent the information will affect the price of a security, the information may not be considered material. The passage of time may also render information that was once important immaterial.

What Constitutes "Nonpublic" Information?

Information is "nonpublic" until it has been disseminated or is available to the marketplace in general (as opposed to a select group of investors). "Disseminated" can be defined as "made known." For example, a company report of profits that is posted on the internet and distributed widely through a press release or accompanied by a filing has been effectively disseminated to the marketplace. Members and candidates must have a reasonable expectation that people have received the information before it can be considered public. It is not necessary, however, to wait for the slowest method of delivery. Once the information is disseminated to the market, it is public information that is no longer covered by this standard.

Members and candidates must be particularly aware of information that is selectively disclosed by corporations to a small group of investors, analysts, or other market participants. Information that is made available to analysts remains nonpublic until it is made available to investors in general. Corporations that disclose information on a limited basis create the potential for insider-trading violations.

Issues of selective disclosure often arise when a corporate insider provides material information to analysts in a briefing or conference call before that information is released to the public. Analysts must be aware that a disclosure made to a room full of analysts does not necessarily make the disclosed information "public." Analysts should also be alert to the possibility that they are selectively receiving material nonpublic information when a company provides them with guidance or interpretation of such publicly available information as financial statements or regulatory filings.

A member or candidate may use insider information provided legitimately by the source company for the specific purpose of conducting due diligence according to the business agreement between the parties for such activities as mergers, loan underwriting, credit ratings, and offering engagements. In such instances, the investment professional would not be considered in violation of Standard II(A) by using the material information. However, the use of insider information provided by the source company for other purposes, especially to trade or entice others to trade the securities of the firm, conflicts with this standard.

Mosaic Theory

A financial analyst gathers and interprets large quantities of information from many sources. The analyst may use significant conclusions derived from the analysis of public and nonmaterial nonpublic information as the basis for investment recommendations and decisions even if those conclusions would have been material inside information had they been communicated directly to the analyst by a company. Under the "mosaic theory," financial analysts are free to act on this collection, or mosaic, of information without risking violation.

The practice of financial analysis depends on the free flow of information. For the fair and efficient operation of the capital markets, analysts and investors must have the greatest amount of information possible to facilitate making well-informed investment decisions about how and where to invest capital. Accurate, timely, and intelligible communication is essential if analysts and investors are to obtain the data needed to make informed decisions about how and where to invest capital. These disclosures must go beyond the information mandated by the reporting requirements of the securities laws and should include specific business information about items used to guide a company's future growth, such as new products, capital projects, and the competitive environment. Analysts seek and use such information to compare and contrast investment alternatives.

Much of the information used by analysts comes directly from companies. Analysts often receive such information through contacts with corporate insiders, especially investor-relations staff and financial officers. Information may be disseminated in the

form of press releases, through oral presentations by company executives in analysts' meetings or conference calls, or during analysts' visits to company premises. In seeking to develop the most accurate and complete picture of a company, analysts should also reach beyond contacts with companies themselves and collect information from other sources, such as customers, contractors, suppliers, and the companies' competitors.

Analysts are in the business of formulating opinions and insights that are not obvious to the general investing public about the attractiveness of particular securities. In the course of their work, analysts actively seek out corporate information not generally known to the market for the express purpose of analyzing that information, forming an opinion on its significance, and informing their clients, who can be expected to trade on the basis of the recommendation. Analysts' initiatives to discover and analyze information and communicate their findings to their clients significantly enhance market efficiency, thus benefiting all investors (see *Dirks v. Securities and Exchange Commission*). Accordingly, violations of Standard II(A) will *not* result when a perceptive analyst reaches a conclusion about a corporate action or event through an analysis of public information and items of nonmaterial nonpublic information.

Investment professionals should note, however, that although analysts are free to use mosaic information in their research reports, they should save and document all their research [see Standard V(C)–Record Retention]. Evidence of the analyst's knowledge of public and nonmaterial nonpublic information about a corporation strengthens the assertion that the analyst reached his or her conclusions solely through appropriate methods rather than through the use of material nonpublic information.

Social Media

The continuing advancement in technology allows members, candidates, and the industry at large to exchange information at rates not previously available. It is important for investment professionals to understand the implications of using information from the internet and social media platforms because all such information may not actually be considered public.

Some social media platforms require membership in specific groups in order to access the published content. Members and candidates participating in groups with membership limitations should verify that material information obtained from these sources can also be accessed from a source that would be considered available to the public (e.g., company filings, webpages, and press releases).

Members and candidates may use social media platforms to communicate with clients or investors without conflicting with this standard. As long as the information reaches all clients or is open to the investing public, the use of these platforms would be comparable with other traditional forms of communications, such as e-mails and press releases. Members and candidates, as required by Standard I(A), should also complete all appropriate regulatory filings related to information distributed through social media platforms.

Using Industry Experts

The increased demand for insights for understanding the complexities of some industries has led to an expansion of engagement with outside experts. As the level of engagement increased, new businesses formed to connect analysts and investors with individuals who have specialized knowledge of their industry (e.g., technology or pharmaceuticals). These networks offer investors the opportunity to reach beyond their usual business circles to speak with experts regarding economic conditions, industry trends, and technical issues relating to specific products and services.

Members and candidates may provide compensation to individuals for their insights without violating this standard. However, members and candidates are ultimately responsible for ensuring that they are not requesting or acting on confidential information received from external experts, which is in violation of security regulations

and laws or duties to others. As the recent string of insider-trading cases displayed, some experts are willing to provide confidential and protected information for the right incentive.

Firms connecting experts with members or candidates often require both parties to sign agreements concerning the disclosure of material nonpublic information. Even with the protections from such compliance practices, if an expert provides material nonpublic information, members and candidates would be prohibited from taking investment actions on the associated firm until the information became publicly known to the market.

Investment Research Reports

When a particularly well-known or respected analyst issues a report or makes changes to his or her recommendation, that information alone may have an effect on the market and thus may be considered material. Theoretically, under Standard II(A), such a report would have to be made public at the time it was distributed to clients. The analyst is not a company insider, however, and does not have access to inside information. Presumably, the analyst created the report from information available to the public (mosaic theory) and by using his or her expertise to interpret the information. The analyst's hard work, paid for by the client, generated the conclusions.

Simply because the public in general would find the conclusions material does not require that the analyst make his or her work public. Investors who are not clients of the analyst can either do the work themselves or become clients of the analyst to gain access to the analyst's expertise.

Recommended Procedures for Compliance

Achieve Public Dissemination

If a member or candidate determines that information is material, the member or candidate should make reasonable efforts to achieve public dissemination of the information. These efforts usually entail encouraging the issuing company to make the information public. If public dissemination is not possible, the member or candidate must communicate the information only to the designated supervisory and compliance personnel within the member's or candidate's firm and must not take investment action or alter current investment recommendations on the basis of the information. Moreover, members and candidates must not knowingly engage in any conduct that may induce company insiders to privately disclose material nonpublic information.

Adopt Compliance Procedures

Members and candidates should encourage their firms to adopt compliance procedures to prevent the misuse of material nonpublic information. Particularly important is improving compliance in such areas as the review of employee and proprietary trading, the review of investment recommendations, documentation of firm procedures, and the supervision of interdepartmental communications in multiservice firms. Compliance procedures should suit the particular characteristics of a firm, including its size and the nature of its business.

Members and candidates are encouraged to inform their supervisor and compliance personnel of suspected inappropriate use of material nonpublic information as the basis for security trading activities or recommendations being made within their firm.

Adopt Disclosure Procedures

Members and candidates should encourage their firms to develop and follow disclosure policies designed to ensure that information is disseminated to the marketplace in an equitable manner. For example, analysts from small firms should receive the

same information and attention from a company as analysts from large firms receive. Similarly, companies should not provide certain information to buy-side analysts but not to sell-side analysts, or vice versa. Furthermore, a company should not discriminate among analysts in the provision of information or "blackball" particular analysts who have given negative reports on the company in the past.

Within investment and research firms, members and candidates should encourage the development of and compliance with procedures for distributing new and updated investment opinions to clients. Recommendations of this nature may represent material market-moving information that needs to be communicated to all clients fairly.

Issue Press Releases

Companies should consider issuing press releases prior to analyst meetings and conference calls and scripting those meetings and calls to decrease the chance that further information will be disclosed. If material nonpublic information is disclosed for the first time in an analyst meeting or call, the company should promptly issue a press release or otherwise make the information publicly available.

Firewall Elements

An information barrier commonly referred to as a "firewall" is the most widely used approach for preventing the communication of material nonpublic information within firms. It restricts the flow of confidential information to those who need to know the information to perform their jobs effectively. The minimum elements of such a system include, but are not limited to, the following:

- substantial control of relevant interdepartmental communications, preferably through a clearance area within the firm in either the compliance or legal department;
- review of employee trading through the maintenance of "watch," "restricted," and "rumor" lists;
- documentation of the procedures designed to limit the flow of information between departments and of the actions taken to enforce those procedures; and
- heightened review or restriction of proprietary trading while a firm is in possession of material nonpublic information.

Appropriate Interdepartmental Communications

Although documentation requirements must, for practical reasons, take into account the differences between the activities of small firms and those of large, multiservice firms, firms of all sizes and types benefit by improving the documentation of their internal enforcement of firewall procedures. Therefore, even at small firms, procedures concerning interdepartmental communication, the review of trading activity, and the investigation of possible violations should be compiled and formalized.

Physical Separation of Departments

As a practical matter, to the greatest extent possible, firms should consider the physical separation of departments and files to prevent the communication of sensitive information that should not be shared. For example, the investment banking and corporate finance areas of a brokerage firm should be separated from the sales and research departments, and a bank's commercial lending department should be segregated from its trust and research departments.

Prevention of Personnel Overlap

There should be no overlap of personnel between the investment banking and corporate finance areas of a brokerage firm and the sales and research departments or between a bank's commercial lending department and its trust and research departments. For a firewall to be effective in a multiservice firm, an employee should be on only one side of the firewall at any time. Inside knowledge may not be limited to information about a specific offering or the current financial condition of a company. Analysts may be exposed to much information about the company, including new product developments or future budget projections that clearly constitute inside knowledge and thus preclude the analyst from returning to his or her research function. For example, an analyst who follows a particular company may provide limited assistance to the investment bankers under carefully controlled circumstances when the firm's investment banking department is involved in a deal with the company. That analyst must then be treated as though he or she were an investment banker; the analyst must remain on the investment banking side of the wall until any information he or she learns is publicly disclosed. In short, the analyst cannot use any information learned in the course of the project for research purposes and cannot share that information with colleagues in the research department.

A Reporting System

A primary objective of an effective firewall procedure is to establish a reporting system in which authorized people review and approve communications between departments. If an employee behind a firewall believes that he or she needs to share confidential information with someone on the other side of the wall, the employee should consult a designated compliance officer to determine whether sharing the information is necessary and how much information should be shared. If the sharing is necessary, the compliance officer should coordinate the process of "looking over the wall" so that the necessary information will be shared and the integrity of the procedure will be maintained.

A single supervisor or compliance officer should have the specific authority and responsibility of deciding whether information is material and whether it is sufficiently public to be used as the basis for investment decisions. Ideally, the supervisor or compliance officer responsible for communicating information to a firm's research or brokerage area would not be a member of that area.

Personal Trading Limitations

Firms should consider restrictions or prohibitions on personal trading by employees and should carefully monitor both proprietary trading and personal trading by employees. Firms should require employees to make periodic reports (to the extent that such reporting is not already required by securities laws) of their own transactions and transactions made for the benefit of family members. Securities should be placed on a restricted list when a firm has or may have material nonpublic information. The broad distribution of a restricted list often triggers the sort of trading the list was developed to avoid. Therefore, a watch list shown to only the few people responsible for compliance should be used to monitor transactions in specified securities. The use of a watch list in combination with a restricted list is an increasingly common means of ensuring effective control of personal trading.

Record Maintenance

Multiservice firms should maintain written records of the communications between various departments. Firms should place a high priority on training and should consider instituting comprehensive training programs, particularly for employees in sensitive areas.

Proprietary Trading Procedures

Procedures concerning the restriction or review of a firm's proprietary trading while the firm possesses material nonpublic information will necessarily depend on the types of proprietary trading in which the firm may engage. A prohibition on all types of proprietary activity when a firm comes into possession of material nonpublic information is *not* appropriate. For example, when a firm acts as a market maker, a prohibition on proprietary trading may be counterproductive to the goals of maintaining the confidentiality of information and market liquidity. This concern is particularly important in the relationships between small, regional broker/dealers and small issuers. In many situations, a firm will take a small issuer public with the understanding that the firm will continue to be a market maker in the stock. In such instances, a withdrawal by the firm from market-making activities would be a clear tip to outsiders. Firms that continue market-making activity while in the possession of material nonpublic information should, however, instruct their market makers to remain passive with respect to the market—that is, to take only the contra side of unsolicited customer trades.

In risk-arbitrage trading, the case for a trading prohibition is more compelling than it is in the case of market making. The impetus for arbitrage trading is neither passive nor reactive, and the potential for illegal profits is greater than in market making. The most prudent course for firms is to suspend arbitrage activity when a security is placed on the watch list. Those firms that continue arbitrage activity face a high hurdle in proving the adequacy of their internal procedures for preventing trading on material nonpublic information and must demonstrate a stringent review and documentation of firm trades.

Communication to All Employees

Members and candidates should encourage their employers to circulate written compliance policies and guidelines to all employees. Policies and guidelines should be used in conjunction with training programs aimed at enabling employees to recognize material nonpublic information. Such information is not always clearly identifiable.

Employees must be given sufficient training to either make an informed decision or to realize they need to consult a supervisor or compliance officer before engaging in questionable transactions. Appropriate policies reinforce that using material nonpublic information is illegal in many countries. Such trading activities based on material nonpublic information undermine the integrity of the individual, the firm, and the capital markets.

Application of the Standard

Example 1 (Acting on Nonpublic Information):

Frank Barnes, the president and controlling shareholder of the SmartTown clothing chain, decides to accept a tender offer and sell the family business at a price almost double the market price of its shares. He describes this decision to his sister (SmartTown's treasurer), who conveys it to her daughter (who owns no stock in the family company at present), who tells her husband, Staple. Staple, however, tells his stockbroker, Alex Halsey, who immediately buys SmartTown stock for himself.

> *Comment*: The information regarding the pending sale is both material and nonpublic. Staple has violated Standard II(A) by communicating the inside information to his broker. Halsey also has violated the standard by buying the shares on the basis of material nonpublic information.

Example 2 (Controlling Nonpublic Information):

Samuel Peter, an analyst with Scotland and Pierce Incorporated, is assisting his firm with a secondary offering for Bright Ideas Lamp Company. Peter participates, via telephone conference call, in a meeting with Scotland and Pierce investment banking employees and Bright Ideas' CEO. Peter is advised that the company's earnings projections for the next year have significantly dropped. Throughout the telephone conference call, several Scotland and Pierce salespeople and portfolio managers walk in and out of Peter's office, where the telephone call is taking place. As a result, they are aware of the drop in projected earnings for Bright Ideas. Before the conference call is concluded, the salespeople trade the stock of the company on behalf of the firm's clients and other firm personnel trade the stock in a firm proprietary account and in employees' personal accounts.

> *Comment*: Peter has violated Standard II(A) because he failed to prevent the transfer and misuse of material nonpublic information to others in his firm. Peter's firm should have adopted information barriers to prevent the communication of nonpublic information between departments of the firm. The salespeople and portfolio managers who traded on the information have also violated Standard II(A) by trading on inside information.

Example 3 (Selective Disclosure of Material Information):

Elizabeth Levenson is based in Taipei and covers the Taiwanese market for her firm, which is based in Singapore. She is invited, together with the other 10 largest shareholders of a manufacturing company, to meet the finance director of that company. During the meeting, the finance director states that the company expects its workforce to strike next Friday, which will cripple productivity and distribution. Can Levenson use this information as a basis to change her rating on the company from "buy" to "sell"?

> *Comment*: Levenson must first determine whether the material information is public. According to Standard II(A), if the company has not made this information public (a small group forum does not qualify as a method of public dissemination), she cannot use the information.

Example 4 (Determining Materiality):

Leah Fechtman is trying to decide whether to hold or sell shares of an oil-and-gas exploration company that she owns in several of the funds she manages. Although the company has underperformed the index for some time already, the trends in the industry sector signal that companies of this type might become takeover targets. While she is considering her decision, her doctor, who casually follows the markets, mentions that she thinks that the company in question will soon be bought out by a large multinational conglomerate and that it would be a good idea to buy the stock right now. After talking to various investment professionals and checking their opinions on the company as well as checking industry trends, Fechtman decides the next day to accumulate more stock in the oil-and-gas exploration company.

> *Comment*: Although information on an expected takeover bid may be of the type that is generally material and nonpublic, in this case, the source of information is unreliable, so the information cannot be considered material. Therefore, Fechtman is not prohibited from trading the stock on the basis of this information.

Example 5 (Applying the Mosaic Theory):

Jagdish Teja is a buy-side analyst covering the furniture industry. Looking for an attractive company to recommend as a buy, he analyzes several furniture makers by studying their financial reports and visiting their operations. He also talks to some designers and retailers to find out which furniture styles are trendy and popular. Although none of the companies that he analyzes are a clear buy, he discovers that one of them, Swan Furniture Company (SFC), may be in financial trouble. SFC's extravagant new designs have been introduced at substantial cost. Even though these designs initially attracted attention, the public is now buying more conservative furniture from other makers. Based on this information and on a profit-and-loss analysis, Teja believes that SFC's next quarter earnings will drop substantially. He issues a sell recommendation for SFC. Immediately after receiving that recommendation, investment managers start reducing the SFC stock in their portfolios.

> *Comment*: Information on quarterly earnings data is material and nonpublic. Teja arrived at his conclusion about the earnings drop on the basis of public information and on pieces of nonmaterial nonpublic information (such as opinions of designers and retailers). Therefore, trading based on Teja's correct conclusion is not prohibited by Standard II(A).

Example 6 (Applying the Mosaic Theory):

Roger Clement is a senior financial analyst who specializes in the European automobile sector at Rivoli Capital. Because he has been repeatedly nominated by many leading industry magazines and newsletters as a "best analyst" for the automobile industry, he is widely regarded as an authority on the sector. After speaking with representatives of Turgot Chariots—a European auto manufacturer with sales primarily in South Korea—and after conducting interviews with salespeople, labor leaders, his firm's Korean currency analysts, and banking officials, Clement analyzed Turgot Chariots and concluded that (1) its newly introduced model will probably not meet sales expectations, (2) its corporate restructuring strategy may well face serious opposition from unions, (3) the depreciation of the Korean won should lead to pressure on margins for the industry in general and Turgot's market segment in particular, and (4) banks could take a tougher-than-expected stance in the upcoming round of credit renegotiations with the company. For these reasons, he changes his conclusion about the company from "market outperform" to "market underperform." Clement retains the support material used to reach his conclusion in case questions later arise.

> *Comment*: To reach a conclusion about the value of the company, Clement has pieced together a number of nonmaterial or public bits of information that affect Turgot Chariots. Therefore, under the mosaic theory, Clement has not violated Standard II(A) in drafting the report.

Example 7 (Analyst Recommendations as Material Nonpublic Information):

The next day, Clement is preparing to be interviewed on a global financial news television program where he will discuss his changed recommendation on Turgot Chariots for the first time in public. While preparing for the program, he mentions to the show's producers and Mary Zito, the journalist who will be interviewing him, the information he will be discussing. Just prior to going on the air, Zito sells her holdings in Turgot Chariots. She also phones her father with the information because she knows that he and other family members have investments in Turgot Chariots.

> *Comment*: When Zito receives advance notice of Clement's change of opinion, she knows it will have a material impact on the stock price, even if she is not totally aware of Clement's underlying reasoning. She is not a client

of Clement but obtains early access to the material nonpublic information prior to publication. Her trades are thus based on material nonpublic information and violate Standard II(A).

Zito further violates the Standard by relaying the information to her father. It would not matter if he or any other family member traded; the act of providing the information violates Standard II(A). The fact that the information is provided to a family member does not absolve someone of the prohibition of using or communicating material nonpublic information.

Example 8 (Acting on Nonpublic Information):

Ashton Kellogg is a retired investment professional who manages his own portfolio. He owns shares in National Savings, a large local bank. A close friend and golfing buddy, John Mayfield, is a senior executive at National. National has seen its stock price drop considerably, and the news and outlook are not good. In a conversation about the economy and the banking industry on the golf course, Mayfield relays the information that National will surprise the investment community in a few days when it announces excellent earnings for the quarter. Kellogg is pleasantly surprised by this information, and thinking that Mayfield, as a senior executive, knows the law and would not disclose inside information, he doubles his position in the bank. Subsequently, National announces that it had good operating earnings but had to set aside reserves for anticipated significant losses on its loan portfolio. The combined news causes the stock to go down 60%.

Comment: Even though Kellogg believes that Mayfield would not break the law by disclosing inside information and money was lost on the purchase, Kellogg should not have purchased additional shares of National. It is the member's or candidate's responsibility to make sure, before executing investment actions, that comments about earnings are not material nonpublic information. Kellogg has violated Standard II(A).

Example 9 (Mosaic Theory):

John Doll is a research analyst for a hedge fund that also sells its research to a select group of paying client investment firms. Doll's focus is medical technology companies and products, and he has been in the business long enough and has been successful enough to build up a very credible network of friends and experts in the business. Doll has been working on a major research report recommending Boyce Health, a medical device manufacturer. He recently ran into an old acquaintance at a wedding who is a senior executive at Boyce, and Doll asked about the business. Doll was drawn to a statement that the executive, who has responsibilities in the new products area, made about a product: "I would not get too excited about the medium-term prospects; we have a lot of work to do first." Doll incorporated this and other information about the new Boyce product in his long-term recommendation of Boyce.

Comment: Doll's conversation with the senior executive is part of the mosaic of information used in recommending Boyce. When holding discussions with a firm executive, Doll would need to guard against soliciting or obtaining material nonpublic information. Before issuing the report, the executive's statement about the continuing development of the product would need to be weighed against the other known public facts to determine whether it would be considered material.

Example 10 (Materiality Determination):

Larry Nadler, a trader for a mutual fund, gets a text message from another firm's trader, whom he has known for years. The message indicates a software company is going to report strong earnings when the firm publicly announces in two days. Nadler has a buy order from a portfolio manager within his firm to purchase several hundred thousand shares of the stock. Nadler is aggressive in placing the portfolio manager's order and completes the purchases by the following morning, a day ahead of the firm's planned earnings announcement.

> *Comment*: There are often rumors and whisper numbers before a release of any kind. The text message from the other trader would most likely be considered market noise. Unless Nadler knew that the trader had an ongoing business relationship with the public firm, he had no reason to suspect he was receiving material nonpublic information that would prevent him from completing the trading request of the portfolio manager.

Example 11 (Using an Expert Network):

Mary McCoy is the senior drug analyst at a mutual fund. Her firm hires a service that connects her to experts in the treatment of cancer. Through various phone conversations, McCoy enhances her understanding of the latest therapies for successful treatment. This information is critical to Mary making informed recommendations of the companies producing these drugs.

> *Comment*: McCoy is appropriately using the expert networks to enhance her evaluation process. She has neither asked for nor received information that may be considered material and nonpublic, such as preliminary trial results. McCoy is allowed to seek advice from professionals within the industry that she follows.

Example 12 (Using an Expert Network):

Tom Watson is a research analyst working for a hedge fund. To stay informed, Watson relies on outside experts for information on such industries as technology and pharmaceuticals, where new advancements occur frequently. The meetings with the industry experts often are arranged through networks or placement agents that have specific policies and procedures in place to deter the exchange of material nonpublic information.

Watson arranges a call to discuss future prospects for one of the fund's existing technology company holdings, a company that was testing a new semiconductor product. The scientist leading the tests indicates his disappointment with the performance of the new semiconductor. Following the call, Watson relays the insights he received to others at the fund. The fund sells its current position in the company and buys many put options because the market is anticipating the success of the new semiconductor and the share price reflects the market's optimism.

> *Comment*: Watson has violated Standard II(A) by passing along material nonpublic information concerning the ongoing product tests, which the fund used to trade in the securities and options of the related company. Watson cannot simply rely on the agreements signed by individuals who participate in expert networks that state that he has not received information that would prohibit his trading activity. He must make his own determination whether information he received through these arrangements reaches a materiality threshold that would affect his trading abilities.

Standard II(B) Market Manipulation

Members and Candidates must not engage in practices that distort prices or artificially inflate trading volume with the intent to mislead market participants.

Guidance

Highlights:

- *Information-Based Manipulation*
- *Transaction-Based Manipulation*

Standard II(B) requires that members and candidates uphold market integrity by prohibiting market manipulation. Market manipulation includes practices that distort security prices or trading volume with the intent to deceive people or entities that rely on information in the market. Market manipulation damages the interests of all investors by disrupting the smooth functioning of financial markets and lowering investor confidence.

Market manipulation may lead to a lack of trust in the fairness of the capital markets, resulting in higher risk premiums and reduced investor participation. A reduction in the efficiency of a local capital market may negatively affect the growth and economic health of the country and may also influence the operations of the globally interconnected capital markets. Although market manipulation may be less likely to occur in mature financial markets than in emerging markets, cross-border investing increasingly exposes all global investors to the potential for such practices.

Market manipulation includes (1) the dissemination of false or misleading information and (2) transactions that deceive or would be likely to mislead market participants by distorting the price-setting mechanism of financial instruments. The development of new products and technologies increases the incentives, means, and opportunities for market manipulation. Additionally, the increasing complexity and sophistication of the technologies used for communicating with market participants have created new avenues for manipulation.

Information-Based Manipulation

Information-based manipulation includes, but is not limited to, spreading false rumors to induce trading by others. For example, members and candidates must refrain from "pumping up" the price of an investment by issuing misleading positive information or overly optimistic projections of a security's worth only to later "dump" the investment (i.e., sell it) once the price, fueled by the misleading information's effect on other market participants, reaches an artificially high level.

Transaction-Based Manipulation

Transaction-based manipulation involves instances where a member or candidate knew or should have known that his or her actions could affect the pricing of a security. This type of manipulation includes, but is not limited to, the following:

- transactions that artificially affect prices or volume to give the impression of activity or price movement in a financial instrument, which represent a diversion from the expectations of a fair and efficient market, and
- securing a controlling, dominant position in a financial instrument to exploit and manipulate the price of a related derivative and/or the underlying asset.

Standard II(B) is not intended to preclude transactions undertaken on legitimate trading strategies based on perceived market inefficiencies. The intent of the action is critical to determining whether it is a violation of this standard.

Application of the Standard

Example 1 (Independent Analysis and Company Promotion):

The principal owner of Financial Information Services (FIS) entered into an agreement with two microcap companies to promote the companies' stock in exchange for stock and cash compensation. The principal owner caused FIS to disseminate e-mails, design and maintain several websites, and distribute an online investment newsletter—all of which recommended investment in the two companies. The systematic publication of purportedly independent analyses and recommendations containing inaccurate and highly promotional and speculative statements increased public investment in the companies and led to dramatically higher stock prices.

> *Comment*: The principal owner of FIS violated Standard II(B) by using inaccurate reporting and misleading information under the guise of independent analysis to artificially increase the stock price of the companies. Furthermore, the principal owner violated Standard V(A)–Diligence and Reasonable Basis by not having a reasonable and adequate basis for recommending the two companies and violated Standard VI(A)–Disclosure of Conflicts by not disclosing to investors the compensation agreements (which constituted a conflict of interest).

Example 2 (Personal Trading Practices and Price):

John Gray is a private investor in Belgium who bought a large position several years ago in Fame Pharmaceuticals, a German small-cap security with limited average trading volume. He has now decided to significantly reduce his holdings owing to the poor price performance. Gray is worried that the low trading volume for the stock may cause the price to decline further as he attempts to sell his large position.

Gray devises a plan to divide his holdings into multiple accounts in different brokerage firms and private banks in the names of family members, friends, and even a private religious institution. He then creates a rumor campaign on various blogs and social media outlets promoting the company.

Gray begins to buy and sell the stock using the accounts in hopes of raising the trading volume and the price. He conducts the trades through multiple brokers, selling slightly larger positions than he bought on a tactical schedule, and over time, he is able to reduce his holding as desired without negatively affecting the sale price.

> *Comment*: John violated Standard II(B) by fraudulently creating the appearance that there was a greater investor interest in the stock through the online rumors. Additionally, through his trading strategy, he created the

appearance that there was greater liquidity in the stock than actually existed. He was able to manipulate the price through both misinformation and trading practices.

Example 3 (Creating Artificial Price Volatility):

Matthew Murphy is an analyst at Divisadero Securities & Co., which has a significant number of hedge funds among its most important brokerage clients. Some of the hedge funds hold short positions on Wirewolf Semiconductor. Two trading days before the publication of a quarter-end report, Murphy alerts his sales force that he is about to issue a research report on Wirewolf that will include the following opinions:

- quarterly revenues are likely to fall short of management's guidance,
- earnings will be as much as 5 cents per share (or more than 10%) below consensus, and
- Wirewolf's highly respected chief financial officer may be about to join another company.

Knowing that Wirewolf has already entered its declared quarter-end "quiet period" before reporting earnings (and thus would be reluctant to respond to rumors), Murphy times the release of his research report specifically to sensationalize the negative aspects of the message in order to create significant downward pressure on Wirewolf's stock—to the distinct advantage of Divisadero's hedge fund clients. The report's conclusions are based on speculation, not on fact. The next day, the research report is broadcast to all of Divisadero's clients and to the usual newswire services.

Before Wirewolf's investor-relations department can assess the damage on the final trading day of the quarter and refute Murphy's report, its stock opens trading sharply lower, allowing Divisadero's clients to cover their short positions at substantial gains.

Comment: Murphy violated Standard II(B) by aiming to create artificial price volatility designed to have a material impact on the price of an issuer's stock. Moreover, by lacking an adequate basis for the recommendation, Murphy also violated Standard V(A)–Diligence and Reasonable Basis.

Example 4 (Personal Trading and Volume):

Rajesh Sekar manages two funds—an equity fund and a balanced fund—whose equity components are supposed to be managed in accordance with the same model. According to that model, the funds' holdings in stock of Digital Design Inc. (DD) are excessive. Reduction of the DD holdings would not be easy, however, because the stock has low liquidity in the stock market. Sekar decides to start trading larger portions of DD stock back and forth between his two funds to slowly increase the price; he believes market participants will see growing volume and increasing price and become interested in the stock. If other investors are willing to buy the DD stock because of such interest, then Sekar will be able to get rid of at least some of his overweight position without inducing price decreases. In this way, the whole transaction will be for the benefit of fund participants, even if additional brokers' commissions are incurred.

Comment: Sekar's plan would be beneficial for his funds' participants but is based on artificial distortion of both trading volume and the price of the DD stock and thus constitutes a violation of Standard II(B).

Example 5 ("Pump-Priming" Strategy):

ACME Futures Exchange is launching a new bond futures contract. To convince investors, traders, arbitrageurs, hedgers, and so on, to use its contract, the exchange attempts to demonstrate that it has the best liquidity. To do so, it enters into agreements with members in which they commit to a substantial minimum trading volume on the new contract over a specific period in exchange for substantial reductions of their regular commissions.

> *Comment*: The formal liquidity of a market is determined by the obligations set on market makers, but the actual liquidity of a market is better estimated by the actual trading volume and bid–ask spreads. Attempts to mislead participants about the actual liquidity of the market constitute a violation of Standard II(B). In this example, investors have been intentionally misled to believe they chose the most liquid instrument for some specific purpose, but they could eventually see the actual liquidity of the contract significantly reduced after the term of the agreement expires. If the ACME Futures Exchange fully discloses its agreement with members to boost transactions over some initial launch period, it will not violate Standard II(B). ACME's intent is not to harm investors but, on the contrary, to give them a better service. For that purpose, it may engage in a liquidity-pumping strategy, but the strategy must be disclosed.

Example 6 (Creating Artificial Price Volatility):

Emily Gordon, an analyst of household products companies, is employed by a research boutique, Picador & Co. Based on information that she has gathered during a trip through Latin America, she believes that Hygene, Inc., a major marketer of personal care products, has generated better-than-expected sales from its new product initiatives in South America. After modestly boosting her projections for revenue and for gross profit margin in her worksheet models for Hygene, Gordon estimates that her earnings projection of US$2.00 per diluted share for the current year may be as much as 5% too low. She contacts the chief financial officer (CFO) of Hygene to try to gain confirmation of her findings from her trip and to get some feedback regarding her revised models. The CFO declines to comment and reiterates management's most recent guidance of US$1.95–US$2.05 for the year.

Gordon decides to try to force a comment from the company by telling Picador & Co. clients who follow a momentum investment style that consensus earnings projections for Hygene are much too low; she explains that she is considering raising her published estimate by an ambitious US$0.15 to US$2.15 per share. She believes that when word of an unrealistically high earnings projection filters back to Hygene's investor-relations department, the company will feel compelled to update its earnings guidance. Meanwhile, Gordon hopes that she is at least correct with respect to the earnings direction and that she will help clients who act on her insights to profit from a quick gain by trading on her advice.

> *Comment*: By exaggerating her earnings projections in order to try to fuel a quick gain in Hygene's stock price, Gordon is in violation of Standard II(B). Furthermore, by virtue of previewing her intentions of revising upward her earnings projections to only a select group of clients, she is in violation of Standard III(B)–Fair Dealing. However, it would have been acceptable for Gordon to write a report that
>
> - framed her earnings projection in a range of possible outcomes,

- outlined clearly the assumptions used in her Hygene models that took into consideration the findings from her trip through Latin America, and
- was distributed to all Picador & Co. clients in an equitable manner.

Example 7 (Pump and Dump Strategy):

In an effort to pump up the price of his holdings in Moosehead & Belfast Railroad Company, Steve Weinberg logs on to several investor chat rooms on the internet to start rumors that the company is about to expand its rail network in anticipation of receiving a large contract for shipping lumber.

> *Comment*: Weinberg has violated Standard II(B) by disseminating false information about Moosehead & Belfast with the intent to mislead market participants.

Example 8 (Manipulating Model Inputs):

Bill Mandeville supervises a structured financing team for Superior Investment Bank. His responsibilities include packaging new structured investment products and managing Superior's relationship with relevant rating agencies. To achieve the best rating possible, Mandeville uses mostly positive scenarios as model inputs—scenarios that reflect minimal downside risk in the assets underlying the structured products. The resulting output statistics in the rating request and underwriting prospectus support the idea that the new structured products have minimal potential downside risk. Additionally, Mandeville's compensation from Superior is partially based on both the level of the rating assigned and the successful sale of new structured investment products but does not have a link to the long-term performance of the instruments.

Mandeville is extremely successful and leads Superior as the top originator of structured investment products for the next two years. In the third year, the economy experiences difficulties and the values of the assets underlying structured products significantly decline. The subsequent defaults lead to major turmoil in the capital markets, the demise of Superior Investment Bank, and the loss of Mandeville's employment.

> *Comment*: Mandeville manipulates the inputs of a model to minimize associated risk to achieve higher ratings. His understanding of structured products allows him to skillfully decide which inputs to include in support of the desired rating and price. This information manipulation for short-term gain, which is in violation of Standard II(B), ultimately causes significant damage to many parties and the capital markets as a whole. Mandeville should have realized that promoting a rating and price with inaccurate information could cause not only a loss of price confidence in the particular structured product but also a loss of investor trust in the system. Such loss of confidence affects the ability of the capital markets to operate efficiently.

Example 9 (Information Manipulation):

Allen King is a performance analyst for Torrey Investment Funds. King believes that the portfolio manager for the firm's small- and microcap equity fund dislikes him because the manager never offers him tickets to the local baseball team's games but does offer tickets to other employees. To incite a potential regulatory review of the manager, King creates user profiles on several online forums under the portfolio manager's name and starts rumors about potential mergers for several of the smaller

companies in the portfolio. As the prices of these companies' stocks increase, the portfolio manager sells the position, which leads to an investigation by the regulator as King desired.

> *Comment*: King has violated Standard II(B) even though he did not personally profit from the market's reaction to the rumor. In posting the false information, King misleads others into believing the companies were likely to be acquired. Although his intent was to create trouble for the portfolio manager, his actions clearly manipulated the factual information that was available to the market.

STANDARD III: DUTIES TO CLIENTS

Standard III(A) Loyalty, Prudence, and Care

Members and Candidates have a duty of loyalty to their clients and must act with reasonable care and exercise prudent judgment. Members and Candidates must act for the benefit of their clients and place their clients' interests before their employer's or their own interests.

Guidance

Highlights:

- *Understanding the Application of Loyalty, Prudence, and Care*
- *Identifying the Actual Investment Client*
- *Developing the Client's Portfolio*
- *Soft Commission Policies*
- *Proxy Voting Policies*

Standard III(A) clarifies that client interests are paramount. A member's or candidate's responsibility to a client includes a duty of loyalty and a duty to exercise reasonable care. Investment actions must be carried out for the sole benefit of the client and in a manner the member or candidate believes, given the known facts and circumstances, to be in the best interest of the client. Members and candidates must exercise the same level of prudence, judgment, and care that they would apply in the management and disposition of their own interests in similar circumstances.

Prudence requires caution and discretion. The exercise of prudence by investment professionals requires that they act with the care, skill, and diligence that a reasonable person acting in a like capacity and familiar with such matters would use. In the context of managing a client's portfolio, prudence requires following the investment parameters set forth by the client and balancing risk and return. Acting with care requires members and candidates to act in a prudent and judicious manner in avoiding harm to clients.

Standard III(A) sets minimum expectations for members and candidates when fulfilling their responsibilities to their clients. Regulatory and legal requirements for such duties can vary across the investment industry depending on a variety of factors,

including job function of the investment professional, the existence of an adviser/client relationship, and the nature of the recommendations being offered. From the perspective of the end user of financial services, these different standards can be arcane and confusing, leaving investors unsure of what level of service to expect from investment professionals they employ. The single standard of conduct described in Standard III(A) benefits investors by establishing a benchmark for the duties of loyalty, prudence, and care and clarifies that all CFA Institute members and candidates, regardless of job title, local laws, or cultural differences, are required to comply with these fundamental responsibilities. Investors hiring members or candidates who must adhere to the duty of loyalty, prudence, and care set forth in this standard can be confident that these responsibilities are a requirement regardless of any legally imposed fiduciary duties.

Standard III(A), however, is not a substitute for a member's or candidate's legal or regulatory obligations. As stated in Standard I(A), members and candidates must abide by the most strict requirements imposed on them by regulators or the Code and Standards, including any legally imposed fiduciary duty. Members and candidates must also be aware of whether they have "custody" or effective control of client assets. If so, a heightened level of responsibility arises. Members and candidates are considered to have custody if they have any direct or indirect access to client funds. Members and candidates must manage any pool of assets in their control in accordance with the terms of the governing documents (such as trust documents and investment management agreements), which are the primary determinant of the manager's powers and duties. Whenever their actions are contrary to provisions of those instruments or applicable law, members and candidates are at risk of violating Standard III(A).

Understanding the Application of Loyalty, Prudence, and Care

Standard III(A) establishes a minimum benchmark for the duties of loyalty, prudence, and care that are required of all members and candidates regardless of whether a legal fiduciary duty applies. Although fiduciary duty often encompasses the principles of loyalty, prudence, and care, Standard III(A) does not render all members and candidates fiduciaries. The responsibilities of members and candidates for fulfilling their obligations under this standard depend greatly on the nature of their professional responsibilities and the relationships they have with clients. The conduct of members and candidates may or may not rise to the level of being a fiduciary, depending on the type of client, whether the member or candidate is giving investment advice, and the many facts and circumstances surrounding a particular transaction or client relationship.

Fiduciary duties are often imposed by law or regulation when an individual or institution is charged with the duty of acting for the benefit of another party, such as managing investment assets. The duty required in fiduciary relationships exceeds what is acceptable in many other business relationships because a fiduciary is in an enhanced position of trust. Although members and candidates must comply with any legally imposed fiduciary duty, the Code and Standards neither impose such a legal responsibility nor require all members or candidates to act as fiduciaries. However, Standard III(A) requires members and candidates to work in the client's best interest no matter what the job function.

A member or candidate who does not provide advisory services to a client but who acts only as a trade execution professional must prudently work in the client's interest when completing requested trades. Acting in the client's best interest requires these professionals to use their skills and diligence to execute trades in the most favorable terms that can be achieved. Members and candidates operating in such positions must use care to operate within the parameters set by the client's trading instructions.

Members and candidates may also operate in a blended environment where they execute client trades and offer advice on a limited set of investment options. The extent of the advisory arrangement and limitations should be outlined in the agreement with the client at the outset of the relationship. For instance, members and candidates should

inform clients that the advice provided will be limited to the propriety products of the firm and not include other products available on the market. Clients who want access to a wider range of investment products would have the information necessary to decide not to engage with members or candidates working under these restrictions.

Members and candidates operating in this blended context would comply with their obligations by recommending the allowable products that are consistent with the client's objectives and risk tolerances. They would exercise care through diligently aligning the client's needs with the attributes of the products being recommended. Members and candidates should place the client's interests first by disregarding any firm or personal interest in motivating a recommended transaction.

There is a large variety of professional relationships that members and candidates have with their clients. Standard III(A) requires them to fulfill the obligations outlined explicitly or implicitly in the client agreements to the best of their abilities and with loyalty, prudence, and care. Whether a member or candidate is structuring a new securitization transaction, completing a credit rating analysis, or leading a public company, he or she must work with prudence and care in delivering the agreed-on services.

Identifying the Actual Investment Client

The first step for members and candidates in fulfilling their duty of loyalty to clients is to determine the identity of the "client" to whom the duty of loyalty is owed. In the context of an investment manager managing the personal assets of an individual, the client is easily identified. When the manager is responsible for the portfolios of pension plans or trusts, however, the client is not the person or entity who hires the manager but, rather, the beneficiaries of the plan or trust. The duty of loyalty is owed to the ultimate beneficiaries.

In some situations, an actual client or group of beneficiaries may not exist. Members and candidates managing a fund to an index or an expected mandate owe the duty of loyalty, prudence, and care to invest in a manner consistent with the stated mandate. The decisions of a fund's manager, although benefiting all fund investors, do not have to be based on an individual investor's requirements and risk profile. Client loyalty and care for those investing in the fund are the responsibility of members and candidates who have an advisory relationship with those individuals.

Situations involving potential conflicts of interest with respect to responsibilities to clients may be extremely complex because they may involve a number of competing interests. The duty of loyalty, prudence, and care applies to a large number of persons in varying capacities, but the exact duties may differ in many respects in accord with the relationship with each client or each type of account in which the assets are managed. Members and candidates must not only put their obligations to clients first in all dealings but also endeavor to avoid all real or potential conflicts of interest.

Members and candidates with positions whose responsibilities do not include direct investment management also have "clients" that must be considered. Just as there are various types of advisory relationships, members and candidates must look at their roles and responsibilities when making a determination of who their clients are. Sometimes the client is easily identifiable; such is the case in the relationship between a company executive and the firm's public shareholders. At other times, the client may be the investing public as a whole, in which case the goals of independence and objectivity of research surpass the goal of loyalty to a single organization.

Developing the Client's Portfolio

The duty of loyalty, prudence, and care owed to the individual client is especially important because the professional investment manager typically possesses greater knowledge in the investment arena than the client does. This disparity places the individual client in a vulnerable position; the client must trust the manager. The manager in these situations should ensure that the client's objectives and expectations for the

performance of the account are realistic and suitable to the client's circumstances and that the risks involved are appropriate. In most circumstances, recommended investment strategies should relate to the long-term objectives and circumstances of the client.

Particular care must be taken to detect whether the goals of the investment manager or the firm in conducting business, selling products, and executing security transactions potentially conflict with the best interests and objectives of the client. When members and candidates cannot avoid potential conflicts between their firm and clients' interests, they must provide clear and factual disclosures of the circumstances to the clients.

Members and candidates must follow any guidelines set by their clients for the management of their assets. Some clients, such as charitable organizations and pension plans, have strict investment policies that limit investment options to certain types or classes of investment or prohibit investment in certain securities. Other organizations have aggressive policies that do not prohibit investments by type but, instead, set criteria on the basis of the portfolio's total risk and return.

Investment decisions must be judged in the context of the total portfolio rather than by individual investment within the portfolio. The member's or candidate's duty is satisfied with respect to a particular investment if the individual has thoroughly considered the investment's place in the overall portfolio, the risk of loss and opportunity for gains, tax implications, and the diversification, liquidity, cash flow, and overall return requirements of the assets or the portion of the assets for which the manager is responsible.

Soft Commission Policies

An investment manager often has discretion over the selection of brokers executing transactions. Conflicts may arise when an investment manager uses client brokerage to purchase research services, a practice commonly called "soft dollars" or "soft commissions." A member or candidate who pays a higher brokerage commission than he or she would normally pay to allow for the purchase of goods or services, without corresponding benefit to the client, violates the duty of loyalty to the client.

From time to time, a client will direct a manager to use the client's brokerage to purchase goods or services for the client, a practice that is commonly called "directed brokerage." Because brokerage commission is an asset of the client and is used to benefit that client, not the manager, such a practice does not violate any duty of loyalty. However, a member or candidate is obligated to seek "best price" and "best execution" and be assured by the client that the goods or services purchased from the brokerage will benefit the account beneficiaries. "Best execution" refers to a trading process that seeks to maximize the value of the client's portfolio within the client's stated investment objectives and constraints. In addition, the member or candidate should disclose to the client that the client may not be getting best execution from the directed brokerage.

Proxy Voting Policies

The duty of loyalty, prudence, and care may apply in a number of situations facing the investment professional besides those related directly to investing assets.

Part of a member's or candidate's duty of loyalty includes voting proxies in an informed and responsible manner. Proxies have economic value to a client, and members and candidates must ensure that they properly safeguard and maximize this value. An investment manager who fails to vote, casts a vote without considering the impact of the question, or votes blindly with management on nonroutine governance issues (e.g., a change in company capitalization) may violate this standard. Voting of proxies is an integral part of the management of investments.

A cost–benefit analysis may show that voting all proxies may not benefit the client, so voting proxies may not be necessary in all instances. Members and candidates should disclose to clients their proxy voting policies.

Recommended Procedures for Compliance

Regular Account Information

Members and candidates with control of client assets (1) should submit to each client, at least quarterly, an itemized statement showing the funds and securities in the custody or possession of the member or candidate plus all debits, credits, and transactions that occurred during the period, (2) should disclose to the client where the assets are to be maintained, as well as where or when they are moved, and (3) should separate the client's assets from any other party's assets, including the member's or candidate's own assets.

Client Approval

If a member or candidate is uncertain about the appropriate course of action with respect to a client, the member or candidate should consider what he or she would expect or demand if the member or candidate were the client. If in doubt, a member or candidate should disclose the questionable matter in writing to the client and obtain client approval.

Firm Policies

Members and candidates should address and encourage their firms to address the following topics when drafting the statements or manuals containing their policies and procedures regarding responsibilities to clients:

- *Follow all applicable rules and laws*: Members and candidates must follow all legal requirements and applicable provisions of the Code and Standards.
- *Establish the investment objectives of the client*: Make a reasonable inquiry into a client's investment experience, risk and return objectives, and financial constraints prior to making investment recommendations or taking investment actions.
- *Consider all the information when taking actions*: When taking investment actions, members and candidates must consider the appropriateness and suitability of the investment relative to (1) the client's needs and circumstances, (2) the investment's basic characteristics, and (3) the basic characteristics of the total portfolio.
- *Diversify*: Members and candidates should diversify investments to reduce the risk of loss, unless diversification is not consistent with plan guidelines or is contrary to the account objectives.
- *Carry out regular reviews*: Members and candidates should establish regular review schedules to ensure that the investments held in the account adhere to the terms of the governing documents.
- *Deal fairly with all clients with respect to investment actions*: Members and candidates must not favor some clients over others and should establish policies for allocating trades and disseminating investment recommendations.
- *Disclose conflicts of interest*: Members and candidates must disclose all actual and potential conflicts of interest so that clients can evaluate those conflicts.
- *Disclose compensation arrangements*: Members and candidates should make their clients aware of all forms of manager compensation.

- *Vote proxies*: In most cases, members and candidates should determine who is authorized to vote shares and vote proxies in the best interests of the clients and ultimate beneficiaries.
- *Maintain confidentiality*: Members and candidates must preserve the confidentiality of client information.
- *Seek best execution*: Unless directed by the client as ultimate beneficiary, members and candidates must seek best execution for their clients. (Best execution is defined in the preceding text.)
- *Place client interests first*: Members and candidates must serve the best interests of clients.

Application of the Standard

Example 1 (Identifying the Client—Plan Participants):

First Country Bank serves as trustee for the Miller Company's pension plan. Miller is the target of a hostile takeover attempt by Newton, Inc. In attempting to ward off Newton, Miller's managers persuade Julian Wiley, an investment manager at First Country Bank, to purchase Miller common stock in the open market for the employee pension plan. Miller's officials indicate that such action would be favorably received and would probably result in other accounts being placed with the bank. Although Wiley believes the stock is overvalued and would not ordinarily buy it, he purchases the stock to support Miller's managers, to maintain Miller's good favor toward the bank, and to realize additional new business. The heavy stock purchases cause Miller's market price to rise to such a level that Newton retracts its takeover bid.

> *Comment*: Standard III(A) requires that a member or candidate, in evaluating a takeover bid, act prudently and solely in the interests of plan participants and beneficiaries. To meet this requirement, a member or candidate must carefully evaluate the long-term prospects of the company against the short-term prospects presented by the takeover offer and by the ability to invest elsewhere. In this instance, Wiley, acting on behalf of his employer, which was the trustee for a pension plan, clearly violated Standard III(A). He used the pension plan to perpetuate existing management, perhaps to the detriment of plan participants and the company's shareholders, and to benefit himself. Wiley's responsibilities to the plan participants and beneficiaries should have taken precedence over any ties of his bank to corporate managers and over his self-interest. Wiley had a duty to examine the takeover offer on its own merits and to make an independent decision. The guiding principle is the appropriateness of the investment decision to the pension plan, not whether the decision benefited Wiley or the company that hired him.

Example 2 (Client Commission Practices):

JNI, a successful investment counseling firm, serves as investment manager for the pension plans of several large regionally based companies. Its trading activities generate a significant amount of commission-related business. JNI uses the brokerage and research services of many firms, but most of its trading activity is handled through a large brokerage company, Thompson, Inc., because the executives of the two firms have a close friendship. Thompson's commission structure is high in comparison with charges for similar brokerage services from other firms. JNI considers Thompson's

research services and execution capabilities average. In exchange for JNI directing its brokerage to Thompson, Thompson absorbs a number of JNI overhead expenses, including those for rent.

> *Comment*: JNI executives are breaching their responsibilities by using client brokerage for services that do not benefit JNI clients and by not obtaining best price and best execution for their clients. Because JNI executives are not upholding their duty of loyalty, they are violating Standard III(A).

Example 3 (Brokerage Arrangements):

Charlotte Everett, a struggling independent investment adviser, serves as investment manager for the pension plans of several companies. One of her brokers, Scott Company, is close to consummating management agreements with prospective new clients whereby Everett would manage the new client accounts and trade the accounts exclusively through Scott. One of Everett's existing clients, Crayton Corporation, has directed Everett to place securities transactions for Crayton's account exclusively through Scott. But to induce Scott to exert efforts to send more new accounts to her, Everett also directs transactions to Scott from other clients without their knowledge.

> *Comment*: Everett has an obligation at all times to seek best price and best execution on all trades. Everett may direct new client trades exclusively through Scott Company as long as Everett receives best price and execution on the trades or receives a written statement from new clients that she is *not* to seek best price and execution and that they are aware of the consequence for their accounts. Everett may trade other accounts through Scott as a reward for directing clients to Everett only if the accounts receive best price and execution and the practice is disclosed to the accounts. Because Everett does not disclose the directed trading, Everett has violated Standard III(A).

Example 4 (Brokerage Arrangements):

Emilie Rome is a trust officer for Paget Trust Company. Rome's supervisor is responsible for reviewing Rome's trust account transactions and her monthly reports of personal stock transactions. Rome has been using Nathan Gray, a broker, almost exclusively for trust account brokerage transactions. When Gray makes a market in stocks, he has been giving Rome a lower price for personal purchases and a higher price for sales than he gives to Rome's trust accounts and other investors.

> *Comment*: Rome is violating her duty of loyalty to the bank's trust accounts by using Gray for brokerage transactions simply because Gray trades Rome's personal account on favorable terms. Rome is placing her own interests before those of her clients.

Example 5 (Client Commission Practices):

Lauren Parker, an analyst with Provo Advisors, covers South American equities for her firm. She likes to travel to the markets for which she is responsible and decides to go on a trip to Chile, Argentina, and Brazil. The trip is sponsored by SouthAM, Inc., a research firm with a small broker/dealer affiliate that uses the clearing facilities of a larger New York brokerage house. SouthAM specializes in arranging South American trips for analysts during which they can meet with central bank officials, government ministers, local economists, and senior executives of corporations. SouthAM accepts commission dollars at a ratio of 2 to 1 against the hard-dollar costs of the research fee for the trip. Parker is not sure that SouthAM's execution is competitive, but without informing her supervisor, she directs the trading desk at Provo to start giving

commission business to SouthAM so she can take the trip. SouthAM has conveniently timed the briefing trip to coincide with the beginning of Carnival season, so Parker also decides to spend five days of vacation in Rio de Janeiro at the end of the trip. Parker uses commission dollars to pay for the five days of hotel expenses.

> *Comment*: Parker is violating Standard III(A) by not exercising her duty of loyalty to her clients. She should have determined whether the commissions charged by SouthAM are reasonable in relation to the benefit of the research provided by the trip. She also should have determined whether best execution and prices could be received from SouthAM. In addition, the five extra days are not part of the research effort because they do not assist in the investment decision making. Thus, the hotel expenses for the five days should not be paid for with client assets.

Example 6 (Excessive Trading):

Vida Knauss manages the portfolios of a number of high-net-worth individuals. A major part of her investment management fee is based on trading commissions. Knauss engages in extensive trading for each of her clients to ensure that she attains the minimum commission level set by her firm. Although the securities purchased and sold for the clients are appropriate and fall within the acceptable asset classes for the clients, the amount of trading for each account exceeds what is necessary to accomplish the client's investment objectives.

> *Comment*: Knauss has violated Standard III(A) because she is using the assets of her clients to benefit her firm and herself.

Example 7 (Managing Family Accounts):

Adam Dill recently joined New Investments Asset Managers. To assist Dill in building a book of clients, both his father and brother opened new fee-paying accounts. Dill followed all the firm's procedures in noting his relationships with these clients and in developing their investment policy statements.

After several years, the number of Dill's clients has grown, but he still manages the original accounts of his family members. An IPO is coming to market that is a suitable investment for many of his clients, including his brother. Dill does not receive the amount of stock he requested, so to avoid any appearance of a conflict of interest, he does not allocate any shares to his brother's account.

> *Comment*: Dill has violated Standard III(A) because he is not acting for the benefit of his brother's account as well as his other accounts. The brother's account is a regular fee-paying account comparable to the accounts of his other clients. By not allocating the shares proportionately across *all* accounts for which he thought the IPO was suitable, Dill is disadvantaging specific clients.
>
> Dill would have been correct in not allocating shares to his brother's account if that account was being managed outside the normal fee structure of the firm.

Example 8 (Identifying the Client):

Donna Hensley has been hired by a law firm to testify as an expert witness. Although the testimony is intended to represent impartial advice, she is concerned that her work may have negative consequences for the law firm. If the law firm is Hensley's client, how does she ensure that her testimony will not violate the required duty of loyalty, prudence, and care to one's client?

> *Comment*: In this situation, the law firm represents Hensley's employer and the aspect of "who is the client" is not well defined. When acting as an expert witness, Hensley is bound by the standard of independence and objectivity in the same manner as an independent research analyst would be bound. Hensley must not let the law firm influence the testimony she provides in the legal proceedings.

Example 9 (Identifying the Client):

Jon Miller is a mutual fund portfolio manager. The fund is focused on the global financial services sector. Wanda Spears is a private wealth manager in the same city as Miller and is a friend of Miller. At a local CFA Institute society meeting, Spears mentions to Miller that her new client is an investor in Miller's fund. She states that the two of them now share a responsibility to this client.

> *Comment*: Spears' statement is not totally correct. Because she provides the advisory services to her new client, she alone is bound by the duty of loyalty to this client. Miller's responsibility is to manage the fund according to the investment policy statement of the fund. His actions should not be influenced by the needs of any particular fund investor.

Example 10 (Client Loyalty):

After providing client account investment performance to the external-facing departments but prior to it being finalized for release to clients, Teresa Nguyen, an investment performance analyst, notices the reporting system missed a trade. Correcting the omission resulted in a large loss for a client that had previously placed the firm on "watch" for potential termination owing to underperformance in prior periods. Nguyen knows this news is unpleasant but informs the appropriate individuals that the report needs to be updated before releasing it to the client.

> *Comment*: Nguyen's actions align with the requirements of Standard III(A). Even though the correction may to lead to the firm's termination by the client, withholding information on errors would not be in the best interest of the client.

Example 11 (Execution-Only Responsibilities):

Baftija Sulejman recently became a candidate in the CFA Program. He is a broker who executes client-directed trades for several high-net-worth individuals. Sulejman does not provide any investment advice and only executes the trading decisions made by clients. He is concerned that the Code and Standards impose a fiduciary duty on him in his dealing with clients and sends an e-mail to the CFA Ethics Helpdesk (ethics@cfainstitute.org) to seek guidance on this issue.

> *Comment*: In this instance, Sulejman serves in an execution-only capacity and his duty of loyalty, prudence, and care is centered on the skill and diligence used when executing trades—namely, by seeking best execution and making trades within the parameters set by the clients (instructions on quantity, price, timing, etc.). Acting in the best interests of the client dictates that trades are executed on the most favorable terms that can be achieved for the client. Given this job function, the requirements of the Code and Standards for loyalty, prudence, and care clearly do not impose a fiduciary duty.

Standard III(B) Fair Dealing

Members and Candidates must deal fairly and objectively with all clients when providing investment analysis, making investment recommendations, taking investment action, or engaging in other professional activities.

Guidance

Highlights:

- *Investment Recommendations*
- *Investment Action*

Standard III(B) requires members and candidates to treat all clients fairly when disseminating investment recommendations or making material changes to prior investment recommendations or when taking investment action with regard to general purchases, new issues, or secondary offerings. Only through the fair treatment of all parties can the investment management profession maintain the confidence of the investing public.

When an investment adviser has multiple clients, the potential exists for the adviser to favor one client over another. This favoritism may take various forms—from the quality and timing of services provided to the allocation of investment opportunities.

The term "fairly" implies that the member or candidate must take care not to discriminate against any clients when disseminating investment recommendations or taking investment action. Standard III(B) does not state "equally" because members and candidates could not possibly reach all clients at exactly the same time—whether by printed mail, telephone (including text messaging), computer (including internet updates and e-mail distribution), facsimile (fax), or wire. Each client has unique needs, investment criteria, and investment objectives, so not all investment opportunities are suitable for all clients. In addition, members and candidates may provide more personal, specialized, or in-depth service to clients who are willing to pay for premium services through higher management fees or higher levels of brokerage. Members and candidates may differentiate their services to clients, but different levels of service must not disadvantage or negatively affect clients. In addition, the different service levels should be disclosed to clients and prospective clients and should be available to everyone (i.e., different service levels should not be offered selectively).

Standard III(B) covers conduct in two broadly defined categories—investment recommendations and investment action.

Investment Recommendations

The first category of conduct involves members and candidates whose primary function is the preparation of investment recommendations to be disseminated either to the public or within a firm for the use of others in making investment decisions. This group includes members and candidates employed by investment counseling, advisory, or consulting firms as well as banks, brokerage firms, and insurance companies. The criterion is that the member's or candidate's primary responsibility is the preparation of recommendations to be acted on by others, including those in the member's or candidate's organization.

An investment recommendation is any opinion expressed by a member or candidate in regard to purchasing, selling, or holding a given security or other investment. The opinion may be disseminated to customers or clients through an initial detailed research report, through a brief update report, by addition to or deletion from a list of recommended securities, or simply by oral communication. A recommendation that is distributed to anyone outside the organization is considered a communication for general distribution under Standard III(B).

Standard III(B) addresses the manner in which investment recommendations or changes in prior recommendations are disseminated to clients. Each member or candidate is obligated to ensure that information is disseminated in such a manner that all clients have a fair opportunity to act on every recommendation. Communicating with all clients on a uniform basis presents practical problems for members and candidates because of differences in timing and methods of communication with various types of customers and clients. Members and candidates should encourage their firms to design an equitable system to prevent selective or discriminatory disclosure and should inform clients about what kind of communications they will receive.

The duty to clients imposed by Standard III(B) may be more critical when members or candidates change their recommendations than when they make initial recommendations. Material changes in a member's or candidate's prior investment recommendations because of subsequent research should be communicated to all current clients; particular care should be taken that the information reaches those clients who the member or candidate knows have acted on or been affected by the earlier advice. Clients who do not know that the member or candidate has changed a recommendation and who, therefore, place orders contrary to a current recommendation should be advised of the changed recommendation before the order is accepted.

Investment Action

The second category of conduct includes those members and candidates whose primary function is taking investment action (portfolio management) on the basis of recommendations prepared internally or received from external sources. Investment action, like investment recommendations, can affect market value. Consequently, Standard III(B) requires that members or candidates treat all clients fairly in light of their investment objectives and circumstances. For example, when making investments in new offerings or in secondary financings, members and candidates should distribute the issues to all customers for whom the investments are appropriate in a manner consistent with the policies of the firm for allocating blocks of stock. If the issue is oversubscribed, then the issue should be prorated to all subscribers. This action should be taken on a round-lot basis to avoid odd-lot distributions. In addition, if the issue is oversubscribed, members and candidates should forgo any sales to themselves or their immediate families in order to free up additional shares for clients. If the investment professional's family-member accounts are managed similarly to the accounts of other clients of the firm, however, the family-member accounts should not be excluded from buying such shares.

Members and candidates must make every effort to treat all individual and institutional clients in a fair and impartial manner. A member or candidate may have multiple relationships with an institution; for example, the member or candidate may be a corporate trustee, pension fund manager, manager of funds for individuals employed by the customer, loan originator, or creditor. A member or candidate must exercise care to treat all clients fairly.

Members and candidates should disclose to clients and prospective clients the documented allocation procedures they or their firms have in place and how the procedures would affect the client or prospect. The disclosure should be clear and complete so that the client can make an informed investment decision. Even when

complete disclosure is made, however, members and candidates must put client interests ahead of their own. A member's or candidate's duty of fairness and loyalty to clients can never be overridden by client consent to patently unfair allocation procedures.

Treating clients fairly also means that members and candidates should not take advantage of their position in the industry to the detriment of clients. For instance, in the context of IPOs, members and candidates must make bona fide public distributions of "hot issue" securities (defined as securities of a public offering that are trading at a premium in the secondary market whenever such trading commences because of the great demand for the securities). Members and candidates are prohibited from withholding such securities for their own benefit and must not use such securities as a reward or incentive to gain benefit.

Recommended Procedures for Compliance

Develop Firm Policies

Although Standard III(B) refers to a member's or candidate's responsibility to deal fairly and objectively with clients, members and candidates should also encourage their firms to establish compliance procedures requiring all employees who disseminate investment recommendations or take investment actions to treat customers and clients fairly. At the very least, a member or candidate should recommend appropriate procedures to management if none are in place. And the member or candidate should make management aware of possible violations of fair-dealing practices within the firm when they come to the attention of the member or candidate.

The extent of the formality and complexity of such compliance procedures depends on the nature and size of the organization and the type of securities involved. An investment adviser who is a sole proprietor and handles only discretionary accounts might not disseminate recommendations to the public, but that adviser should have formal written procedures to ensure that all clients receive fair investment action.

Good business practice dictates that initial recommendations be made available to all customers who indicate an interest. Although a member or candidate need not communicate a recommendation to all customers, the selection process by which customers receive information should be based on suitability and known interest, not on any preferred or favored status. A common practice to assure fair dealing is to communicate recommendations simultaneously within the firm and to customers.

Members and candidates should consider the following points when establishing fair-dealing compliance procedures:

- *Limit the number of people involved*: Members and candidates should make reasonable efforts to limit the number of people who are privy to the fact that a recommendation is going to be disseminated.
- *Shorten the time frame between decision and dissemination*: Members and candidates should make reasonable efforts to limit the amount of time that elapses between the decision to make an investment recommendation and the time the actual recommendation is disseminated. If a detailed institutional recommendation that might take two or three weeks to publish is in preparation, a short summary report including the conclusion might be published in advance. In an organization where both a research committee and an investment policy committee must approve a recommendation, the meetings should be held on the same day if possible. The process of reviewing reports and printing and mailing them, faxing them, or distributing them by e-mail necessarily involves the passage of time, sometimes long periods of time. In large firms with extensive review processes, the time factor is usually not within the control of the analyst who prepares the report. Thus, many firms and their analysts communicate

to customers and firm personnel the new or changed recommendations by an update or "flash" report. The communication technique might be fax, e-mail, wire, or short written report.

- *Publish guidelines for pre-dissemination behavior*: Members and candidates should encourage firms to develop guidelines that prohibit personnel who have prior knowledge of an investment recommendation from discussing or taking any action on the pending recommendation.
- *Simultaneous dissemination*: Members and candidates should establish procedures for the timing of dissemination of investment recommendations so that all clients are treated fairly—that is, are informed at approximately the same time. For example, if a firm is going to announce a new recommendation, supervisory personnel should time the announcement to avoid placing any client or group of clients at an unfair advantage relative to other clients. A communication to all branch offices should be sent at the time of the general announcement. (When appropriate, the firm should accompany the announcement of a new recommendation with a statement that trading restrictions for the firm's employees are now in effect. The trading restrictions should stay in effect until the recommendation is widely distributed to all relevant clients.) Once this distribution has occurred, the member or candidate may follow up separately with individual clients, but members and candidates should not give favored clients advance information when such advance notification may disadvantage other clients.
- *Maintain a list of clients and their holdings*: Members and candidates should maintain a list of all clients and the securities or other investments each client holds in order to facilitate notification of customers or clients of a change in an investment recommendation. If a particular security or other investment is to be sold, such a list can be used to ensure that all holders are treated fairly in the liquidation of that particular investment.
- *Develop and document trade allocation procedures*: When formulating procedures for allocating trades, members and candidates should develop a set of guiding principles that ensure
  - fairness to advisory clients, both in priority of execution of orders and in the allocation of the price obtained in execution of block orders or trades,
  - timeliness and efficiency in the execution of orders, and
  - accuracy of the member's or candidate's records as to trade orders and client account positions.

With these principles in mind, members and candidates should develop or encourage their firm to develop written allocation procedures, with particular attention to procedures for block trades and new issues. Procedures to consider are as follows:

- requiring orders and modifications or cancellations of orders to be documented and time stamped;
- processing and executing orders on a first-in, first-out basis with consideration of bundling orders for efficiency as appropriate for the asset class or the security;
- developing a policy to address such issues as calculating execution prices and "partial fills" when trades are grouped, or in a block, for efficiency;
- giving all client accounts participating in a block trade the same execution price and charging the same commission;

- when the full amount of the block order is not executed, allocating partially executed orders among the participating client accounts pro rata on the basis of order size while not going below an established minimum lot size for some securities (e.g., bonds); and
- when allocating trades for new issues, obtaining advance indications of interest, allocating securities by client (rather than portfolio manager), and providing a method for calculating allocations.

Disclose Trade Allocation Procedures

Members and candidates should disclose to clients and prospective clients how they select accounts to participate in an order and how they determine the amount of securities each account will buy or sell. Trade allocation procedures must be fair and equitable, and disclosure of inequitable allocation methods does not relieve the member or candidate of this obligation.

Establish Systematic Account Review

Member and candidate supervisors should review each account on a regular basis to ensure that no client or customer is being given preferential treatment and that the investment actions taken for each account are suitable for each account's objectives. Because investments should be based on individual needs and circumstances, an investment manager may have good reasons for placing a given security or other investment in one account while selling it from another account and should fully document the reasons behind both sides of the transaction. Members and candidates should encourage firms to establish review procedures, however, to detect whether trading in one account is being used to benefit a favored client.

Disclose Levels of Service

Members and candidates should disclose to all clients whether the organization offers different levels of service to clients for the same fee or different fees. Different levels of service should not be offered to clients selectively.

Application of the Standard

Example 1 (Selective Disclosure):

Bradley Ames, a well-known and respected analyst, follows the computer industry. In the course of his research, he finds that a small, relatively unknown company whose shares are traded over the counter has just signed significant contracts with some of the companies he follows. After a considerable amount of investigation, Ames decides to write a research report on the small company and recommend purchase of its shares. While the report is being reviewed by the company for factual accuracy, Ames schedules a luncheon with several of his best clients to discuss the company. At the luncheon, he mentions the purchase recommendation scheduled to be sent early the following week to all the firm's clients.

> *Comment*: Ames has violated Standard III(B) by disseminating the purchase recommendation to the clients with whom he has lunch a week before the recommendation is sent to all clients.

Example 2 (Fair Dealing between Funds):

Spencer Rivers, president of XYZ Corporation, moves his company's growth-oriented pension fund to a particular bank primarily because of the excellent investment performance achieved by the bank's commingled fund for the prior five-year period.

Later, Rivers compares the results of his pension fund with those of the bank's commingled fund. He is startled to learn that, even though the two accounts have the same investment objectives and similar portfolios, his company's pension fund has significantly underperformed the bank's commingled fund. Questioning this result at his next meeting with the pension fund's manager, Rivers is told that, as a matter of policy, when a new security is placed on the recommended list, Morgan Jackson, the pension fund manager, first purchases the security for the commingled account and then purchases it on a pro rata basis for all other pension fund accounts. Similarly, when a sale is recommended, the security is sold first from the commingled account and then sold on a pro rata basis from all other accounts. Rivers also learns that if the bank cannot get enough shares (especially of hot issues) to be meaningful to all the accounts, its policy is to place the new issues only in the commingled account.

Seeing that Rivers is neither satisfied nor pleased by the explanation, Jackson quickly adds that nondiscretionary pension accounts and personal trust accounts have a lower priority on purchase and sale recommendations than discretionary pension fund accounts. Furthermore, Jackson states, the company's pension fund had the opportunity to invest up to 5% in the commingled fund.

> *Comment*: The bank's policy does not treat all customers fairly, and Jackson has violated her duty to her clients by giving priority to the growth-oriented commingled fund over all other funds and to discretionary accounts over nondiscretionary accounts. Jackson must execute orders on a systematic basis that is fair to all clients. In addition, trade allocation procedures should be disclosed to all clients when they become clients. Of course, in this case, disclosure of the bank's policy would not change the fact that the policy is unfair.

Example 3 (Fair Dealing and IPO Distribution):

Dominic Morris works for a small regional securities firm. His work consists of corporate finance activities and investing for institutional clients. Arena, Ltd., is planning to go public. The partners have secured rights to buy an arena football league franchise and are planning to use the funds from the issue to complete the purchase. Because arena football is the current rage, Morris believes he has a hot issue on his hands. He has quietly negotiated some options for himself for helping convince Arena to do the financing through his securities firm. When he seeks expressions of interest, the institutional buyers oversubscribe the issue. Morris, assuming that the institutions have the financial clout to drive the stock up, then fills all orders (including his own) and decreases the institutional blocks.

> *Comment*: Morris has violated Standard III(B) by not treating all customers fairly. He should not have taken any shares himself and should have prorated the shares offered among all clients. In addition, he should have disclosed to his firm and to his clients that he received options as part of the deal [see Standard VI(A)–Disclosure of Conflicts].

Example 4 (Fair Dealing and Transaction Allocation):

Eleanor Preston, the chief investment officer of Porter Williams Investments (PWI), a medium-size money management firm, has been trying to retain a client, Colby Company. Management at Colby, which accounts for almost half of PWI's revenues, recently told Preston that if the performance of its account did not improve, it would find a new money manager. Shortly after this threat, Preston purchases mortgage-backed securities (MBSs) for several accounts, including Colby's. Preston is busy with a number of transactions that day, so she fails to allocate the trades immediately or write up the trade tickets. A few days later, when Preston is allocating trades, she notes

that some of the MBSs have significantly increased in price and some have dropped. Preston decides to allocate the profitable trades to Colby and spread the losing trades among several other PWI accounts.

> *Comment*: Preston has violated Standard III(B) by failing to deal fairly with her clients in taking these investment actions. Preston should have allocated the trades prior to executing the orders, or she should have had a systematic approach to allocating the trades, such as pro rata, as soon as practical after they were executed. Among other things, Preston must disclose to the client that the adviser may act as broker for, receive commissions from, and have a potential conflict of interest regarding both parties in agency cross-transactions. After the disclosure, she should obtain from the client consent authorizing such transactions in advance.

Example 5 (Selective Disclosure):

Saunders Industrial Waste Management (SIWM) publicly indicates to analysts that it is comfortable with the somewhat disappointing earnings-per-share projection of US$1.16 for the quarter. Bernard Roberts, an analyst at Coffey Investments, is confident that SIWM management has understated the forecasted earnings so that the real announcement will cause an "upside surprise" and boost the price of SIWM stock. The "whisper number" (rumored) estimate based on extensive research and discussed among knowledgeable analysts is higher than US$1.16. Roberts repeats the US$1.16 figure in his research report to all Coffey clients but informally tells his large clients that he expects the earnings per share to be higher, making SIWM a good buy.

> *Comment*: By not sharing his opinion regarding the potential for a significant upside earnings surprise with all clients, Roberts is not treating all clients fairly and has violated Standard III(B).

Example 6 (Additional Services for Select Clients):

Jenpin Weng uses e-mail to issue a new recommendation to all his clients. He then calls his three largest institutional clients to discuss the recommendation in detail.

> *Comment*: Weng has not violated Standard III(B) because he widely disseminated the recommendation and provided the information to all his clients prior to discussing it with a select few. Weng's largest clients received additional personal service because they presumably pay higher fees or because they have a large amount of assets under Weng's management. If Weng had discussed the report with a select group of clients prior to distributing it to all his clients, he would have violated Standard III(B).

Example 7 (Minimum Lot Allocations):

Lynn Hampton is a well-respected private wealth manager in her community with a diversified client base. She determines that a new 10-year bond being offered by Healthy Pharmaceuticals is appropriate for five of her clients. Three clients request to purchase US$10,000 each, and the other two request US$50,000 each. The minimum lot size is established at US$5,000, and the issue is oversubscribed at the time of placement. Her firm's policy is that odd-lot allocations, especially those below the minimum, should be avoided because they may affect the liquidity of the security at the time of sale.

Hampton is informed she will receive only US$55,000 of the offering for all accounts. Hampton distributes the bond investments as follows: The three accounts that requested US$10,000 are allocated US$5,000 each, and the two accounts that requested US$50,000 are allocated US$20,000 each.

> *Comment*: Hampton has not violated Standard III(B), even though the distribution is not on a completely pro rata basis because of the required minimum lot size. With the total allocation being significantly below the amount requested, Hampton ensured that each client received at least the minimum lot size of the issue. This approach allowed the clients to efficiently sell the bond later if necessary.

Example 8 (Excessive Trading):

Ling Chan manages the accounts for many pension plans, including the plan of his father's employer. Chan developed similar but not identical investment policies for each client, so the investment portfolios are rarely the same. To minimize the cost to his father's pension plan, he intentionally trades more frequently in the accounts of other clients to ensure the required brokerage is incurred to continue receiving free research for use by all the pensions.

> *Comment*: Chan is violating Standard III(B) because his trading actions are disadvantaging his clients to enhance a relationship with a preferred client. All clients are benefiting from the research being provided and should incur their fair portion of the costs. This does not mean that additional trading should occur if a client has not paid an equal portion of the commission; trading should occur only as required by the strategy.

Example 9 (Limited Social Media Disclosures):

Mary Burdette was recently hired by Fundamental Investment Management (FIM) as a junior auto industry analyst. Burdette is expected to expand the social media presence of the firm because she is active with various networks, including Facebook, LinkedIn, and Twitter. Although Burdette's supervisor, Joe Graf, has never used social media, he encourages Burdette to explore opportunities to increase FIM's online presence and ability to share content, communicate, and broadcast information to clients. In response to Graf's encouragement, Burdette is working on a proposal detailing the advantages of getting FIM onto Twitter in addition to launching a company Facebook page.

As part of her auto industry research for FIM, Burdette is completing a report on the financial impact of Sun Drive Auto Ltd.'s new solar technology for compact automobiles. This research report will be her first for FIM, and she believes Sun Drive's technology could revolutionize the auto industry. In her excitement, Burdette sends a quick tweet to FIM Twitter followers summarizing her "buy" recommendation for Sun Drive Auto stock.

> *Comment*: Burdette has violated Standard III(B) by sending an investment recommendation to a select group of contacts prior to distributing it to all clients. Burdette must make sure she has received the appropriate training about FIM's policies and procedures, including the appropriate business use of personal social media networks before engaging in such activities.
>
> See Standard IV(C) for guidance related to the duties of the supervisor.

Example 10 (Fair Dealing between Clients):

Paul Rove, performance analyst for Alpha-Beta Investment Management, is describing to the firm's chief investment officer (CIO) two new reports he would like to develop to assist the firm in meeting its obligations to treat clients fairly. Because many of the firm's clients have similar investment objectives and portfolios, Rove suggests a report detailing securities owned across several clients and the percentage of the portfolio the security represents. The second report would compare the monthly performance of portfolios with similar strategies. The outliers within each report would be submitted to the CIO for review.

> *Comment*: As a performance analyst, Rove likely has little direct contact with clients and thus has limited opportunity to treat clients differently. The recommended reports comply with Standard III(B) while helping the firm conduct after-the-fact reviews of how effectively the firm's advisers are dealing with their clients' portfolios. Reports that monitor the fair treatment of clients are an important oversight tool to ensure that clients are treated fairly.

Standard III(C) Suitability

1 When Members and Candidates are in an advisory relationship with a client, they must:

- **a** Make a reasonable inquiry into a client's or prospective client's investment experience, risk and return objectives, and financial constraints prior to making any investment recommendation or taking investment action and must reassess and update this information regularly.
- **b** Determine that an investment is suitable to the client's financial situation and consistent with the client's written objectives, mandates, and constraints before making an investment recommendation or taking investment action.
- **c** Judge the suitability of investments in the context of the client's total portfolio.

2 When Members and Candidates are responsible for managing a portfolio to a specific mandate, strategy, or style, they must make only investment recommendations or take only investment actions that are consistent with the stated objectives and constraints of the portfolio.

Guidance

Highlights:

- *Developing an Investment Policy*
- *Understanding the Client's Risk Profile*
- *Updating an Investment Policy*
- *The Need for Diversification*
- *Addressing Unsolicited Trading Requests*
- *Managing to an Index or Mandate*

Standard III(C) requires that members and candidates who are in an investment advisory relationship with clients consider carefully the needs, circumstances, and objectives of the clients when determining the appropriateness and suitability of a given investment or course of investment action. An appropriate suitability determination will not, however, prevent some investments or investment actions from losing value.

In judging the suitability of a potential investment, the member or candidate should review many aspects of the client's knowledge, experience related to investing, and financial situation. These aspects include, but are not limited to, the risk profile of the investment as compared with the constraints of the client, the impact of the investment on the diversity of the portfolio, and whether the client has the means or net worth to assume the associated risk. The investment professional's determination of suitability should reflect only the investment recommendations or actions that a prudent person would be willing to undertake. Not every investment opportunity will be suitable for every portfolio, regardless of the potential return being offered.

The responsibilities of members and candidates to gather information and make a suitability analysis prior to making a recommendation or taking investment action fall on those members and candidates who provide investment advice in the course of an advisory relationship with a client. Other members and candidates may be simply executing specific instructions for retail clients when buying or selling securities, such as shares in mutual funds. These members and candidates and some others, such as sell-side analysts, may not have the opportunity to judge the suitability of a particular investment for the ultimate client.

Developing an Investment Policy

When an advisory relationship exists, members and candidates must gather client information at the inception of the relationship. Such information includes the client's financial circumstances, personal data (such as age and occupation) that are relevant to investment decisions, attitudes toward risk, and objectives in investing. This information should be incorporated into a written investment policy statement (IPS) that addresses the client's risk tolerance, return requirements, and all investment constraints (including time horizon, liquidity needs, tax concerns, legal and regulatory factors, and unique circumstances). Without identifying such client factors, members and candidates cannot judge whether a particular investment or strategy is suitable for a particular client. The IPS also should identify and describe the roles and responsibilities of the parties to the advisory relationship and investment process, as well as schedules for review and evaluation of the IPS. After formulating long-term capital market expectations, members and candidates can assist in developing an appropriate strategic asset allocation and investment program for the client, whether these are presented in separate documents or incorporated in the IPS or in appendices to the IPS.

Understanding the Client's Risk Profile

One of the most important factors to be considered in matching appropriateness and suitability of an investment with a client's needs and circumstances is measuring that client's tolerance for risk. The investment professional must consider the possibilities of rapidly changing investment environments and their likely impact on a client's holdings, both individual securities and the collective portfolio. The risk of many investment strategies can and should be analyzed and quantified in advance.

The use of synthetic investment vehicles and derivative investment products has introduced particular issues of risk. Members and candidates should pay careful attention to the leverage inherent in many of these vehicles or products when considering them for use in a client's investment program. Such leverage and limited liquidity, depending on the degree to which they are hedged, bear directly on the issue of suitability for the client.

Updating an Investment Policy

Updating the IPS should be repeated at least annually and also prior to material changes to any specific investment recommendations or decisions on behalf of the client. The effort to determine the needs and circumstances of each client is not a one-time occurrence. Investment recommendations or decisions are usually part of an ongoing process that takes into account the diversity and changing nature of portfolio and client characteristics. The passage of time is bound to produce changes that are important with respect to investment objectives.

For an individual client, important changes might include the number of dependents, personal tax status, health, liquidity needs, risk tolerance, amount of wealth beyond that represented in the portfolio, and extent to which compensation and other income provide for current income needs. With respect to an institutional client, such changes might relate to the magnitude of unfunded liabilities in a pension fund, the withdrawal privileges in an employee savings plan, or the distribution requirements of a charitable foundation. Without efforts to update information concerning client factors, one or more factors could change without the investment manager's knowledge.

Suitability review can be done most effectively when the client fully discloses his or her complete financial portfolio, including those portions not managed by the member or candidate. If clients withhold information about their financial portfolios, the suitability analysis conducted by members and candidates cannot be expected to be complete; it must be based on the information provided.

The Need for Diversification

The investment profession has long recognized that combining several different investments is likely to provide a more acceptable level of risk exposure than having all assets in a single investment. The unique characteristics (or risks) of an individual investment may become partially or entirely neutralized when it is combined with other individual investments within a portfolio. Some reasonable amount of diversification is thus the norm for many portfolios, especially those managed by individuals or institutions that have some degree of legal fiduciary responsibility.

An investment with high relative risk on its own may be a suitable investment in the context of the entire portfolio or when the client's stated objectives contemplate speculative or risky investments. The manager may be responsible for only a portion of the client's total portfolio, or the client may not have provided a full financial picture. Members and candidates can be responsible for assessing the suitability of an investment only on the basis of the information and criteria actually provided by the client.

Addressing Unsolicited Trading Requests

Members and candidates may receive requests from a client for trades that do not properly align with the risk and return objectives outlined in the client's investment policy statement. These transaction requests may be based on the client's individual biases or professional experience. Members and candidates will need to make reasonable efforts to balance their clients' trading requests with their responsibilities to follow the agreed-on investment policy statement.

In cases of unsolicited trade requests that a member or candidate knows are unsuitable for a client, the member or candidate should refrain from making the trade until he or she discusses the concerns with the client. The discussions and resulting actions may encompass a variety of scenarios depending on how the requested unsuitable investment relates to the client's full portfolio.

Many times, an unsolicited request may be expected to have only a minimum impact on the entire portfolio because the size of the requested trade is small or the trade would result in a limited change to the portfolio's risk profile. In discussing the trade, the member or candidate should focus on educating the investor on how the request

deviates from the current policy statement. Following the discussion, the member or candidate may follow his or her firm's policies regarding the necessary client approval for executing unsuitable trades. At a minimum, the client should acknowledge the discussion and accept the conditions that make the recommendation unsuitable.

Should the unsolicited request be expected to have a material impact on the portfolio, the member or candidate should use this opportunity to update the investment policy statement. Doing so would allow the client to fully understand the potential effect of the requested trade on his or her current goals or risk levels.

Members and candidates may have some clients who decline to modify their policy statements while insisting an unsolicited trade be made. In such instances, members or candidates will need to evaluate the effectiveness of their services to the client. The options available to the members or candidates will depend on the services provided by their employer. Some firms may allow for the trade to be executed in a new unmanaged account. If alternative options are not available, members and candidates ultimately will need to determine whether they should continue the advisory arrangement with the client.

Managing to an Index or Mandate

Some members and candidates do not manage money for individuals but are responsible for managing a fund to an index or an expected mandate. The responsibility of these members and candidates is to invest in a manner consistent with the stated mandate. For example, a member or candidate who serves as the fund manager for a large-cap income fund would not be following the fund mandate by investing heavily in small-cap or start-up companies whose stock is speculative in nature. Members and candidates who manage pooled assets to a specific mandate are not responsible for determining the suitability of the *fund* as an investment for investors who may be purchasing shares in the fund. The responsibility for determining the suitability of an investment for clients can be conferred only on members and candidates who have an advisory relationship with clients.

Recommended Procedures for Compliance

Investment Policy Statement

To fulfill the basic provisions of Standard III(C), a member or candidate should put the needs and circumstances of each client and the client's investment objectives into a written investment policy statement. In formulating an investment policy for the client, the member or candidate should take the following into consideration:

- client identification—(1) type and nature of client, (2) the existence of separate beneficiaries, and (3) approximate portion of total client assets that the member or candidate is managing;
- investor objectives—(1) return objectives (income, growth in principal, maintenance of purchasing power) and (2) risk tolerance (suitability, stability of values);
- investor constraints—(1) liquidity needs, (2) expected cash flows (patterns of additions and/or withdrawals), (3) investable funds (assets and liabilities or other commitments), (4) time horizon, (5) tax considerations, (6) regulatory and legal circumstances, (7) investor preferences, prohibitions, circumstances, and unique needs, and (8) proxy voting responsibilities and guidance; and
- performance measurement benchmarks.

Regular Updates

The investor's objectives and constraints should be maintained and reviewed periodically to reflect any changes in the client's circumstances. Members and candidates should regularly compare client constraints with capital market expectations to arrive at an appropriate asset allocation. Changes in either factor may result in a fundamental change in asset allocation. Annual review is reasonable unless business or other reasons, such as a major change in market conditions, dictate more frequent review. Members and candidates should document attempts to carry out such a review if circumstances prevent it.

Suitability Test Policies

With the increase in regulatory required suitability tests, members and candidates should encourage their firms to develop related policies and procedures. The procedures will differ according to the size of the firm and the scope of the services offered to its clients.

The test procedures should require the investment professional to look beyond the potential return of the investment and include the following:

- an analysis of the impact on the portfolio's diversification,
- a comparison of the investment risks with the client's assessed risk tolerance, and
- the fit of the investment with the required investment strategy.

Application of the Standard

Example 1 (Investment Suitability—Risk Profile):

Caleb Smith, an investment adviser, has two clients: Larry Robertson, 60 years old, and Gabriel Lanai, 40 years old. Both clients earn roughly the same salary, but Robertson has a much higher risk tolerance because he has a large asset base. Robertson is willing to invest part of his assets very aggressively; Lanai wants only to achieve a steady rate of return with low volatility to pay for his children's education. Smith recommends investing 20% of both portfolios in zero-yield, small-cap, high-technology equity issues.

> *Comment*: In Robertson's case, the investment may be appropriate because of his financial circumstances and aggressive investment position, but this investment is not suitable for Lanai. Smith is violating Standard III(C) by applying Robertson's investment strategy to Lanai because the two clients' financial circumstances and objectives differ.

Example 2 (Investment Suitability—Entire Portfolio):

Jessica McDowell, an investment adviser, suggests to Brian Crosby, a risk-averse client, that covered call options be used in his equity portfolio. The purpose would be to enhance Crosby's income and partially offset any untimely depreciation in the portfolio's value should the stock market or other circumstances affect his holdings unfavorably. McDowell educates Crosby about all possible outcomes, including the risk of incurring an added tax liability if a stock rises in price and is called away and, conversely, the risk of his holdings losing protection on the downside if prices drop sharply.

> *Comment*: When determining suitability of an investment, the primary focus should be the characteristics of the client's entire portfolio, not the characteristics of single securities on an issue-by-issue basis. The basic characteristics of the entire portfolio will largely determine whether investment

recommendations are taking client factors into account. Therefore, the most important aspects of a particular investment are those that will affect the characteristics of the total portfolio. In this case, McDowell properly considers the investment in the context of the entire portfolio and thoroughly explains the investment to the client.

Example 3 (IPS Updating):

In a regular meeting with client Seth Jones, the portfolio managers at Blue Chip Investment Advisors are careful to allow some time to review his current needs and circumstances. In doing so, they learn that some significant changes have recently taken place in his life. A wealthy uncle left Jones an inheritance that increased his net worth fourfold, to US$1 million.

Comment: The inheritance has significantly increased Jones's ability (and possibly his willingness) to assume risk and has diminished the average yield required to meet his current income needs. Jones's financial circumstances have definitely changed, so Blue Chip managers must update Jones's investment policy statement to reflect how his investment objectives have changed. Accordingly, the Blue Chip portfolio managers should consider a somewhat higher equity ratio for his portfolio than was called for by the previous circumstances, and the managers' specific common stock recommendations might be heavily tilted toward low-yield, growth-oriented issues.

Example 4 (Following an Investment Mandate):

Louis Perkowski manages a high-income mutual fund. He purchases zero-dividend stock in a financial services company because he believes the stock is undervalued and is in a potential growth industry, which makes it an attractive investment.

Comment: A zero-dividend stock does not seem to fit the mandate of the fund that Perkowski is managing. Unless Perkowski's investment fits within the mandate or is within the realm of allowable investments the fund has made clear in its disclosures, Perkowski has violated Standard III(C).

Example 5 (IPS Requirements and Limitations):

Max Gubler, chief investment officer of a property/casualty insurance subsidiary of a large financial conglomerate, wants to improve the diversification of the subsidiary's investment portfolio and increase its returns. The subsidiary's investment policy statement provides for highly liquid investments, such as large-cap equities and government, supranational, and corporate bonds with a minimum credit rating of AA and maturity of no more than five years. In a recent presentation, a venture capital group offered very attractive prospective returns on some of its private equity funds that provide seed capital to ventures. An exit strategy was already contemplated, but investors would have to observe a minimum three-year lockup period and a subsequent laddered exit option for a maximum of one-third of their shares per year. Gubler does not want to miss this opportunity. After extensive analysis, with the intent to optimize the return on the equity assets within the subsidiary's current portfolio, he invests 4% in this seed fund, leaving the portfolio's total equity exposure still well below its upper limit.

Comment: Gubler is violating Standard III(A)–Loyalty, Prudence, and Care as well as Standard III(C). His new investment locks up part of the subsidiary's assets for at least three years and up to as many as five years and possibly beyond. The IPS requires investments in highly liquid investments and describes accepted asset classes; private equity investments with

a lockup period certainly do not qualify. Even without a lockup period, an asset class with only an occasional, and thus implicitly illiquid, market may not be suitable for the portfolio. Although an IPS typically describes objectives and constraints in great detail, the manager must also make every effort to understand the client's business and circumstances. Doing so should enable the manager to recognize, understand, and discuss with the client other factors that may be or may become material in the investment management process.

Example 6 (Submanager and IPS Reviews):

Paul Ostrowski's investment management business has grown significantly over the past couple of years, and some clients want to diversify internationally. Ostrowski decides to find a submanager to handle the expected international investments. Because this will be his first subadviser, Ostrowski uses the CFA Institute model "request for proposal" to design a questionnaire for his search. By his deadline, he receives seven completed questionnaires from a variety of domestic and international firms trying to gain his business. Ostrowski reviews all the applications in detail and decides to select the firm that charges the lowest fees because doing so will have the least impact on his firm's bottom line.

Comment: When selecting an external manager or subadviser, Ostrowski needs to ensure that the new manager's services are appropriate for his clients. This due diligence includes comparing the risk profile of the clients with the investment strategy of the manager. In basing the decision on the fee structure alone, Ostrowski may be violating Standard III(C).

When clients ask to diversify into international products, it is an appropriate time to review and update the clients' IPSs. Ostrowski's review may determine that the risk of international investments modifies the risk profiles of the clients or does not represent an appropriate investment.

See also Standard V(A)–Diligence and Reasonable Basis for further discussion of the review process needed in selecting appropriate submanagers.

Example 7 (Investment Suitability—Risk Profile):

Samantha Snead, a portfolio manager for Thomas Investment Counsel, Inc., specializes in managing public retirement funds and defined benefit pension plan accounts, all of which have long-term investment objectives. A year ago, Snead's employer, in an attempt to motivate and retain key investment professionals, introduced a bonus compensation system that rewards portfolio managers on the basis of quarterly performance relative to their peers and to certain benchmark indices. In an attempt to improve the short-term performance of her accounts, Snead changes her investment strategy and purchases several high-beta stocks for client portfolios. These purchases are seemingly contrary to the clients' investment policy statements. Following their purchase, an officer of Griffin Corporation, one of Snead's pension fund clients, asks why Griffin Corporation's portfolio seems to be dominated by high-beta stocks of companies that often appear among the most actively traded issues. No change in objective or strategy has been recommended by Snead during the year.

Comment: Snead violated Standard III(C) by investing the clients' assets in high-beta stocks. These high-risk investments are contrary to the long-term risk profile established in the clients' IPSs. Snead has changed the investment strategy of the clients in an attempt to reap short-term rewards offered by her firm's new compensation arrangement, not in response to changes in clients' investment policy statements.

See also Standard VI(A)–Disclosure of Conflicts.

Example 8 (Investment Suitability):

Andre Shrub owns and operates Conduit, an investment advisory firm. Prior to opening Conduit, Shrub was an account manager with Elite Investment, a hedge fund managed by his good friend Adam Reed. To attract clients to a new Conduit fund, Shrub offers lower-than-normal management fees. He can do so because the fund consists of two top-performing funds managed by Reed. Given his personal friendship with Reed and the prior performance record of these two funds, Shrub believes this new fund is a winning combination for all parties. Clients quickly invest with Conduit to gain access to the Elite funds. No one is turned away because Conduit is seeking to expand its assets under management.

> *Comment*: Shrub has violated Standard III(C) because the risk profile of the new fund may not be suitable for every client. As an investment adviser, Shrub needs to establish an investment policy statement for each client and recommend only investments that match each client's risk and return profile in the IPS. Shrub is required to act as more than a simple sales agent for Elite.
>
> Although Shrub cannot disobey the direct request of a client to purchase a specific security, he should fully discuss the risks of a planned purchase and provide reasons why it might not be suitable for a client. This requirement may lead members and candidates to decline new customers if those customers' requested investment decisions are significantly out of line with their stated requirements.
>
> See also Standard V(A)–Diligence and Reasonable Basis.

Standard III(D) Performance Presentation

When communicating investment performance information, Members and Candidates must make reasonable efforts to ensure that it is fair, accurate, and complete.

Guidance

Standard III(D) requires members and candidates to provide credible performance information to clients and prospective clients and to avoid misstating performance or misleading clients and prospective clients about the investment performance of members or candidates or their firms. This standard encourages full disclosure of investment performance data to clients and prospective clients.

Standard III(D) covers any practice that would lead to misrepresentation of a member's or candidate's performance record, whether the practice involves performance presentation or performance measurement. This standard prohibits misrepresentations of past performance or reasonably expected performance. A member or candidate must give a fair and complete presentation of performance information whenever communicating data with respect to the performance history of individual accounts, composites or groups of accounts, or composites of an analyst's or firm's performance results. Furthermore, members and candidates should not state or imply that clients will obtain or benefit from a rate of return that was generated in the past.

The requirements of this standard are not limited to members and candidates managing separate accounts. Whenever a member or candidate provides performance information for which the manager is claiming responsibility, such as for pooled funds, the history must be accurate. Research analysts promoting the success or accuracy of their recommendations must ensure that their claims are fair, accurate, and complete.

If the presentation is brief, the member or candidate must make available to clients and prospects, on request, the detailed information supporting that communication. Best practice dictates that brief presentations include a reference to the limited nature of the information provided.

Recommended Procedures for Compliance

Apply the GIPS Standards

For members and candidates who are showing the performance history of the assets they manage, compliance with the GIPS standards is the best method to meet their obligations under Standard III(D). Members and candidates should encourage their firms to comply with the GIPS standards.

Compliance without Applying GIPS Standards

Members and candidates can also meet their obligations under Standard III(D) by

- considering the knowledge and sophistication of the audience to whom a performance presentation is addressed,
- presenting the performance of the weighted composite of similar portfolios rather than using a single representative account,
- including terminated accounts as part of performance history with a clear indication of when the accounts were terminated,
- including disclosures that fully explain the performance results being reported (for example, stating, when appropriate, that results are simulated when model results are used, clearly indicating when the performance record is that of a prior entity, or disclosing whether the performance is gross of fees, net of fees, or after tax), and
- maintaining the data and records used to calculate the performance being presented.

Application of the Standard

Example 1 (Performance Calculation and Length of Time):

Kyle Taylor of Taylor Trust Company, noting the performance of Taylor's common trust fund for the past two years, states in a brochure sent to his potential clients, "You can expect steady 25% annual compound growth of the value of your investments over the year." Taylor Trust's common trust fund did increase at the rate of 25% per year for the past year, which mirrored the increase of the entire market. The fund has never averaged that growth for more than one year, however, and the average rate of growth of all of its trust accounts for five years is 5% per year.

> *Comment*: Taylor's brochure is in violation of Standard III(D). Taylor should have disclosed that the 25% growth occurred only in one year. Additionally, Taylor did not include client accounts other than those in the firm's common trust fund. A general claim of firm performance should take into account the performance of all categories of accounts. Finally, by

stating that clients can expect a steady 25% annual compound growth rate, Taylor is also violating Standard I(C)–Misrepresentation, which prohibits assurances or guarantees regarding an investment.

Example 2 (Performance Calculation and Asset Weighting):

Anna Judd, a senior partner of Alexander Capital Management, circulates a performance report for the capital appreciation accounts for the years 1988 through 2004. The firm claims compliance with the GIPS standards. Returns are not calculated in accordance with the requirements of the GIPS standards, however, because the composites are not asset weighted.

Comment: Judd is in violation of Standard III(D). When claiming compliance with the GIPS standards, firms must meet *all* of the requirements, make mandatory disclosures, and meet any other requirements that apply to that firm's specific situation. Judd's violation is not from any misuse of the data but from a false claim of GIPS compliance.

Example 3 (Performance Presentation and Prior Fund/Employer):

Aaron McCoy is vice president and managing partner of the equity investment group of Mastermind Financial Advisors, a new business. Mastermind recruited McCoy because he had a proven six-year track record with G&P Financial. In developing Mastermind's advertising and marketing campaign, McCoy prepares an advertisement that includes the equity investment performance he achieved at G&P Financial. The advertisement for Mastermind does not identify the equity performance as being earned while at G&P. The advertisement is distributed to existing clients and prospective clients of Mastermind.

Comment: McCoy has violated Standard III(D) by distributing an advertisement that contains material misrepresentations about the historical performance of Mastermind. Standard III(D) requires that members and candidates make every reasonable effort to ensure that performance information is a fair, accurate, and complete representation of an individual's or firm's performance. As a general matter, this standard does not prohibit showing past performance of funds managed at a prior firm as part of a performance track record as long as showing that record is accompanied by appropriate disclosures about where the performance took place and the person's specific role in achieving that performance. If McCoy chooses to use his past performance from G&P in Mastermind's advertising, he should make full disclosure of the source of the historical performance.

Example 4 (Performance Presentation and Simulated Results):

Jed Davis has developed a mutual fund selection product based on historical information from the 1990–95 period. Davis tested his methodology by applying it retroactively to data from the 1996–2003 period, thus producing simulated performance results for those years. In January 2004, Davis's employer decided to offer the product and Davis began promoting it through trade journal advertisements and direct dissemination to clients. The advertisements included the performance results for the 1996–2003 period but did not indicate that the results were simulated.

Comment: Davis violated Standard III(D) by failing to clearly identify simulated performance results. Standard III(D) prohibits members and candidates from making any statements that misrepresent the performance achieved by them or their firms and requires members and candidates

to make every reasonable effort to ensure that performance information presented to clients is fair, accurate, and complete. Use of simulated results should be accompanied by full disclosure as to the source of the performance data, including the fact that the results from 1995 through 2003 were the result of applying the model retroactively to that time period.

Example 5 (Performance Calculation and Selected Accounts Only):

In a presentation prepared for prospective clients, William Kilmer shows the rates of return realized over a five-year period by a "composite" of his firm's discretionary accounts that have a "balanced" objective. This composite, however, consisted of only a few of the accounts that met the balanced criterion set by the firm, excluded accounts under a certain asset level without disclosing the fact of their exclusion, and included accounts that did not have the balanced mandate because those accounts would boost the investment results. In addition, to achieve better results, Kilmer manipulated the narrow range of accounts included in the composite by changing the accounts that made up the composite over time.

Comment: Kilmer violated Standard III(D) by misrepresenting the facts in the promotional material sent to prospective clients, distorting his firm's performance record, and failing to include disclosures that would have clarified the presentation.

Example 6 (Performance Attribution Changes):

Art Purell is reviewing the quarterly performance attribution reports for distribution to clients. Purell works for an investment management firm with a bottom-up, fundamentals-driven investment process that seeks to add value through stock selection. The attribution methodology currently compares each stock with its sector. The attribution report indicates that the value added this quarter came from asset allocation and that stock selection contributed negatively to the calculated return.

Through running several different scenarios, Purell discovers that calculating attribution by comparing each stock with its industry and then rolling the effect to the sector level improves the appearance of the manager's stock selection activities. Because the firm defines the attribution terms and the results better reflect the stated strategy, Purell recommends that the client reports should use the revised methodology.

Comment: Modifying the attribution methodology without proper notifications to clients would fail to meet the requirements of Standard III(D). Purrell's recommendation is being done solely for the interest of the firm to improve its perceived ability to meet the stated investment strategy. Such changes are unfair to clients and obscure the facts regarding the firm's abilities.

Had Purell believed the new methodology offered improvements to the original model, then he would have needed to report the results of both calculations to the client. The report should also include the reasons why the new methodology is preferred, which would allow the client to make a meaningful comparison to prior results and provide a basis for comparing future attributions.

Example 7 (Performance Calculation Methodology Disclosure):

While developing a new reporting package for existing clients, Alisha Singh, a performance analyst, discovers that her company's new system automatically calculates both time-weighted and money-weighted returns. She asks the head of client services and retention which value would be preferred given that the firm has various investment

strategies that include bonds, equities, securities without leverage, and alternatives. Singh is told not to label the return value so that the firm may show whichever value is greatest for the period.

> *Comment*: Following these instructions would lead to Singh violating Standard III(D). In reporting inconsistent return values, Singh would not be providing complete information to the firm's clients. Full information is provided when clients have sufficient information to judge the performance generated by the firm.

Example 8 (Performance Calculation Methodology Disclosure):

Richmond Equity Investors manages a long–short equity fund in which clients can trade once a week (on Fridays). For transparency reasons, a daily net asset value of the fund is calculated by Richmond. The monthly fact sheets of the fund report month-to-date and year-to-date performance. Richmond publishes the performance based on the higher of the last trading day of the month (typically, not the last business day) or the last business day of the month as determined by Richmond. The fact sheet mentions only that the data are as of the end of the month, without giving the exact date. Maggie Clark, the investment performance analyst in charge of the calculations, is concerned about the frequent changes and asks her supervisor whether they are appropriate.

> *Comment*: Clark's actions in questioning the changing performance metric comply with Standard III(D). She has shown concern that these changes are not presenting an accurate and complete picture of the performance generated.

Standard III(E) Preservation of Confidentiality

Members and Candidates must keep information about current, former, and prospective clients confidential unless:

1. The information concerns illegal activities on the part of the client;
2. Disclosure is required by law; or
3. The client or prospective client permits disclosure of the information.

Guidance

Highlights:

- *Status of Client*
- *Compliance with Laws*
- *Electronic Information and Security*
- *Professional Conduct Investigations by CFA Institute*

Standard III(E) requires that members and candidates preserve the confidentiality of information communicated to them by their clients, prospective clients, and former clients. This standard is applicable when (1) the member or candidate receives information because of his or her special ability to conduct a portion of the client's business or personal affairs and (2) the member or candidate receives information that arises

from or is relevant to that portion of the client's business that is the subject of the special or confidential relationship. If disclosure of the information is required by law or the information concerns illegal activities by the client, however, the member or candidate may have an obligation to report the activities to the appropriate authorities.

Status of Client

This standard protects the confidentiality of client information even if the person or entity is no longer a client of the member or candidate. Therefore, members and candidates must continue to maintain the confidentiality of client records even after the client relationship has ended. If a client or former client expressly authorizes the member or candidate to disclose information, however, the member or candidate may follow the terms of the authorization and provide the information.

Compliance with Laws

As a general matter, members and candidates must comply with applicable law. If applicable law requires disclosure of client information in certain circumstances, members and candidates must comply with the law. Similarly, if applicable law requires members and candidates to maintain confidentiality, even if the information concerns illegal activities on the part of the client, members and candidates should not disclose such information. Additionally, applicable laws, such as inter-departmental communication restrictions within financial institutions, can impose limitations on information flow about a client within an entity that may lead to a violation of confidentiality. When in doubt, members and candidates should consult with their employer's compliance personnel or legal counsel before disclosing confidential information about clients.

Electronic Information and Security

Because of the ever-increasing volume of electronically stored information, members and candidates need to be particularly aware of possible accidental disclosures. Many employers have strict policies about how to electronically communicate sensitive client information and store client information on personal laptops, mobile devices, or portable disk/flash drives. In recent years, regulatory authorities have imposed stricter data security laws applying to the use of mobile remote digital communication, including the use of social media, that must be considered. Standard III(E) does not require members or candidates to become experts in information security technology, but they should have a thorough understanding of the policies of their employer. The size and operations of the firm will lead to differing policies for ensuring the security of confidential information maintained within the firm. Members and candidates should encourage their firm to conduct regular periodic training on confidentiality procedures for all firm personnel, including portfolio associates, receptionists, and other non-investment staff who have routine direct contact with clients and their records.

Professional Conduct Investigations by CFA Institute

The requirements of Standard III(E) are not intended to prevent members and candidates from cooperating with an investigation by the CFA Institute Professional Conduct Program (PCP). When permissible under applicable law, members and candidates shall consider the PCP an extension of themselves when requested to provide information about a client in support of a PCP investigation into their own conduct. Members and candidates are encouraged to cooperate with investigations into the conduct of others. Any information turned over to the PCP is kept in the strictest confidence. Members and candidates will not be considered in violation of this standard by forwarding confidential information to the PCP.

Recommended Procedures for Compliance

The simplest, most conservative, and most effective way to comply with Standard III(E) is to avoid disclosing any information received from a client except to authorized fellow employees who are also working for the client. In some instances, however, a member or candidate may want to disclose information received from clients that is outside the scope of the confidential relationship and does not involve illegal activities. Before making such a disclosure, a member or candidate should ask the following:

- In what context was the information disclosed? If disclosed in a discussion of work being performed for the client, is the information relevant to the work?
- Is the information background material that, if disclosed, will enable the member or candidate to improve service to the client?

Members and candidates need to understand and follow their firm's electronic information communication and storage procedures. If the firm does not have procedures in place, members and candidates should encourage the development of procedures that appropriately reflect the firm's size and business operations.

Communicating with Clients

Technological changes are constantly enhancing the methods that are used to communicate with clients and prospective clients. Members and candidates should make reasonable efforts to ensure that firm-supported communication methods and compliance procedures follow practices designed for preventing accidental distribution of confidential information. Given the rate at which technology changes, a regular review of privacy protection measures is encouraged.

Members and candidates should be diligent in discussing with clients the appropriate methods for providing confidential information. It is important to convey to clients that not all firm-sponsored resources may be appropriate for such communications.

Application of the Standard

Example 1 (Possessing Confidential Information):

Sarah Connor, a financial analyst employed by Johnson Investment Counselors, Inc., provides investment advice to the trustees of City Medical Center. The trustees have given her a number of internal reports concerning City Medical's needs for physical plant renovation and expansion. They have asked Connor to recommend investments that would generate capital appreciation in endowment funds to meet projected capital expenditures. Connor is approached by a local businessman, Thomas Kasey, who is considering a substantial contribution either to City Medical Center or to another local hospital. Kasey wants to find out the building plans of both institutions before making a decision, but he does not want to speak to the trustees.

> *Comment*: The trustees gave Connor the internal reports so she could advise them on how to manage their endowment funds. Because the information in the reports is clearly both confidential and within the scope of the confidential relationship, Standard III(E) requires that Connor refuse to divulge information to Kasey.

Example 2 (Disclosing Confidential Information):

Lynn Moody is an investment officer at the Lester Trust Company. She has an advisory customer who has talked to her about giving approximately US$50,000 to charity to reduce her income taxes. Moody is also treasurer of the Home for Indigent Widows (HIW), which is planning its annual giving campaign. HIW hopes to expand its list

of prospects, particularly those capable of substantial gifts. Moody recommends that HIW's vice president for corporate gifts call on her customer and ask for a donation in the US$50,000 range.

> *Comment*: Even though the attempt to help the Home for Indigent Widows was well intended, Moody violated Standard III(E) by revealing confidential information about her client.

Example 3 (Disclosing Possible Illegal Activity):

Government officials approach Casey Samuel, the portfolio manager for Garcia Company's pension plan, to examine pension fund records. They tell her that Garcia's corporate tax returns are being audited and the pension fund is being reviewed. Two days earlier, Samuel had learned in a regular investment review with Garcia officers that potentially excessive and improper charges were being made to the pension plan by Garcia. Samuel consults her employer's general counsel and is advised that Garcia has probably violated tax and fiduciary regulations and laws.

> *Comment*: Samuel should inform her supervisor of these activities, and her employer should take steps, with Garcia, to remedy the violations. If that approach is not successful, Samuel and her employer should seek advice of legal counsel to determine the appropriate steps to be taken. Samuel may well have a duty to disclose the evidence she has of the continuing legal violations and to resign as asset manager for Garcia.

Example 4 (Disclosing Possible Illegal Activity):

David Bradford manages money for a family-owned real estate development corporation. He also manages the individual portfolios of several of the family members and officers of the corporation, including the chief financial officer (CFO). Based on the financial records of the corporation and some questionable practices of the CFO that Bradford has observed, Bradford believes that the CFO is embezzling money from the corporation and putting it into his personal investment account.

> *Comment*: Bradford should check with his firm's compliance department or appropriate legal counsel to determine whether applicable securities regulations require reporting the CFO's financial records.

Example 5 (Accidental Disclosure of Confidential Information):

Lynn Moody is an investment officer at the Lester Trust Company (LTC). She has stewardship of a significant number of individually managed taxable accounts. In addition to receiving quarterly written reports, about a dozen high-net-worth individuals have indicated to Moody a willingness to receive communications about overall economic and financial market outlooks directly from her by way of a social media platform. Under the direction of her firm's technology and compliance departments, she established a new group page on an existing social media platform specifically for her clients. In the instructions provided to clients, Moody asked them to "join" the group so they may be granted access to the posted content. The instructions also advised clients that all comments posted would be available to the public and thus the platform was not an appropriate method for communicating personal or confidential information.

Six months later, in early January, Moody posted LTC's year-end "Market Outlook." The report outlined a new asset allocation strategy that the firm is adding to its recommendations in the new year. Moody introduced the publication with a note informing her clients that she would be discussing the changes with them individually in their upcoming meetings.

One of Moody's clients responded directly on the group page that his family recently experienced a major change in their financial profile. The client described highly personal and confidential details of the event. Unfortunately, all clients that were part of the group were also able to read the detailed posting until Moody was able to have the comment removed.

> *Comment*: Moody has taken reasonable steps for protecting the confidentiality of client information while using the social media platform. She provided instructions clarifying that all information posted to the site would be publically viewable to all group members and warned against using this method for communicating confidential information. The accidental disclosure of confidential information by a client is not under Moody's control. Her actions to remove the information promptly once she became aware further align with Standard III(E).
>
> In understanding the potential sensitivity clients express surrounding the confidentiality of personal information, this event highlights a need for further training. Moody might advocate for additional warnings or controls for clients when they consider using social media platforms for two-way communications.

STANDARD IV: DUTIES TO EMPLOYERS

Standard IV(A) Loyalty

In matters related to their employment, Members and Candidates must act for the benefit of their employer and not deprive their employer of the advantage of their skills and abilities, divulge confidential information, or otherwise cause harm to their employer.

Guidance

Highlights:

- *Employer Responsibilities*
- *Independent Practice*
- *Leaving an Employer*
- *Use of Social Media*
- *Whistleblowing*
- *Nature of Employment*

Standard IV(A) requires members and candidates to protect the interests of their firm by refraining from any conduct that would injure the firm, deprive it of profit, or deprive it of the member's or candidate's skills and ability. Members and candidates

must always place the interests of clients above the interests of their employer but should also consider the effects of their conduct on the sustainability and integrity of the employer firm. In matters related to their employment, members and candidates must not engage in conduct that harms the interests of their employer. Implicit in this standard is the obligation of members and candidates to comply with the policies and procedures established by their employers that govern the employer–employee relationship—to the extent that such policies and procedures do not conflict with applicable laws, rules, or regulations or the Code and Standards.

This standard is not meant to be a blanket requirement to place employer interests ahead of personal interests in all matters. The standard does not require members and candidates to subordinate important personal and family obligations to their work. Members and candidates should enter into a dialogue with their employer about balancing personal and employment obligations when personal matters may interfere with their work on a regular or significant basis.

Employer Responsibilities

The employer–employee relationship imposes duties and responsibilities on both parties. Employers must recognize the duties and responsibilities that they owe to their employees if they expect to have content and productive employees.

Members and candidates are encouraged to provide their employer with a copy of the Code and Standards. These materials will inform the employer of the responsibilities of a CFA Institute member or a candidate in the CFA Program. The Code and Standards also serve as a basis for questioning employer policies and practices that conflict with these responsibilities.

Employers are not obligated to adhere to the Code and Standards. In expecting to retain competent employees who are members and candidates, however, they should not develop conflicting policies and procedures. The employer is responsible for a positive working environment, which includes an ethical workplace. Senior management has the additional responsibility to devise compensation structures and incentive arrangements that do not encourage unethical behavior.

Independent Practice

Included in Standard IV(A) is the requirement that members and candidates abstain from independent competitive activity that could conflict with the interests of their employer. Although Standard IV(A) does not preclude members or candidates from entering into an independent business while still employed, members and candidates who plan to engage in independent practice for compensation must notify their employer and describe the types of services they will render to prospective independent clients, the expected duration of the services, and the compensation for the services. Members and candidates should not render services until they receive consent from their employer to all of the terms of the arrangement. "Practice" means any service that the employer currently makes available for remuneration. "Undertaking independent practice" means engaging in competitive business, as opposed to making preparations to begin such practice.

Leaving an Employer

When members and candidates are planning to leave their current employer, they must continue to act in the employer's best interest. They must not engage in any activities that would conflict with this duty until their resignation becomes effective. It is difficult to define specific guidelines for those members and candidates who are planning to compete with their employer as part of a new venture. The circumstances

of each situation must be reviewed to distinguish permissible preparations from violations of duty. Activities that might constitute a violation, especially in combination, include the following:

- misappropriation of trade secrets,
- misuse of confidential information,
- solicitation of the employer's clients prior to cessation of employment,
- self-dealing (appropriating for one's own property a business opportunity or information belonging to one's employer), and
- misappropriation of clients or client lists.

A departing employee is generally free to make arrangements or preparations to go into a competitive business before terminating the relationship with his or her employer as long as such preparations do not breach the employee's duty of loyalty. A member or candidate who is contemplating seeking other employment must not contact existing clients or potential clients prior to leaving his or her employer for purposes of soliciting their business for the new employer. Once notice is provided to the employer of the intent to resign, the member or candidate must follow the employer's policies and procedures related to notifying clients of his or her planned departure. In addition, the member or candidate must not take records or files to a new employer without the written permission of the previous employer.

Once an employee has left the firm, the skills and experience that an employee obtained while employed are not "confidential" or "privileged" information. Similarly, simple knowledge of the names and existence of former clients is generally not confidential information unless deemed such by an agreement or by law. Standard IV(A) does not prohibit experience or knowledge gained at one employer from being used at another employer. Firm records or work performed on behalf of the firm that is stored in paper copy or electronically for the member's or candidate's convenience while employed, however, should be erased or returned to the employer unless the firm gives permission to keep those records after employment ends.

The standard does not prohibit former employees from contacting clients of their previous firm as long as the contact information does not come from the records of the former employer or violate an applicable "noncompete agreement." Members and candidates are free to use public information after departing to contact former clients without violating Standard IV(A) as long as there is no specific agreement not to do so.

Employers often require employees to sign noncompete agreements that preclude a departing employee from engaging in certain conduct. Members and candidates should take care to review the terms of any such agreement when leaving their employer to determine what, if any, conduct those agreements may prohibit.

In some markets, there are agreements between employers within an industry that outline information that departing employees are permitted to take upon resignation, such as the "Protocol for Broker Recruiting" in the United States. These agreements ease individuals' transition between firms that have agreed to follow the outlined procedures. Members and candidates who move between firms that sign such agreements may rely on the protections provided as long as they faithfully adhere to all the procedures outlined.

For example, under the agreement between many US brokers, individuals are allowed to take some general client contact information when departing. To be protected, a copy of the information the individual is taking must be provided to the local management team for review. Additionally, the specific client information may only be used by the departing employee and not others employed by the new firm.

Use of Social Media

The growth in various online networking platforms, such as LinkedIn, Twitter, and Facebook (commonly referred to as social media platforms), is providing new opportunities and challenges for businesses. Members and candidates should understand and abide by all applicable firm policies and regulations as to the acceptable use of social media platforms to interact with clients and prospective clients. This is especially important when a member or candidate is planning to leave an employer.

Social media use makes determining how and when departure notification is delivered to clients more complex. Members and candidates may have developed profiles on these platforms that include connections with individuals who are clients of the firm, as well as individuals unrelated to their employer. Communications through social media platforms that potentially reach current clients should adhere to the employer's policies and procedures regarding notification of departing employees.

Social media connections with clients are also raising questions concerning the differences between public information and firm property. Specific accounts and user profiles of members and candidates may be created for solely professional reasons, including firm-approved accounts for client engagements. Such firm-approved business-related accounts would be considered part of the firm's assets, thus requiring members and candidates to transfer or delete the accounts as directed by their firm's policies and procedures. Best practice for members and candidates is to maintain separate accounts for their personal and professional social media activities. Members and candidates should discuss with their employers how profiles should be treated when a single account includes personal connections and also is used to conduct aspects of their professional activities.

Whistleblowing

A member's or candidate's personal interests, as well as the interests of his or her employer, are secondary to protecting the integrity of capital markets and the interests of clients. Therefore, circumstances may arise (e.g., when an employer is engaged in illegal or unethical activity) in which members and candidates must act contrary to their employer's interests in order to comply with their duties to the market and clients. In such instances, activities that would normally violate a member's or candidate's duty to his or her employer (such as contradicting employer instructions, violating certain policies and procedures, or preserving a record by copying employer records) may be justified. Such action would be permitted only if the intent is clearly aimed at protecting clients or the integrity of the market, not for personal gain.

Nature of Employment

A wide variety of business relationships exists within the investment industry. For instance, a member or candidate may be an employee or an independent contractor. Members and candidates must determine whether they are employees or independent contractors in order to determine the applicability of Standard IV(A). This issue will be decided largely by the degree of control exercised by the employing entity over the member or candidate. Factors determining control include whether the member's or candidate's hours, work location, and other parameters of the job are set; whether facilities are provided to the member or candidate; whether the member's or candidate's expenses are reimbursed; whether the member or candidate seeks work from other employers; and the number of clients or employers the member or candidate works for.

A member's or candidate's duties within an independent contractor relationship are governed by the oral or written agreement between the member and the client. Members and candidates should take care to define clearly the scope of their

responsibilities and the expectations of each client within the context of each relationship. Once a member or candidate establishes a relationship with a client, the member or candidate has a duty to abide by the terms of the agreement.

Recommended Procedures for Compliance

Employers may establish codes of conduct and operating procedures for their employees to follow. Members and candidates should fully understand the policies to ensure that they are not in conflict with the Code and Standards. The following topics identify policies that members and candidates should encourage their firms to adopt if the policies are not currently in place.

Competition Policy

A member or candidate must understand any restrictions placed by the employer on offering similar services outside the firm while employed by the firm. The policy may outline the procedures for requesting approval to undertake the outside service or may be a strict prohibition of such service. If a member's or candidate's employer elects to have its employees sign a noncompete agreement as part of the employment agreement, the member or candidate should ensure that the details are clear and fully explained prior to signing the agreement.

Termination Policy

Members and candidates should clearly understand the termination policies of their employer. Termination policies should establish clear procedures regarding the resignation process, including addressing how the termination will be disclosed to clients and staff and whether updates posted through social media platforms will be allowed. The firm's policy may also outline the procedures for transferring ongoing research and account management responsibilities. Finally, the procedures should address agreements that allow departing employees to remove specific client-related information upon resignation.

Incident-Reporting Procedures

Members and candidates should be aware of their firm's policies related to whistleblowing and encourage their firm to adopt industry best practices in this area. Many firms are required by regulatory mandates to establish confidential and anonymous reporting procedures that allow employees to report potentially unethical and illegal activities in the firm.

Employee Classification

Members and candidates should understand their status within their employer firm. Firms are encouraged to adopt a standardized classification structure (e.g., part time, full time, outside contractor) for their employees and indicate how each of the firm's policies applies to each employee class.

Application of the Standard

Example 1 (Soliciting Former Clients):

Samuel Magee manages pension accounts for Trust Assets, Inc., but has become frustrated with the working environment and has been offered a position with Fiduciary Management. Before resigning from Trust Assets, Magee asks four big accounts to

leave that firm and open accounts with Fiduciary. Magee also persuades several prospective clients to sign agreements with Fiduciary Management. Magee had previously made presentations to these prospects on behalf of Trust Assets.

> *Comment*: Magee violated the employee–employer principle requiring him to act solely for his employer's benefit. Magee's duty is to Trust Assets as long as he is employed there. The solicitation of Trust Assets' current clients and prospective clients is unethical and violates Standard IV(A).

Example 2 (Former Employer's Documents and Files):

James Hightower has been employed by Jason Investment Management Corporation for 15 years. He began as an analyst but assumed increasing responsibilities and is now a senior portfolio manager and a member of the firm's investment policy committee. Hightower has decided to leave Jason Investment and start his own investment management business. He has been careful not to tell any of Jason's clients that he is leaving; he does not want to be accused of breaching his duty to Jason by soliciting Jason's clients before his departure. Hightower is planning to copy and take with him the following documents and information he developed or worked on while at Jason: (1) the client list, with addresses, telephone numbers, and other pertinent client information; (2) client account statements; (3) sample marketing presentations to prospective clients containing Jason's performance record; (4) Jason's recommended list of securities; (5) computer models to determine asset allocations for accounts with various objectives; (6) computer models for stock selection; and (7) personal computer spreadsheets for Hightower's major corporate recommendations, which he developed when he was an analyst.

> *Comment*: Except with the consent of their employer, departing members and candidates may not take employer property, which includes books, records, reports, and other materials, because taking such materials may interfere with their employer's business opportunities. Taking any employer records, even those the member or candidate prepared, violates Standard IV(A). Employer records include items stored in hard copy or any other medium (e.g., home computers, portable storage devices, cell phones).

Example 3 (Addressing Rumors):

Reuben Winston manages all-equity portfolios at Target Asset Management (TAM), a large, established investment counselor. Ten years previously, Philpott & Company, which manages a family of global bond mutual funds, acquired TAM in a diversification move. After the merger, the combined operations prospered in the fixed-income business but the equity management business at TAM languished. Lately, a few of the equity pension accounts that had been with TAM before the merger have terminated their relationships with TAM. One day, Winston finds on his voice mail the following message from a concerned client: "Hey! I just heard that Philpott is close to announcing the sale of your firm's equity management business to Rugged Life. What is going on?" Not being aware of any such deal, Winston and his associates are stunned. Their internal inquiries are met with denials from Philpott management, but the rumors persist. Feeling left in the dark, Winston contemplates leading an employee buyout of TAM's equity management business.

> *Comment*: An employee-led buyout of TAM's equity asset management business would be consistent with Standard IV(A) because it would rest on the permission of the employer and, ultimately, the clients. In this case,

> however, in which employees suspect the senior managers or principals are not truthful or forthcoming, Winston should consult legal counsel to determine appropriate action.

Example 4 (Ownership of Completed Prior Work):

Laura Clay, who is unemployed, wants part-time consulting work while seeking a full-time analyst position. During an interview at Bradley Associates, a large institutional asset manager, Clay is told that the firm has no immediate research openings but would be willing to pay her a flat fee to complete a study of the wireless communications industry within a given period of time. Clay would be allowed unlimited access to Bradley's research files and would be welcome to come to the offices and use whatever support facilities are available during normal working hours. Bradley's research director does not seek any exclusivity for Clay's output, and the two agree to the arrangement on a handshake. As Clay nears completion of the study, she is offered an analyst job in the research department of Winston & Company, a brokerage firm, and she is pondering submitting the draft of her wireless study for publication by Winston.

> *Comment*: Although she is under no written contractual obligation to Bradley, Clay has an obligation to let Bradley act on the output of her study before Winston & Company or Clay uses the information to their advantage. That is, unless Bradley gives permission to Clay and waives its rights to her wireless report, Clay would be in violation of Standard IV(A) if she were to immediately recommend to Winston the same transactions recommended in the report to Bradley. Furthermore, Clay must not take from Bradley any research file material or other property that she may have used.

Example 5 (Ownership of Completed Prior Work):

Emma Madeline, a recent college graduate and a candidate in the CFA Program, spends her summer as an unpaid intern at Murdoch and Lowell. The senior managers at Murdoch are attempting to bring the firm into compliance with the GIPS standards, and Madeline is assigned to assist in its efforts. Two months into her internship, Madeline applies for a job at McMillan & Company, which has plans to become GIPS compliant. Madeline accepts the job with McMillan. Before leaving Murdoch, she copies the firm's software that she helped develop because she believes this software will assist her in her new position.

> *Comment*: Even though Madeline does not receive monetary compensation for her services at Murdoch, she has used firm resources in creating the software and is considered an employee because she receives compensation and benefits in the form of work experience and knowledge. By copying the software, Madeline violated Standard IV(A) because she misappropriated Murdoch's property without permission.

Example 6 (Soliciting Former Clients):

Dennis Elliot has hired Sam Chisolm, who previously worked for a competing firm. Chisolm left his former firm after 18 years of employment. When Chisolm begins working for Elliot, he wants to contact his former clients because he knows them well and is certain that many will follow him to his new employer. Is Chisolm in violation of Standard IV(A) if he contacts his former clients?

> *Comment*: Because client records are the property of the firm, contacting former clients for any reason through the use of client lists or other information taken from a former employer without permission would be a

violation of Standard IV(A). In addition, the nature and extent of the contact with former clients may be governed by the terms of any noncompete agreement signed by the employee and the former employer that covers contact with former clients after employment.

Simple knowledge of the names and existence of former clients is not confidential information, just as skills or experience that an employee obtains while employed are not "confidential" or "privileged" information. The Code and Standards do not impose a prohibition on the use of experience or knowledge gained at one employer from being used at another employer. The Code and Standards also do not prohibit former employees from contacting clients of their previous firm, in the absence of a noncompete agreement. Members and candidates are free to use public information about their former firm after departing to contact former clients without violating Standard IV(A).

In the absence of a noncompete agreement, as long as Chisolm maintains his duty of loyalty to his employer before joining Elliot's firm, does not take steps to solicit clients until he has left his former firm, and does not use material from his former employer without its permission after he has left, he is not in violation of the Code and Standards.

Example 7 (Starting a New Firm):

Geraldine Allen currently works at a registered investment company as an equity analyst. Without notice to her employer, she registers with government authorities to start an investment company that will compete with her employer, but she does not actively seek clients. Does registration of this competing company with the appropriate regulatory authorities constitute a violation of Standard IV(A)?

Comment: Allen's preparation for the new business by registering with the regulatory authorities does not conflict with the work for her employer if the preparations have been done on Allen's own time outside the office and if Allen will not be soliciting clients for the business or otherwise operating the new company until she has left her current employer.

Example 8 (Competing with Current Employer):

Several employees are planning to depart their current employer within a few weeks and have been careful to not engage in any activities that would conflict with their duty to their current employer. They have just learned that one of their employer's clients has undertaken a request for proposal (RFP) to review and possibly hire a new investment consultant. The RFP has been sent to the employer and all of its competitors. The group believes that the new entity to be formed would be qualified to respond to the RFP and be eligible for the business. The RFP submission period is likely to conclude before the employees' resignations are effective. Is it permissible for the group of departing employees to respond to the RFP for their anticipated new firm?

Comment: A group of employees responding to an RFP that their employer is also responding to would lead to direct competition between the employees and the employer. Such conduct violates Standard IV(A) unless the group of employees receives permission from their employer as well as the entity sending out the RFP.

Example 9 (Externally Compensated Assignments):

Alfonso Mota is a research analyst with Tyson Investments. He works part time as a mayor for his hometown, a position for which he receives compensation. Must Mota seek permission from Tyson to serve as mayor?

> *Comment*: If Mota's mayoral duties are so extensive and time-consuming that they might detract from his ability to fulfill his responsibilities at Tyson, he should discuss his outside activities with his employer and come to a mutual agreement regarding how to manage his personal commitments with his responsibilities to his employer.

Example 10 (Soliciting Former Clients):

After leaving her employer, Shawna McQuillen establishes her own money management business. While with her former employer, she did not sign a noncompete agreement that would have prevented her from soliciting former clients. Upon her departure, she does not take any of her client lists or contact information and she clears her personal computer of any employer records, including client contact information. She obtains the phone numbers of her former clients through public records and contacts them to solicit their business.

> *Comment*: McQuillen is not in violation of Standard IV(A) because she has not used information or records from her former employer and is not prevented by an agreement with her former employer from soliciting her former clients.

Example 11 (Whistleblowing Actions):

Meredith Rasmussen works on a buy-side trading desk and concentrates on in-house trades for a hedge fund subsidiary managed by a team at the investment management firm. The hedge fund has been very successful and is marketed globally by the firm. From her experience as the trader for much of the activity of the fund, Rasmussen has become quite knowledgeable about the hedge fund's strategy, tactics, and performance. When a distinct break in the market occurs, however, and many of the securities involved in the hedge fund's strategy decline markedly in value, Rasmussen observes that the reported performance of the hedge fund does not reflect this decline. In her experience, the lack of any effect is a very unlikely occurrence. She approaches the head of trading about her concern and is told that she should not ask any questions and that the fund is big and successful and is not her concern. She is fairly sure something is not right, so she contacts the compliance officer, who also tells her to stay away from the issue of this hedge fund's reporting.

> *Comment*: Rasmussen has clearly come upon an error in policies, procedures, and compliance practices in the firm's operations. Having been unsuccessful in finding a resolution with her supervisor and the compliance officer, Rasmussen should consult the firm's whistleblowing policy to determine the appropriate next step toward informing management of her concerns. The potentially unethical actions of the investment management division are appropriate grounds for further disclosure, so Rasmussen's whistleblowing would not represent a violation of Standard IV(A).
>
> See also Standard I(D)–Misconduct and Standard IV(C)–Responsibilities of Supervisors.

Example 12 (Soliciting Former Clients):

Angel Crome has been a private banker for YBSafe Bank for the past eight years. She has been very successful and built a considerable client portfolio during that time but is extremely frustrated by the recent loss of reputation by her current employer and subsequent client insecurity. A locally renowned headhunter contacted Crome a few days ago and offered her an interesting job with a competing private bank. This bank offers a substantial signing bonus for advisers with their own client portfolios. Crome figures that she can solicit at least 70% of her clients to follow her and gladly enters into the new employment contract.

> *Comment*: Crome may contact former clients upon termination of her employment with YBSafe Bank, but she is prohibited from using client records built by and kept with her in her capacity as an employee of YBSafe Bank. Client lists are proprietary information of her former employer and must not be used for her or her new employer's benefit. The use of written, electronic, or any other form of records other than publicly available information to contact her former clients at YBSafe Bank will be a violation of Standard IV(A).

Example 13 (Notification of Code and Standards):

Krista Smith is a relatively new assistant trader for the fixed-income desk of a major investment bank. She is on a team responsible for structuring collateralized debt obligations (CDOs) made up of securities in the inventory of the trading desk. At a meeting of the team, senior executives explain the opportunity to eventually separate the CDO into various risk-rated tranches to be sold to the clients of the firm. After the senior executives leave the meeting, the head trader announces various responsibilities of each member of the team and then says, "This is a good time to unload some of the junk we have been stuck with for a while and disguise it with ratings and a thick, unreadable prospectus, so don't be shy in putting this CDO together. Just kidding." Smith is worried by this remark and asks some of her colleagues what the head trader meant. They all respond that he was just kidding but that there is some truth in the remark because the CDO is seen by management as an opportunity to improve the quality of the securities in the firm's inventory.

Concerned about the ethical environment of the workplace, Smith decides to talk to her supervisor about her concerns and provides the head trader with a copy of the Code and Standards. Smith discusses the principle of placing the client above the interest of the firm and the possibility that the development of the new CDO will not adhere to this responsibility. The head trader assures Smith that the appropriate analysis will be conducted when determining the appropriate securities for collateral. Furthermore, the ratings are assigned by an independent firm and the prospectus will include full and factual disclosures. Smith is reassured by the meeting, but she also reviews the company's procedures and requirements for reporting potential violations of company policy and securities laws.

> *Comment*: Smith's review of the company policies and procedures for reporting violations allows her to be prepared to report through the appropriate whistleblower process if she decides that the CDO development process involves unethical actions by others. Smith's actions comply with the Code and Standards principles of placing the client's interests first and being loyal to her employer. In providing her supervisor with a copy of the Code and Standards, Smith is highlighting the high level of ethical conduct she is required to adhere to in her professional activities.

Example 14 (Leaving an Employer):

Laura Webb just left her position as portfolio analyst at Research Systems, Inc. (RSI). Her employment contract included a non-solicitation agreement that requires her to wait two years before soliciting RSI clients for any investment-related services. Upon leaving, Webb was informed that RSI would contact clients immediately about her departure and introduce her replacement.

While working at RSI, Webb connected with clients, other industry associates, and friends through her LinkedIn network. Her business and personal relationships were intermingled because she considered many of her clients to be personal friends. Realizing that her LinkedIn network would be a valuable resource for new employment opportunities, she updated her profile several days following her departure from RSI. LinkedIn automatically sent a notification to Webb's entire network that her employment status had been changed in her profile.

> *Comment*: Prior to her departure, Webb should have discussed any client information contained in her social media networks. By updating her LinkedIn profile after RSI notified clients and after her employment ended, she has appropriately placed her employer's interests ahead of her own personal interests. In addition, she has not violated the non-solicitation agreement with RSI, unless it prohibited any contact with clients during the two-year period.

Example 15 (Confidential Firm Information):

Sanjay Gupta is a research analyst at Naram Investment Management (NIM). NIM uses a team-based research process to develop recommendations on investment opportunities covered by the team members. Gupta, like others, provides commentary for NIM's clients through the company blog, which is posted weekly on the NIM password-protected website. According to NIM's policy, every contribution to the website must be approved by the company's compliance department before posting. Any opinions expressed on the website are disclosed as representing the perspective of NIM.

Gupta also writes a personal blog to share his experiences with friends and family. As with most blogs, Gupta's personal blog is widely available to interested readers through various internet search engines. Occasionally, when he disagrees with the team-based research opinions of NIM, Gupta uses his personal blog to express his own opinions as a counterpoint to the commentary posted on the NIM website. Gupta believes this provides his readers with a more complete perspective on these investment opportunities.

> *Comment*: Gupta is in violation of Standard IV(A) for disclosing confidential firm information through his personal blog. The recommendations on the firm's blog to clients are not freely available across the internet, but his personal blog post indirectly provides the firm's recommendations.
>
> Additionally, by posting research commentary on his personal blog, Gupta is using firm resources for his personal advantage. To comply with Standard IV(A), members and candidates must receive consent from their employer prior to using company resources.

Standard IV(B) Additional Compensation Arrangements

Members and Candidates must not accept gifts, benefits, compensation, or consideration that competes with or might reasonably be expected to create a conflict of interest with their employer's interest unless they obtain written consent from all parties involved.

Guidance

Standard IV(B) requires members and candidates to obtain permission from their employer before accepting compensation or other benefits from third parties for the services rendered to the employer or for any services that might create a conflict with their employer's interest. Compensation and benefits include direct compensation by the client and any indirect compensation or other benefits received from third parties. "Written consent" includes any form of communication that can be documented (for example, communication via e-mail that can be retrieved and documented).

Members and candidates must obtain permission for additional compensation/benefits because such arrangements may affect loyalties and objectivity and create potential conflicts of interest. Disclosure allows an employer to consider the outside arrangements when evaluating the actions and motivations of members and candidates. Moreover, the employer is entitled to have full knowledge of all compensation/benefit arrangements so as to be able to assess the true cost of the services members or candidates are providing.

There may be instances in which a member or candidate is hired by an employer on a "part-time" basis. "Part-time" status applies to employees who do not commit the full number of hours required for a normal work week. Members and candidates should discuss possible limitations to their abilities to provide services that may be competitive with their employer during the negotiation and hiring process. The requirements of Standard IV(B) would be applicable to limitations identified at that time.

Recommended Procedures for Compliance

Members and candidates should make an immediate written report to their supervisor and compliance officer specifying any compensation they propose to receive for services in addition to the compensation or benefits received from their employer. The details of the report should be confirmed by the party offering the additional compensation, including performance incentives offered by clients. This written report should state the terms of any agreement under which a member or candidate will receive additional compensation; "terms" include the nature of the compensation, the approximate amount of compensation, and the duration of the agreement.

Application of the Standard

Example 1 (Notification of Client Bonus Compensation):

Geoff Whitman, a portfolio analyst for Adams Trust Company, manages the account of Carol Cochran, a client. Whitman is paid a salary by his employer, and Cochran pays the trust company a standard fee based on the market value of assets in her portfolio. Cochran proposes to Whitman that "any year that my portfolio achieves at least a 15% return before taxes, you and your wife can fly to Monaco at my expense

and use my condominium during the third week of January." Whitman does not inform his employer of the arrangement and vacations in Monaco the following January as Cochran's guest.

> *Comment*: Whitman violated Standard IV(B) by failing to inform his employer in writing of this supplemental, contingent compensation arrangement. The nature of the arrangement could have resulted in partiality to Cochran's account, which could have detracted from Whitman's performance with respect to other accounts he handles for Adams Trust. Whitman must obtain the consent of his employer to accept such a supplemental benefit.

Example 2 (Notification of Outside Compensation):

Terry Jones sits on the board of directors of Exercise Unlimited, Inc. In return for his services on the board, Jones receives unlimited membership privileges for his family at all Exercise Unlimited facilities. Jones purchases Exercise Unlimited stock for the client accounts for which it is appropriate. Jones does not disclose this arrangement to his employer because he does not receive monetary compensation for his services to the board.

> *Comment*: Jones has violated Standard IV(B) by failing to disclose to his employer benefits received in exchange for his services on the board of directors. The nonmonetary compensation may create a conflict of interest in the same manner as being paid to serve as a director.

Example 3 (Prior Approval for Outside Compensation):

Jonathan Hollis is an analyst of oil-and-gas companies for Specialty Investment Management. He is currently recommending the purchase of ABC Oil Company shares and has published a long, well-thought-out research report to substantiate his recommendation. Several weeks after publishing the report, Hollis receives a call from the investor-relations office of ABC Oil saying that Thomas Andrews, CEO of the company, saw the report and really liked the analyst's grasp of the business and his company. The investor-relations officer invites Hollis to visit ABC Oil to discuss the industry further. ABC Oil offers to send a company plane to pick Hollis up and arrange for his accommodations while visiting. Hollis, after gaining the appropriate approvals, accepts the meeting with the CEO but declines the offered travel arrangements.

Several weeks later, Andrews and Hollis meet to discuss the oil business and Hollis's report. Following the meeting, Hollis joins Andrews and the investment relations officer for dinner at an upscale restaurant near ABC Oil's headquarters.

Upon returning to Specialty Investment Management, Hollis provides a full review of the meeting to the director of research, including a disclosure of the dinner attended.

> *Comment*: Hollis's actions did not violate Standard IV(B). Through gaining approval before accepting the meeting and declining the offered travel arrangements, Hollis sought to avoid any potential conflicts of interest between his company and ABC Oil. Because the location of the dinner was not available prior to arrival and Hollis notified his company of the dinner upon his return, accepting the dinner should not impair his objectivity. By disclosing the dinner, Hollis has enabled Specialty Investment Management to assess whether it has any impact on future reports and recommendations by Hollis related to ABC Oil.

Standard IV(C) Responsibilities of Supervisors

Members and Candidates must make reasonable efforts to ensure that anyone subject to their supervision or authority complies with applicable laws, rules, regulations, and the Code and Standards.

Guidance

Highlights:

- *System for Supervision*
- *Supervision Includes Detection*

Standard IV(C) states that members and candidates must promote actions by all employees under their supervision and authority to comply with applicable laws, rules, regulations, and firm policies and the Code and Standards.

Any investment professional who has employees subject to her or his control or influence—whether or not the employees are CFA Institute members, CFA charterholders, or candidates in the CFA Program—exercises supervisory responsibility. Members and candidates acting as supervisors must also have in-depth knowledge of the Code and Standards so that they can apply this knowledge in discharging their supervisory responsibilities.

The conduct that constitutes reasonable supervision in a particular case depends on the number of employees supervised and the work performed by those employees. Members and candidates with oversight responsibilities for large numbers of employees may not be able to personally evaluate the conduct of these employees on a continuing basis. These members and candidates may delegate supervisory duties to subordinates who directly oversee the other employees. A member's or candidate's responsibilities under Standard IV(C) include instructing those subordinates to whom supervision is delegated about methods to promote compliance, including preventing and detecting violations of laws, rules, regulations, firm policies, and the Code and Standards.

At a minimum, Standard IV(C) requires that members and candidates with supervisory responsibility make reasonable efforts to prevent and detect violations by ensuring the establishment of effective compliance systems. However, an effective compliance system goes beyond enacting a code of ethics, establishing policies and procedures to achieve compliance with the code and applicable law, and reviewing employee actions to determine whether they are following the rules.

To be effective supervisors, members and candidates should implement education and training programs on a recurring or regular basis for employees under their supervision. Such programs will assist the employees with meeting their professional obligations to practice in an ethical manner within the applicable legal system. Further, establishing incentives—monetary or otherwise—for employees not only to meet business goals but also to reward ethical behavior offers supervisors another way to assist employees in complying with their legal and ethical obligations.

Often, especially in large organizations, members and candidates may have supervisory responsibility but not the authority to establish or modify firm-wide compliance policies and procedures or incentive structures. Such limitations should not prevent

a member or candidate from working with his or her own superiors and within the firm structure to develop and implement effective compliance tools, including but not limited to:

- a code of ethics,
- compliance policies and procedures,
- education and training programs,
- an incentive structure that rewards ethical conduct, and
- adoption of firm-wide best practice standards (e.g., the GIPS standards, the CFA Institute Asset Manager Code of Professional Conduct).

A member or candidate with supervisory responsibility should bring an inadequate compliance system to the attention of the firm's senior managers and recommend corrective action. If the member or candidate clearly cannot discharge supervisory responsibilities because of the absence of a compliance system or because of an inadequate compliance system, the member or candidate should decline in writing to accept supervisory responsibility until the firm adopts reasonable procedures to allow adequate exercise of supervisory responsibility.

System for Supervision

Members and candidates with supervisory responsibility must understand what constitutes an adequate compliance system for their firms and make reasonable efforts to see that appropriate compliance procedures are established, documented, communicated to covered personnel, and followed. "Adequate" procedures are those designed to meet industry standards, regulatory requirements, the requirements of the Code and Standards, and the circumstances of the firm. Once compliance procedures are established, the supervisor must also make reasonable efforts to ensure that the procedures are monitored and enforced.

To be effective, compliance procedures must be in place prior to the occurrence of a violation of the law or the Code and Standards. Although compliance procedures cannot be designed to anticipate every potential violation, they should be designed to anticipate the activities most likely to result in misconduct. Compliance programs must be appropriate for the size and nature of the organization. The member or candidate should review model compliance procedures or other industry programs to ensure that the firm's procedures meet the minimum industry standards.

Once a supervisor learns that an employee has violated or may have violated the law or the Code and Standards, the supervisor must promptly initiate an assessment to determine the extent of the wrongdoing. Relying on an employee's statements about the extent of the violation or assurances that the wrongdoing will not reoccur is not enough. Reporting the misconduct up the chain of command and warning the employee to cease the activity are also not enough. Pending the outcome of the investigation, a supervisor should take steps to ensure that the violation will not be repeated, such as placing limits on the employee's activities or increasing the monitoring of the employee's activities.

Supervision Includes Detection

Members and candidates with supervisory responsibility must also make reasonable efforts to detect violations of laws, rules, regulations, firm policies, and the Code and Standards. The supervisors exercise reasonable supervision by establishing and implementing written compliance procedures and ensuring that those procedures are followed through periodic review. If a member or candidate has adopted reasonable procedures and taken steps to institute an effective compliance program, then the member or candidate may not be in violation of Standard IV(C) if he or she does not detect violations that occur despite these efforts. The fact that violations do occur may

indicate, however, that the compliance procedures are inadequate. In addition, in some cases, merely enacting such procedures may not be sufficient to fulfill the duty required by Standard IV(C). A member or candidate may be in violation of Standard IV(C) if he or she knows or should know that the procedures designed to promote compliance, including detecting and preventing violations, are not being followed.

Recommended Procedures for Compliance

Codes of Ethics or Compliance Procedures

Members and candidates are encouraged to recommend that their employers adopt a code of ethics. Adoption of a code of ethics is critical to establishing a strong ethical foundation for investment advisory firms and their employees. Codes of ethics formally emphasize and reinforce the client loyalty responsibilities of investment firm personnel, protect investing clients by deterring misconduct, and protect the firm's reputation for integrity.

There is a distinction, however, between codes of ethics and the specific policies and procedures needed to ensure compliance with the codes and with securities laws and regulations. Although both are important, codes of ethics should consist of fundamental, principle-based ethical and fiduciary concepts that are applicable to all of the firm's employees. In this way, firms can best convey to employees and clients the ethical ideals that investment advisers strive to achieve. These concepts need to be implemented, however, by detailed, firm-wide compliance policies and procedures. Compliance procedures assist the firm's personnel in fulfilling the responsibilities enumerated in the code of ethics and make probable that the ideals expressed in the code of ethics will be adhered to in the day-to-day operation of the firm.

Stand-alone codes of ethics should be written in plain language and should address general fiduciary concepts. They should be unencumbered by numerous detailed procedures. Codes presented in this way are the most effective in stressing to employees that they are in positions of trust and must act with integrity at all times. Mingling compliance procedures in the firm's code of ethics goes against the goal of reinforcing the ethical obligations of employees.

Separating the code of ethics from compliance procedures will also reduce, if not eliminate, the legal terminology and "boilerplate" language that can make the underlying ethical principles incomprehensible to the average person. Above all, to ensure the creation of a culture of ethics and integrity rather than one that merely focuses on following the rules, the principles in the code of ethics must be stated in a way that is accessible and understandable to everyone in the firm.

Members and candidates should encourage their employers to provide their codes of ethics to clients. In this case also, a simple, straightforward code of ethics will be best understood by clients. Unencumbered by the compliance procedures, the code of ethics will be effective in conveying that the firm is committed to conducting business in an ethical manner and in the best interests of the clients.

Adequate Compliance Procedures

A supervisor complies with Standard IV(C) by identifying situations in which legal violations or violations of the Code and Standards are likely to occur and by establishing and enforcing compliance procedures to prevent such violations. Adequate compliance procedures should

- be contained in a clearly written and accessible manual that is tailored to the firm's operations,
- be drafted so that the procedures are easy to understand,

- designate a compliance officer whose authority and responsibility are clearly defined and who has the necessary resources and authority to implement the firm's compliance procedures,
- describe the hierarchy of supervision and assign duties among supervisors,
- implement a system of checks and balances,
- outline the scope of the procedures,
- outline procedures to document the monitoring and testing of compliance procedures,
- outline permissible conduct, and
- delineate procedures for reporting violations and sanctions.

Once a compliance program is in place, a supervisor should

- disseminate the contents of the program to appropriate personnel,
- periodically update procedures to ensure that the measures are adequate under the law,
- continually educate personnel regarding the compliance procedures,
- issue periodic reminders of the procedures to appropriate personnel,
- incorporate a professional conduct evaluation as part of an employee's performance review,
- review the actions of employees to ensure compliance and identify violators, and
- take the necessary steps to enforce the procedures once a violation has occurred.

Once a violation is discovered, a supervisor should

- respond promptly,
- conduct a thorough investigation of the activities to determine the scope of the wrongdoing,
- increase supervision or place appropriate limitations on the wrongdoer pending the outcome of the investigation, and
- review procedures for potential changes necessary to prevent future violations from occurring.

Implementation of Compliance Education and Training

No amount of ethics education and awareness will deter someone determined to commit fraud for personal enrichment. But the vast majority of investment professionals strive to achieve personal success with dedicated service to their clients and employers.

Regular ethics and compliance training, in conjunction with adoption of a code of ethics, is critical to investment firms seeking to establish a strong culture of integrity and to provide an environment in which employees routinely engage in ethical conduct in compliance with the law. Training and education assist individuals in both recognizing areas that are prone to ethical and legal pitfalls and identifying those circumstances and influences that can impair ethical judgment.

By implementing educational programs, supervisors can train their subordinates to put into practice what the firm's code of ethics requires. Education helps employees make the link between legal and ethical conduct and the long-term success of the business; a strong culture of compliance signals to clients and potential clients that the firm has truly embraced ethical conduct as fundamental to the firm's mission to serve its clients.

Establish an Appropriate Incentive Structure

Even if individuals want to make the right choices and follow an ethical course of conduct and are aware of the obstacles that may trip them up, they can still be influenced to act improperly by a corporate culture that embraces a "succeed at all costs" mentality, stresses results regardless of the methods used to achieve those results, and does not reward ethical behavior. Supervisors can reinforce an individual's natural desire to "do the right thing" by building a culture of integrity in the workplace.

Supervisors and firms must look closely at their incentive structure to determine whether the structure encourages profits and returns at the expense of ethically appropriate conduct. Reward structures may turn a blind eye to how desired outcomes are achieved and encourage dysfunctional or counterproductive behavior. Only when compensation and incentives are firmly tied to client interests and *how* outcomes are achieved, rather than *how much* is generated for the firm, will employees work to achieve a culture of integrity.

Application of the Standard

Example 1 (Supervising Research Activities):

Jane Mattock, senior vice president and head of the research department of H&V, Inc., a regional brokerage firm, has decided to change her recommendation for Timber Products from buy to sell. In line with H&V's procedures, she orally advises certain other H&V executives of her proposed actions before the report is prepared for publication. As a result of Mattock's conversation with Dieter Frampton, one of the H&V executives accountable to Mattock, Frampton immediately sells Timber's stock from his own account and from certain discretionary client accounts. In addition, other personnel inform certain institutional customers of the changed recommendation before it is printed and disseminated to all H&V customers who have received previous Timber reports.

> *Comment*: Mattock has violated Standard IV(C) by failing to reasonably and adequately supervise the actions of those accountable to her. She did not prevent or establish reasonable procedures designed to prevent dissemination of or trading on the information by those who knew of her changed recommendation. She must ensure that her firm has procedures for reviewing or recording any trading in the stock of a corporation that has been the subject of an unpublished change in recommendation. Adequate procedures would have informed the subordinates of their duties and detected sales by Frampton and selected customers.

Example 2 (Supervising Research Activities):

Deion Miller is the research director for Jamestown Investment Programs. The portfolio managers have become critical of Miller and his staff because the Jamestown portfolios do not include any stock that has been the subject of a merger or tender offer. Georgia Ginn, a member of Miller's staff, tells Miller that she has been studying a local company, Excelsior, Inc., and recommends its purchase. Ginn adds that the company has been widely rumored to be the subject of a merger study by a well-known conglomerate and discussions between them are under way. At Miller's request, Ginn prepares a memo recommending the stock. Miller passes along Ginn's memo to the portfolio managers prior to leaving for vacation, and he notes that he has not reviewed the memo. As a result of the memo, the portfolio managers buy Excelsior stock immediately. The day Miller returns to the office, he learns that Ginn's only sources for the report were her brother, who is an acquisitions analyst with Acme Industries, the "well-known conglomerate," and that the merger discussions were planned but not held.

> *Comment*: Miller violated Standard IV(C) by not exercising reasonable supervision when he disseminated the memo without checking to ensure that Ginn had a reasonable and adequate basis for her recommendations and that Ginn was not relying on material nonpublic information.

Example 3 (Supervising Trading Activities):

David Edwards, a trainee trader at Wheeler & Company, a major national brokerage firm, assists a customer in paying for the securities of Highland, Inc., by using anticipated profits from the immediate sale of the same securities. Despite the fact that Highland is not on Wheeler's recommended list, a large volume of its stock is traded through Wheeler in this manner. Roberta Ann Mason is a Wheeler vice president responsible for supervising compliance with the securities laws in the trading department. Part of her compensation from Wheeler is based on commission revenues from the trading department. Although she notices the increased trading activity, she does nothing to investigate or halt it.

> *Comment*: Mason's failure to adequately review and investigate purchase orders in Highland stock executed by Edwards and her failure to supervise the trainee's activities violate Standard IV(C). Supervisors should be especially sensitive to actual or potential conflicts between their own self-interests and their supervisory responsibilities.

Example 4 (Supervising Trading Activities and Record Keeping):

Samantha Tabbing is senior vice president and portfolio manager for Crozet, Inc., a registered investment advisory and registered broker/dealer firm. She reports to Charles Henry, the president of Crozet. Crozet serves as the investment adviser and principal underwriter for ABC and XYZ public mutual funds. The two funds' prospectuses allow Crozet to trade financial futures for the funds for the limited purpose of hedging against market risks. Henry, extremely impressed by Tabbing's performance in the past two years, directs Tabbing to act as portfolio manager for the funds. For the benefit of its employees, Crozet has also organized the Crozet Employee Profit-Sharing Plan (CEPSP), a defined contribution retirement plan. Henry assigns Tabbing to manage 20% of the assets of CEPSP. Tabbing's investment objective for her portion of CEPSP's assets is aggressive growth. Unbeknownst to Henry, Tabbing frequently places S&P 500 Index purchase and sale orders for the funds and the CEPSP without providing the futures commission merchants (FCMs) who take the orders with any prior or simultaneous designation of the account for which the trade has been placed. Frequently, neither Tabbing nor anyone else at Crozet completes an internal trade ticket to record the time an order was placed or the specific account for which the order was intended. FCMs often designate a specific account only after the trade, when Tabbing provides such designation. Crozet has no written operating procedures or compliance manual concerning its futures trading, and its compliance department does not review such trading. After observing the market's movement, Tabbing assigns to CEPSP the S&P 500 positions with more favorable execution prices and assigns positions with less favorable execution prices to the funds.

> *Comment*: Henry violated Standard IV(C) by failing to adequately supervise Tabbing with respect to her S&P 500 trading. Henry further violated Standard IV(C) by failing to establish record-keeping and reporting procedures to prevent or detect Tabbing's violations. Henry must make a reasonable effort to determine that adequate compliance procedures covering all employee trading activity are established, documented, communicated, and followed.

Example 5 (Accepting Responsibility):

Meredith Rasmussen works on a buy-side trading desk and concentrates on in-house trades for a hedge fund subsidiary managed by a team at the investment management firm. The hedge fund has been very successful and is marketed globally by the firm. From her experience as the trader for much of the activity of the fund, Rasmussen has become quite knowledgeable about the hedge fund's strategy, tactics, and performance. When a distinct break in the market occurs and many of the securities involved in the hedge fund's strategy decline markedly in value, however, Rasmussen observes that the reported performance of the hedge fund does not at all reflect this decline. From her experience, this lack of an effect is a very unlikely occurrence. She approaches the head of trading about her concern and is told that she should not ask any questions and that the fund is too big and successful and is not her concern. She is fairly sure something is not right, so she contacts the compliance officer and is again told to stay away from the hedge fund reporting issue.

> *Comment*: Rasmussen has clearly come upon an error in policies, procedures, and compliance practices within the firm's operations. According to Standard IV(C), the supervisor and the compliance officer have the responsibility to review the concerns brought forth by Rasmussen. Supervisors have the responsibility of establishing and encouraging an ethical culture in the firm. The dismissal of Rasmussen's question violates Standard IV(C) and undermines the firm's ethical operations.
>
> See also Standard I(D)–Misconduct and, for guidance on whistleblowing, Standard IV(A)–Loyalty.

Example 6 (Inadequate Procedures):

Brendan Witt, a former junior sell-side technology analyst, decided to return to school to earn an MBA. To keep his research skills and industry knowledge sharp, Witt accepted a position with On-line and Informed, an independent internet-based research company. The position requires the publication of a recommendation and report on a different company every month. Initially, Witt is a regular contributor of new research and a participant in the associated discussion boards that generally have positive comments on the technology sector. Over time, his ability to manage his educational requirements and his work requirements begin to conflict with one another. Knowing a recommendation is due the next day for On-line, Witt creates a report based on a few news articles and what the conventional wisdom of the markets has deemed the "hot" security of the day.

> *Comment*: Allowing the report submitted by Witt to be posted highlights a lack of compliance procedures by the research firm. Witt's supervisor needs to work with the management of On-line to develop an appropriate review process to ensure that all contracted analysts comply with the requirements.
>
> See also Standard V(A)–Diligence and Reasonable Basis because it relates to Witt's responsibility for substantiating a recommendation.

Example 7 (Inadequate Supervision):

Michael Papis is the chief investment officer of his state's retirement fund. The fund has always used outside advisers for the real estate allocation, and this information is clearly presented in all fund communications. Thomas Nagle, a recognized sell-side research analyst and Papis's business school classmate, recently left the investment bank he worked for to start his own asset management firm, Accessible Real Estate. Nagle is trying to build his assets under management and contacts Papis about gaining some of the retirement fund's allocation. In the previous few years, the performance

of the retirement fund's real estate investments was in line with the fund's benchmark but was not extraordinary. Papis decides to help out his old friend and also to seek better returns by moving the real estate allocation to Accessible. The only notice of the change in adviser appears in the next annual report in the listing of associated advisers.

> *Comment*: Papis's actions highlight the need for supervision and review at all levels in an organization. His responsibilities may include the selection of external advisers, but the decision to change advisers appears arbitrary. Members and candidates should ensure that their firm has appropriate policies and procedures in place to detect inappropriate actions, such as the action taken by Papis.
>
> See also Standard V(A)–Diligence and Reasonable Basis, Standard V(B)–Communication with Clients and Prospective Clients, and Standard VI(A)–Disclosure of Conflicts.

Example 8 (Supervising Research Activities):

Mary Burdette was recently hired by Fundamental Investment Management (FIM) as a junior auto industry analyst. Burdette is expected to expand the social media presence of the firm because she is active with various networks, including Facebook, LinkedIn, and Twitter. Although Burdette's supervisor, Joe Graf, has never used social media, he encourages Burdette to explore opportunities to increase FIM's online presence and ability to share content, communicate, and broadcast information to clients. In response to Graf's encouragement, Burdette is working on a proposal detailing the advantages of getting FIM onto Twitter in addition to launching a company Facebook page.

As part of her auto industry research for FIM, Burdette is completing a report on the financial impact of Sun Drive Auto Ltd.'s new solar technology for compact automobiles. This research report will be her first for FIM, and she believes Sun Drive's technology could revolutionize the auto industry. In her excitement, Burdette sends a quick tweet to FIM Twitter followers summarizing her "buy" recommendation for Sun Drive Auto stock.

> *Comment*: Graf has violated Standard IV(C) by failing to reasonably supervise Burdette with respect to the contents of her tweet. He did not establish reasonable procedures to prevent the unauthorized dissemination of company research through social media networks. Graf must make sure all employees receive regular training about FIM's policies and procedures, including the appropriate business use of personal social media networks.
>
> See Standard III(B) for additional guidance.

Example 9 (Supervising Research Activities):

Chen Wang leads the research department at YYRA Retirement Planning Specialists. Chen supervises a team of 10 analysts in a fast-paced and understaffed organization. He is responsible for coordinating the firm's approved process to review all reports before they are provided to the portfolio management team for use in rebalancing client portfolios.

One of Chen's direct reports, Huang Mei, covers the banking industry. Chen must submit the latest updates to the portfolio management team tomorrow morning. Huang has yet to submit her research report on ZYX Bank because she is uncomfortable providing a "buy" or "sell" opinion of ZYX on the basis of the completed analysis. Pressed for time and concerned that Chen will reject a "hold" recommendation, she researches various websites and blogs on the banking sector for whatever she can find on ZYX. One independent blogger provides a new interpretation of the recently reported data Huang has analyzed and concludes with a strong "sell" recommendation for ZYX. She is impressed by the originality and resourcefulness of this blogger's report.

Very late in the evening, Huang submits her report and "sell" recommendation to Chen without any reference to the independent blogger's report. Given the late time of the submission and the competence of Huang's prior work, Chen compiles this report with the recommendations from each of the other analysts and meets with the portfolio managers to discuss implementation.

> *Comment*: Chen has violated Standard IV(C) by neglecting to reasonably and adequately follow the firm's approved review process for Huang's research report. The delayed submission and the quality of prior work do not remove Chen's requirement to uphold the designated review process. A member or candidate with supervisory responsibility must make reasonable efforts to see that appropriate procedures are established, documented, communicated to covered personnel, and followed.

STANDARD V: INVESTMENT ANALYSIS, RECOMMENDATIONS, AND ACTIONS

Standard V(A) Diligence and Reasonable Basis

Members and Candidates must:

1. Exercise diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions.
2. Have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis, recommendation, or action.

Guidance

Highlights:

- *Defining Diligence and Reasonable Basis*
- *Using Secondary or Third-Party Research*
- *Using Quantitatively Oriented Research*
- *Developing Quantitatively Oriented Techniques*
- *Selecting External Advisers and Subadvisers*
- *Group Research and Decision Making*

The application of Standard V(A) depends on the investment philosophy the member, candidate, or firm is following, the role of the member or candidate in the investment decision-making process, and the support and resources provided by the member's or candidate's employer. These factors will dictate the nature of the diligence and thoroughness of the research and the level of investigation required by Standard V(A).

The requirements for issuing conclusions based on research will vary in relation to the member's or candidate's role in the investment decision-making process, but the member or candidate must make reasonable efforts to cover all pertinent issues

when arriving at a recommendation. Members and candidates enhance transparency by providing or offering to provide supporting information to clients when recommending a purchase or sale or when changing a recommendation.

Defining Diligence and Reasonable Basis

Every investment decision is based on a set of facts known and understood at the time. Clients turn to members and candidates for advice and expect these advisers to have more information and knowledge than they do. This information and knowledge is the basis from which members and candidates apply their professional judgment in taking investment actions and making recommendations.

At a basic level, clients want assurance that members and candidates are putting forth the necessary effort to support the recommendations they are making. Communicating the level and thoroughness of the information reviewed before the member or candidate makes a judgment allows clients to understand the reasonableness of the recommended investment actions.

As with determining the suitability of an investment for the client, the necessary level of research and analysis will differ with the product, security, or service being offered. In providing an investment service, members and candidates typically use a variety of resources, including company reports, third-party research, and results from quantitative models. A reasonable basis is formed through a balance of these resources appropriate for the security or decision being analyzed.

The following list provides some, but definitely not all, examples of attributes to consider while forming the basis for a recommendation:

- global, regional, and country macroeconomic conditions,
- a company's operating and financial history,
- the industry's and sector's current conditions and the stage of the business cycle,
- a mutual fund's fee structure and management history,
- the output and potential limitations of quantitative models,
- the quality of the assets included in a securitization, and
- the appropriateness of selected peer-group comparisons.

Even though an investment recommendation may be well informed, downside risk remains for any investment. Members and candidates can base their decisions only on the information available at the time decisions are made. The steps taken in developing a diligent and reasonable recommendation should minimize unexpected downside events.

Using Secondary or Third-Party Research

If members and candidates rely on secondary or third-party research, they must make reasonable and diligent efforts to determine whether such research is sound. Secondary research is defined as research conducted by someone else in the member's or candidate's firm. Third-party research is research conducted by entities outside the member's or candidate's firm, such as a brokerage firm, bank, or research firm. If a member or candidate has reason to suspect that either secondary or third-party research or information comes from a source that lacks a sound basis, the member or candidate must not rely on that information.

Members and candidates should make reasonable enquiries into the source and accuracy of all data used in completing their investment analysis and recommendations. The sources of the information and data will influence the level of the review a member or candidate must undertake. Information and data taken from internet

sources, such as personal blogs, independent research aggregation websites, or social media websites, likely require a greater level of review than information from more established research organizations.

Criteria that a member or candidate can use in forming an opinion on whether research is sound include the following:

- assumptions used,
- rigor of the analysis performed,
- date/timeliness of the research, and
- evaluation of the objectivity and independence of the recommendations.

A member or candidate may rely on others in his or her firm to determine whether secondary or third-party research is sound and use the information in good faith unless the member or candidate has reason to question its validity or the processes and procedures used by those responsible for the research. For example, a portfolio manager may not have a choice of a data source because the firm's senior managers conducted due diligence to determine which vendor would provide services; the member or candidate can use the information in good faith assuming the due diligence process was deemed adequate.

A member or candidate should verify that the firm has a policy about the timely and consistent review of approved research providers to ensure that the quality of the research continues to meet the necessary standards. If such a policy is not in place at the firm, the member or candidate should encourage the development and adoption of a formal review practice.

Using Quantitatively Oriented Research

Standard V(A) applies to the rapidly expanding use of quantitatively oriented research models and processes, such as computer-generated modeling, screening, and ranking of investment securities; the creation or valuation of derivative instruments; and quantitative portfolio construction techniques. These models and processes are being used for much more than the back testing of investment strategies, especially with continually advancing technology and techniques. The continued broad development of quantitative methods and models is an important part of capital market developments.

Members and candidates need to have an understanding of the parameters used in models and quantitative research that are incorporated into their investment recommendations. Although they are not required to become experts in every technical aspect of the models, they must understand the assumptions and limitations inherent in any model and how the results were used in the decision-making process.

The reliance on and potential limitations of financial models became clear through the investment crisis that unfolded in 2007 and 2008. In some cases, the financial models used to value specific securities and related derivative products did not adequately demonstrate the level of associated risks. Members and candidates should make reasonable efforts to test the output of investment models and other pre-programed analytical tools they use. Such validation should occur before incorporating the process into their methods, models, or analyses.

Although not every model can test for every factor or outcome, members and candidates should ensure that their analyses incorporate a broad range of assumptions sufficient to capture the underlying characteristics of investments. The omission from the analysis of potentially negative outcomes or of levels of risk outside the norm may misrepresent the true economic value of an investment. The possible scenarios for analysis should include factors that are likely to have a substantial influence on the investment value and may include extremely positive and negative scenarios.

Developing Quantitatively Oriented Techniques

Individuals who create new quantitative models and services must exhibit a higher level of diligence in reviewing new products than the individuals who ultimately use the analytical output. Members and candidates involved in the development and oversight of quantitatively oriented models, methods, and algorithms must understand the technical aspects of the products they provide to clients. A thorough testing of the model and resulting analysis should be completed prior to product distribution.

Members and candidates need to consider the source and time horizon of the data used as inputs in financial models. The information from many commercially available databases may not effectively incorporate both positive and negative market cycles. In the development of a recommendation, the member or candidate may need to test the models by using volatility and performance expectations that represent scenarios outside the observable databases. In reviewing the computer models or the resulting output, members and candidates need to pay particular attention to the assumptions used in the analysis and the rigor of the analysis to ensure that the model incorporates a wide range of possible input expectations, including negative market events.

Selecting External Advisers and Subadvisers

Financial instruments and asset allocation techniques continue to develop and evolve. This progression has led to the use of specialized managers to invest in specific asset classes or diversification strategies that complement a firm's in-house expertise. Standard V(A) applies to the level of review necessary in selecting an external adviser or subadviser to manage a specifically mandated allocation. Members and candidates must review managers as diligently as they review individual funds and securities.

Members and candidates who are directly involved with the use of external advisers need to ensure that their firms have standardized criteria for reviewing these selected external advisers and managers. Such criteria would include, but would not be limited to, the following:

- reviewing the adviser's established code of ethics,
- understanding the adviser's compliance and internal control procedures,
- assessing the quality of the published return information, and
- reviewing the adviser's investment process and adherence to its stated strategy.

Codes, standards, and guides to best practice published by CFA Institute provide members and candidates with examples of acceptable practices for external advisers and advice in selecting a new adviser. The following guides are available at the CFA Institute website (www.cfainstitute.org): Asset Manager Code of Professional Conduct, Global Investment Performance Standards, and Model Request for Proposal (for equity, credit, or real estate managers).

Group Research and Decision Making

Commonly, members and candidates are part of a group or team that is collectively responsible for producing investment analysis or research. The conclusions or recommendations of the group report represent the consensus of the group and are not necessarily the views of the member or candidate, even though the name of the member or candidate is included on the report. In some instances, a member or candidate will not agree with the view of the group. If, however, the member or candidate believes that the consensus opinion has a reasonable and adequate basis and is independent and objective, the member or candidate need not decline to be identified with the report. If the member or candidate is confident in the process, the member or candidate does not need to dissociate from the report even if it does not reflect his or her opinion.

Recommended Procedures for Compliance

Members and candidates should encourage their firms to consider the following policies and procedures to support the principles of Standard V(A):

- Establish a policy requiring that research reports, credit ratings, and investment recommendations have a basis that can be substantiated as reasonable and adequate. An individual employee (a supervisory analyst) or a group of employees (a review committee) should be appointed to review and approve such items prior to external circulation to determine whether the criteria established in the policy have been met.
- Develop detailed, written guidance for analysts (research, investment, or credit), supervisory analysts, and review committees that establishes the due diligence procedures for judging whether a particular recommendation has a reasonable and adequate basis.
- Develop measurable criteria for assessing the quality of research, the reasonableness and adequacy of the basis for any recommendation or rating, and the accuracy of recommendations over time. In some cases, firms may consider implementing compensation arrangements that depend on these measurable criteria and that are applied consistently to all related analysts.
- Develop detailed, written guidance that establishes minimum levels of scenario testing of all computer-based models used in developing, rating, and evaluating financial instruments. The policy should contain criteria related to the breadth of the scenarios tested, the accuracy of the output over time, and the analysis of cash flow sensitivity to inputs.
- Develop measurable criteria for assessing outside providers, including the quality of information being provided, the reasonableness and adequacy of the provider's collection practices, and the accuracy of the information over time. The established policy should outline how often the provider's products are reviewed.
- Adopt a standardized set of criteria for evaluating the adequacy of external advisers. The policy should include how often and on what basis the allocation of funds to the adviser will be reviewed.

Application of the Standard

Example 1 (Sufficient Due Diligence):

Helen Hawke manages the corporate finance department of Sarkozi Securities, Ltd. The firm is anticipating that the government will soon close a tax loophole that currently allows oil-and-gas exploration companies to pass on drilling expenses to holders of a certain class of shares. Because market demand for this tax-advantaged class of stock is currently high, Sarkozi convinces several companies to undertake new equity financings at once, before the loophole closes. Time is of the essence, but Sarkozi lacks sufficient resources to conduct adequate research on all the prospective issuing companies. Hawke decides to estimate the IPO prices on the basis of the relative size of each company and to justify the pricing later when her staff has time.

> *Comment*: Sarkozi should have taken on only the work that it could adequately handle. By categorizing the issuers by general size, Hawke has bypassed researching all the other relevant aspects that should be considered when pricing new issues and thus has not performed sufficient due diligence. Such an omission can result in investors purchasing shares at prices that have no actual basis. Hawke has violated Standard V(A).

Example 2 (Sufficient Scenario Testing):

Babu Dhaliwal works for Heinrich Brokerage in the corporate finance group. He has just persuaded Feggans Resources, Ltd., to allow his firm to do a secondary equity financing at Feggans Resources' current stock price. Because the stock has been trading at higher multiples than similar companies with equivalent production, Dhaliwal presses the Feggans Resources managers to project what would be the maximum production they could achieve in an optimal scenario. Based on these numbers, he is able to justify the price his firm will be asking for the secondary issue. During a sales pitch to the brokers, Dhaliwal then uses these numbers as the base-case production levels that Feggans Resources will achieve.

> *Comment*: When presenting information to the brokers, Dhaliwal should have given a range of production scenarios and the probability of Feggans Resources achieving each level. By giving the maximum production level as the likely level of production, he has misrepresented the chances of achieving that production level and seriously misled the brokers. Dhaliwal has violated Standard V(A).

Example 3 (Developing a Reasonable Basis):

Brendan Witt, a former junior sell-side technology analyst, decided to return to school to earn an MBA. To keep his research skills and industry knowledge sharp, Witt accepted a position with On-line and Informed, an independent internet-based research company. The position requires the publication of a recommendation and report on a different company every month. Initially, Witt is a regular contributor of new research and a participant in the associated discussion boards that generally have positive comments on the technology sector. Over time, his ability to manage his educational requirements and his work requirements begin to conflict with one another. Knowing a recommendation is due the next day for On-line, Witt creates a report based on a few news articles and what the conventional wisdom of the markets has deemed the "hot" security of the day.

> *Comment*: Witt's knowledge of and exuberance for technology stocks, a few news articles, and the conventional wisdom of the markets do not constitute, without more information, a reasonable and adequate basis for a stock recommendation that is supported by appropriate research and investigation. Therefore, Witt has violated Standard V(A).
>
> See also Standard IV(C)–Responsibilities of Supervisors because it relates to the firm's inadequate procedures.

Example 4 (Timely Client Updates):

Kristen Chandler is an investment consultant in the London office of Dalton Securities, a major global investment consultant firm. One of her UK pension funds has decided to appoint a specialist US equity manager. Dalton's global manager of research relies on local consultants to cover managers within their regions and, after conducting thorough due diligence, puts their views and ratings in Dalton's manager database. Chandler accesses Dalton's global manager research database and conducts a screen of all US equity managers on the basis of a match with the client's desired philosophy/style, performance, and tracking-error targets. She selects the five managers that meet these criteria and puts them in a briefing report that is delivered to the client 10 days later. Between the time of Chandler's database search and the delivery of the report to the client, Chandler is told that Dalton has updated the database with the information that one of the firms that Chandler has recommended for consideration

lost its chief investment officer, the head of its US equity research, and the majority of its portfolio managers on the US equity product—all of whom have left to establish their own firm. Chandler does not revise her report with this updated information.

> *Comment*: Chandler has failed to satisfy the requirement of Standard V(A). Although Dalton updated the manager ratings to reflect the personnel turnover at one of the firms, Chandler did not update her report to reflect the new information.

Example 5 (Group Research Opinions):

Evelyn Mastakis is a junior analyst who has been asked by her firm to write a research report predicting the expected interest rate for residential mortgages over the next six months. Mastakis submits her report to the fixed-income investment committee of her firm for review, as required by firm procedures. Although some committee members support Mastakis's conclusion, the majority of the committee disagrees with her conclusion, and the report is significantly changed to indicate that interest rates are likely to increase more than originally predicted by Mastakis. Should Mastakis ask that her name be taken off the report when it is disseminated?

> *Comment*: The results of research are not always clear, and different people may have different opinions based on the same factual evidence. In this case, the committee may have valid reasons for issuing a report that differs from the analyst's original research. The firm can issue a report that is different from the original report of an analyst as long as there is a reasonable and adequate basis for its conclusions.
>
> Generally, analysts must write research reports that reflect their own opinion and can ask the firm not to put their name on reports that ultimately differ from that opinion. When the work is a group effort, however, not all members of the team may agree with all aspects of the report. Ultimately, members and candidates can ask to have their names removed from the report, but if they are satisfied that the process has produced results or conclusions that have a reasonable and adequate basis, members and candidates do not have to dissociate from the report even when they do not agree with its contents. If Mastakis is confident in the process, she does not need to dissociate from the report even if it does not reflect her opinion.

Example 6 (Reliance on Third-Party Research):

Gary McDermott runs a two-person investment management firm. McDermott's firm subscribes to a service from a large investment research firm that provides research reports. McDermott's firm makes investment recommendations on the basis of these reports.

> *Comment*: Members and candidates can rely on third-party research but must make reasonable and diligent efforts to determine that such research is sound. If McDermott undertakes due diligence efforts on a regular basis to ensure that the research produced by the large firm is objective and reasonably based, McDermott can rely on that research when making investment recommendations to clients.

Example 7 (Due Diligence in Submanager Selection):

Paul Ostrowski's business has grown significantly over the past couple of years, and some clients want to diversify internationally. Ostrowski decides to find a submanager to handle the expected international investments. Because this will be his

first subadviser, Ostrowski uses the CFA Institute model "request for proposal" to design a questionnaire for his search. By his deadline, he receives seven completed questionnaires from a variety of domestic and international firms trying to gain his business. Ostrowski reviews all the applications in detail and decides to select the firm that charges the lowest fees because doing so will have the least impact on his firm's bottom line.

> *Comment*: The selection of an external adviser or subadviser should be based on a full and complete review of the adviser's services, performance history, and cost structure. In basing the decision on the fee structure alone, Ostrowski may be violating Standard V(A).
>
> See also Standard III(C)–Suitability because it relates to the ability of the selected adviser to meet the needs of the clients.

Example 8 (Sufficient Due Diligence):

Michael Papis is the chief investment officer of his state's retirement fund. The fund has always used outside advisers for the real estate allocation, and this information is clearly presented in all fund communications. Thomas Nagle, a recognized sell-side research analyst and Papis's business school classmate, recently left the investment bank he worked for to start his own asset management firm, Accessible Real Estate. Nagle is trying to build his assets under management and contacts Papis about gaining some of the retirement fund's allocation. In the previous few years, the performance of the retirement fund's real estate investments was in line with the fund's benchmark but was not extraordinary. Papis decides to help out his old friend and also to seek better returns by moving the real estate allocation to Accessible. The only notice of the change in adviser appears in the next annual report in the listing of associated advisers.

> *Comment*: Papis violated Standard V(A). His responsibilities may include the selection of the external advisers, but the decision to change advisers appears to have been arbitrary. If Papis was dissatisfied with the current real estate adviser, he should have conducted a proper solicitation to select the most appropriate adviser.
>
> See also Standard IV(C)–Responsibilities of Supervisors, Standard V(B)–Communication with Clients and Prospective Clients, and Standard VI(A)–Disclosure of Conflicts.

Example 9 (Sufficient Due Diligence):

Andre Shrub owns and operates Conduit, an investment advisory firm. Prior to opening Conduit, Shrub was an account manager with Elite Investment, a hedge fund managed by his good friend Adam Reed. To attract clients to a new Conduit fund, Shrub offers lower-than-normal management fees. He can do so because the fund consists of two top-performing funds managed by Reed. Given his personal friendship with Reed and the prior performance record of these two funds, Shrub believes this new fund is a winning combination for all parties. Clients quickly invest with Conduit to gain access to the Elite funds. No one is turned away because Conduit is seeking to expand its assets under management.

> *Comment*: Shrub violated Standard V(A) by not conducting a thorough analysis of the funds managed by Reed before developing the new Conduit fund. Shrub's reliance on his personal relationship with Reed and his prior knowledge of Elite are insufficient justification for the investments. The funds may be appropriately considered, but a full review of their operating procedures, reporting practices, and transparency are some elements of the necessary due diligence.

See also Standard III(C)–Suitability.

Example 10 (Sufficient Due Diligence):

Bob Thompson has been doing research for the portfolio manager of the fixed-income department. His assignment is to do sensitivity analysis on securitized subprime mortgages. He has discussed with the manager possible scenarios to use to calculate expected returns. A key assumption in such calculations is housing price appreciation (HPA) because it drives "prepays" (prepayments of mortgages) and losses. Thompson is concerned with the significant appreciation experienced over the previous five years as a result of the increased availability of funds from subprime mortgages. Thompson insists that the analysis should include a scenario run with –10% for Year 1, –5% for Year 2, and then (to project a worst-case scenario) 0% for Years 3 through 5. The manager replies that these assumptions are too dire because there has never been a time in their available database when HPA was negative.

Thompson conducts his research to better understand the risks inherent in these securities and evaluates these securities in the worst-case scenario, a less likely but possible environment. Based on the results of the enhanced scenarios, Thompson does not recommend the purchase of the securitization. Against the general market trends, the manager follows Thompson's recommendation and does not invest. The following year, the housing market collapses. In avoiding the subprime investments, the manager's portfolio outperforms its peer group that year.

> *Comment*: Thompson's actions in running the scenario test with inputs beyond the historical trends available in the firm's databases adhere to the principles of Standard V(A). His concerns over recent trends provide a sound basis for further analysis. Thompson understands the limitations of his model, when combined with the limited available historical information, to accurately predict the performance of the funds if market conditions change negatively.
>
> See also Standard I(B)–Independence and Objectivity.

Example 11 (Use of Quantitatively Oriented Models):

Espacia Liakos works in sales for Hellenica Securities, a firm specializing in developing intricate derivative strategies to profit from particular views on market expectations. One of her clients is Eugenie Carapalis, who has become convinced that commodity prices will become more volatile over the coming months. Carapalis asks Liakos to quickly engineer a strategy that will benefit from this expectation. Liakos turns to Hellenica's modeling group to fulfill this request. Because of the tight deadline, the modeling group outsources parts of the work to several trusted third parties. Liakos implements the disparate components of the strategy as the firms complete them.

Within a month, Carapalis is proven correct: Volatility across a range of commodities increases sharply. But her derivatives position with Hellenica returns huge losses, and the losses increase daily. Liakos investigates and realizes that although each of the various components of the strategy had been validated, they had never been evaluated as an integrated whole. In extreme conditions, portions of the model worked at cross-purposes with other portions, causing the overall strategy to fail dramatically.

> *Comment*: Liakos violated Standard V(A). Members and candidates must understand the statistical significance of the results of the models they recommend and must be able to explain them to clients. Liakos did not take adequate care to ensure a thorough review of the whole model; its components were evaluated only individually. Because Carapalis clearly

intended to implement the strategy as a whole rather than as separate parts, Liakos should have tested how the components of the strategy interacted as well as how they performed individually.

Example 12 (Successful Due Diligence/Failed Investment):

Alton Newbury is an investment adviser to high-net-worth clients. A client with an aggressive risk profile in his investment policy statement asks about investing in the Top Shelf hedge fund. This fund, based in Calgary, Alberta, Canada, has reported 20% returns for the first three years. The fund prospectus states that its strategy involves long and short positions in the energy sector and extensive leverage. Based on his analysis of the fund's track record, the principals involved in managing the fund, the fees charged, and the fund's risk profile, Newbury recommends the fund to the client and secures a position in it. The next week, the fund announces that it has suffered a loss of 60% of its value and is suspending operations and redemptions until after a regulatory review. Newbury's client calls him in a panic and asks for an explanation.

Comment: Newbury's actions were consistent with Standard V(A). Analysis of an investment that results in a reasonable basis for recommendation does not guarantee that the investment has no downside risk. Newbury should discuss the analysis process with the client while reminding him or her that past performance does not lead to guaranteed future gains and that losses in an aggressive investment portfolio should be expected.

Example 13 (Quantitative Model Diligence):

Barry Cannon is the lead quantitative analyst at CityCenter Hedge Fund. He is responsible for the development, maintenance, and enhancement of the proprietary models the fund uses to manage its investors' assets. Cannon reads several high-level mathematical publications and blogs to stay informed of current developments. One blog, run by Expert CFA, presents some intriguing research that may benefit one of CityCenter's current models. Cannon is under pressure from firm executives to improve the model's predictive abilities, and he incorporates the factors discussed in the online research. The updated output recommends several new investments to the fund's portfolio managers.

Comment: Cannon has violated Standard V(A) by failing to have a reasonable basis for the new recommendations made to the portfolio managers. He needed to diligently research the effect of incorporating the new factors before offering the output recommendations. Cannon may use the blog for ideas, but it is his responsibility to determine the effect on the firm's proprietary models.

See Standard VII(B) regarding the violation by "Expert CFA" in the use of the CFA designation.

Example 14 (Selecting a Service Provider):

Ellen Smith is a performance analyst at Artic Global Advisors, a firm that manages global equity mandates for institutional clients. She was asked by her supervisor to review five new performance attribution systems and recommend one that would more appropriately explain the firm's investment strategy to clients. On the list was a system she recalled learning about when visiting an exhibitor booth at a recent conference. The system is highly quantitative and something of a "black box" in how it calculates the attribution values. Smith recommended this option without researching the others because the sheer complexity of the process was sure to impress the clients.

Comment: Smith's actions do not demonstrate a sufficient level of diligence in reviewing this product to make a recommendation for selecting the service. Besides not reviewing or considering the other four potential systems, she did not determine whether the "black box" attribution process aligns with the investment practices of the firm, including its investments in different countries and currencies. Smith must review and understand the process of any software or system before recommending its use as the firm's attribution system.

Example 15 (Subadviser Selection):

Craig Jackson is working for Adams Partners, Inc., and has been assigned to select a hedge fund subadviser to improve the diversification of the firm's large fund-of-funds product. The allocation must be in place before the start of the next quarter. Jackson uses a consultant database to find a list of suitable firms that claim compliance with the GIPS standards. He calls more than 20 firms on the list to confirm their potential interest and to determine their most recent quarterly and annual total return values. Because of the short turnaround, Jackson recommends the firm with the greatest total return values for selection.

Comment: By considering only performance and GIPS compliance, Jackson has not conducted sufficient review of potential firms to satisfy the requirements of Standard V(A). A thorough investigation of the firms and their operations should be conducted to ensure that their addition would increase the diversity of clients' portfolios and that they are suitable for the fund-of-funds product.

Example 16 (Manager Selection):

Timothy Green works for Peach Asset Management, where he creates proprietary models that analyze data from the firm request for proposal questionnaires to identify managers for possible inclusion in the firm's fund-of-funds investment platform. Various criteria must be met to be accepted to the platform. Because of the number of respondents to the questionnaires, Green uses only the data submitted to make a recommendation for adding a new manager.

Comment: By failing to conduct any additional outside review of the information to verify what was submitted through the request for proposal, Green has likely not satisfied the requirements of Standard V(A). The amount of information requested from outside managers varies among firms. Although the requested information may be comprehensive, Green should ensure sufficient effort is undertaken to verify the submitted information before recommending a firm for inclusion. This requires that he go beyond the information provided by the manager on the request for proposal questionnaire and may include interviews with interested managers, reviews of regulatory filings, and discussions with the managers' custodian or auditor.

Example 17 (Technical Model Requirements):

Jérôme Dupont works for the credit research group of XYZ Asset Management, where he is in charge of developing and updating credit risk models. In order to perform accurately, his models need to be regularly updated with the latest market data.

Dupont does not interact with or manage money for any of the firm's clients. He is in contact with the firm's US corporate bond fund manager, John Smith, who has only very superficial knowledge of the model and who from time to time asks very basic questions regarding the output recommendations. Smith does not consult Dupont with respect to finalizing his clients' investment strategies.

Dupont's recently assigned objective is to develop a new emerging market corporate credit risk model. The firm is planning to expand into emerging credit, and the development of such a model is a critical step in this process. Because Smith seems to follow the model's recommendations without much concern for its quality as he develops his clients' investment strategies, Dupont decides to focus his time on the development of the new emerging market model and neglects to update the US model.

After several months without regular updates, Dupont's diagnostic statistics start to show alarming signs with respect to the quality of the US credit model. Instead of conducting the long and complicated data update, Dupont introduces new codes into his model with some limited new data as a quick "fix." He thinks this change will address the issue without needing to complete the full data update, so he continues working on the new emerging market model.

Several months following the quick "fix," another set of diagnostic statistics reveals nonsensical results and Dupont realizes that his earlier change contained an error. He quickly corrects the error and alerts Smith. Smith realizes that some of the prior trades he performed were due to erroneous model results. Smith rebalances the portfolio to remove the securities purchased on the basis of the questionable results without reporting the issue to anyone else.

> *Comment*: Smith violated standard V(A) because exercising "diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions" means that members and candidates must understand the technical aspects of the products they provide to clients. Smith does not understand the model he is relying on to manage money. Members and candidates should also make reasonable enquiries into the source and accuracy of all data used in completing their investment analysis and recommendations.
>
> Dupont violated V(A) even if he does not trade securities or make investment decisions. Dupont's models give investment recommendations, and Dupont is accountable for the quality of those recommendations. Members and candidates should make reasonable efforts to test the output of preprogramed analytical tools they use. Such validation should occur before incorporating the tools into their decision-making process.
>
> See also Standard V(B)–Communication with Clients and Prospective Clients.

Standard V(B) Communication with Clients and Prospective Clients

Members and Candidates must:

1. Disclose to clients and prospective clients the basic format and general principles of the investment processes they use to analyze investments, select securities, and construct portfolios and must promptly disclose any changes that might materially affect those processes.

2 Disclose to clients and prospective clients significant limitations and risks associated with the investment process.

3 Use reasonable judgment in identifying which factors are important to their investment analyses, recommendations, or actions and include those factors in communications with clients and prospective clients.

4 Distinguish between fact and opinion in the presentation of investment analyses and recommendations.

Guidance

Highlights:

- *Informing Clients of the Investment Process*
- *Different Forms of Communication*
- *Identifying Risk and Limitations*
- *Report Presentation*
- *Distinction between Facts and Opinions in Reports*

Standard V(B) addresses member and candidate conduct with respect to communicating with clients. Developing and maintaining clear, frequent, and thorough communication practices is critical to providing high-quality financial services to clients. When clients understand the information communicated to them, they also can understand exactly how members and candidates are acting on their behalf, which gives clients the opportunity to make well-informed decisions about their investments. Such understanding can be accomplished only through clear communication.

Standard V(B) states that members and candidates should communicate in a recommendation the factors that were instrumental in making the investment recommendation. A critical part of this requirement is to distinguish clearly between opinions and facts. In preparing a research report, the member or candidate must present the basic characteristics of the security(ies) being analyzed, which will allow the reader to evaluate the report and incorporate information the reader deems relevant to his or her investment decision-making process.

Similarly, in preparing a recommendation about, for example, an asset allocation strategy, alternative investment vehicle, or structured investment product, the member or candidate should include factors that are relevant to the asset classes that are being discussed. Follow-up communication of significant changes in the risk characteristics of a security or asset strategy is required. Providing regular updates to any changes in the risk characteristics is recommended.

Informing Clients of the Investment Process

Members and candidates must adequately describe to clients and prospective clients the manner in which they conduct the investment decision-making process. Such disclosure should address factors that have positive and negative influences on the recommendations, including significant risks and limitations of the investment process used. The member or candidate must keep clients and other interested parties informed on an ongoing basis about changes to the investment process, especially newly identified significant risks and limitations. Only by thoroughly understanding the nature of the investment product or service can a client determine whether changes to that product or service could materially affect his or her investment objectives.

Understanding the basic characteristics of an investment is of great importance in judging the suitability of that investment on a standalone basis, but it is especially important in determining the impact each investment will have on the characteristics

of a portfolio. Although the risk and return characteristics of a common stock might seem to be essentially the same for any investor when the stock is viewed in isolation, the effects of those characteristics greatly depend on the other investments held. For instance, if the particular stock will represent 90% of an individual's investments, the stock's importance in the portfolio is vastly different from what it would be to an investor with a highly diversified portfolio for whom the stock will represent only 2% of the holdings.

A firm's investment policy may include the use of outside advisers to manage various portions of clients' assets under management. Members and candidates should inform the clients about the specialization or diversification expertise provided by the external adviser(s). This information allows clients to understand the full mix of products and strategies being applied that may affect their investment objectives.

Different Forms of Communication

For purposes of Standard V(B), communication is not confined to a written report of the type traditionally generated by an analyst researching a security, company, or industry. A presentation of information can be made via any means of communication, including in-person recommendation or description, telephone conversation, media broadcast, or transmission by computer (e.g., on the internet).

Computer and mobile device communications have rapidly evolved over the past few years. Members and candidates using any social media service to communicate business information must be diligent in their efforts to avoid unintended problems because these services may not be available to all clients. When providing information to clients through new technologies, members and candidates should take reasonable steps to ensure that such delivery would treat all clients fairly and, if necessary, be considered publicly disseminated.

The nature of client communications is highly diverse—from one word ("buy" or "sell") to in-depth reports of more than 100 pages. A communication may contain a general recommendation about the market, asset allocations, or classes of investments (e.g., stocks, bonds, real estate) or may relate to a specific security. If recommendations are contained in capsule form (such as a recommended stock list), members and candidates should notify clients that additional information and analyses are available from the producer of the report.

Identifying Risks and Limitations

Members and candidates must outline to clients and prospective clients significant risks and limitations of the analysis contained in their investment products or recommendations. The type and nature of significant risks will depend on the investment process that members and candidates are following and on the personal circumstances of the client. In general, the use of leverage constitutes a significant risk and should be disclosed.

Members and candidates must adequately disclose the general market-related risks and the risks associated with the use of complex financial instruments that are deemed significant. Other types of risks that members and candidates may consider disclosing include, but are not limited to, counterparty risk, country risk, sector or industry risk, security-specific risk, and credit risk.

Investment securities and vehicles may have limiting factors that influence a client's or potential client's investment decision. Members and candidates must report to clients and prospective clients the existence of limitations significant to the decision-making process. Examples of such factors and attributes include, but are not limited to, investment liquidity and capacity. Liquidity is the ability to liquidate an investment on a timely basis at a reasonable cost. Capacity is the investment amount beyond which returns will be negatively affected by new investments.

The appropriateness of risk disclosure should be assessed on the basis of what was known at the time the investment action was taken (often called an *ex ante* basis). Members and candidates must disclose significant risks known to them at the time of the disclosure. Members and candidates cannot be expected to disclose risks they are unaware of at the time recommendations or investment actions are made. In assessing compliance with Standard V(B), it is important to establish knowledge of a purported significant risk or limitation. A one-time investment loss that occurs after the disclosure does not constitute a pertinent factor in assessing whether significant risks and limitations were properly disclosed. Having no knowledge of a risk or limitation that subsequently triggers a loss may reveal a deficiency in the diligence and reasonable basis of the research of the member or candidate but may not reveal a breach of Standard V(B).

Report Presentation

Once the analytical process has been completed, the member or candidate who prepares the report must include those elements that are important to the analysis and conclusions of the report so that the reader can follow and challenge the report's reasoning. A report writer who has done adequate investigation may emphasize certain areas, touch briefly on others, and omit certain aspects deemed unimportant. For instance, a report may dwell on a quarterly earnings release or new-product introduction and omit other matters as long as the analyst clearly stipulates the limits to the scope of the report.

Investment advice based on quantitative research and analysis must be supported by readily available reference material and should be applied in a manner consistent with previously applied methodology. If changes in methodology are made, they should be highlighted.

Distinction between Facts and Opinions in Reports

Standard V(B) requires that opinion be separated from fact. Violations often occur when reports fail to separate the past from the future by not indicating that earnings estimates, changes in the outlook for dividends, or future market price information are *opinions* subject to future circumstances.

In the case of complex quantitative analyses, members and candidates must clearly separate fact from statistical conjecture and should identify the known limitations of an analysis. Members and candidates may violate Standard V(B) by failing to identify the limits of statistically developed projections because such omission leaves readers unaware of the limits of the published projections.

Members and candidates should explicitly discuss with clients and prospective clients the assumptions used in the investment models and processes to generate the analysis. Caution should be used in promoting the perceived accuracy of any model or process to clients because the ultimate output is merely an estimate of future results and not a certainty.

Recommended Procedures for Compliance

Because the selection of relevant factors is an analytical skill, determination of whether a member or candidate has used reasonable judgment in excluding and including information in research reports depends heavily on case-by-case review rather than a specific checklist.

Members and candidates should encourage their firms to have a rigorous methodology for reviewing research that is created for publication and dissemination to clients.

To assist in the after-the-fact review of a report, the member or candidate must maintain records indicating the nature of the research and should, if asked, be able to supply additional information to the client (or any user of the report) covering factors not included in the report.

Application of the Standard

Example 1 (Sufficient Disclosure of Investment System):

Sarah Williamson, director of marketing for Country Technicians, Inc., is convinced that she has found the perfect formula for increasing Country Technicians' income and diversifying its product base. Williamson plans to build on Country Technicians' reputation as a leading money manager by marketing an exclusive and expensive investment advice letter to high-net-worth individuals. One hitch in the plan is the complexity of Country Technicians' investment system—a combination of technical trading rules (based on historical price and volume fluctuations) and portfolio construction rules designed to minimize risk. To simplify the newsletter, she decides to include only each week's top five "buy" and "sell" recommendations and to leave out details of the valuation models and the portfolio structuring scheme.

> *Comment*: Williamson's plans for the newsletter violate Standard V(B). Williamson need not describe the investment system in detail in order to implement the advice effectively, but she must inform clients of Country Technicians' basic process and logic. Without understanding the basis for a recommendation, clients cannot possibly understand its limitations or its inherent risks.

Example 2 (Providing Opinions as Facts):

Richard Dox is a mining analyst for East Bank Securities. He has just finished his report on Boisy Bay Minerals. Included in his report is his own assessment of the geological extent of mineral reserves likely to be found on the company's land. Dox completed this calculation on the basis of the core samples from the company's latest drilling. According to Dox's calculations, the company has more than 500,000 ounces of gold on the property. Dox concludes his research report as follows: "Based on the fact that the company has 500,000 ounces of gold to be mined, I recommend a strong BUY."

> *Comment*: If Dox issues the report as written, he will violate Standard V(B). His calculation of the total gold reserves for the property based on the company's recent sample drilling is a quantitative opinion, not a fact. Opinion must be distinguished from fact in research reports.

Example 3 (Proper Description of a Security):

Olivia Thomas, an analyst at Government Brokers, Inc., which is a brokerage firm specializing in government bond trading, has produced a report that describes an investment strategy designed to benefit from an expected decline in US interest rates. The firm's derivative products group has designed a structured product that will allow the firm's clients to benefit from this strategy. Thomas's report describing the strategy indicates that high returns are possible if various scenarios for declining interest rates are assumed. Citing the proprietary nature of the structured product underlying the strategy, the report does not describe in detail how the firm is able to offer such returns or the related risks in the scenarios, nor does the report address the likely returns of the strategy if, contrary to expectations, interest rates rise.

Comment: Thomas has violated Standard V(B) because her report fails to describe properly the basic characteristics of the actual and implied risks of the investment strategy, including how the structure was created and the degree to which leverage was embedded in the structure. The report should include a balanced discussion of how the strategy would perform in the case of rising as well as falling interest rates, preferably illustrating how the strategies might be expected to perform in the event of a reasonable variety of interest rate and credit risk–spread scenarios. If liquidity issues are relevant with regard to the valuation of either the derivatives or the underlying securities, provisions the firm has made to address those risks should also be disclosed.

Example 4 (Notification of Fund Mandate Change):

May & Associates is an aggressive growth manager that has represented itself since its inception as a specialist at investing in small-cap US stocks. One of May's selection criteria is a maximum capitalization of US$250 million for any given company. After a string of successful years of superior performance relative to its peers, May has expanded its client base significantly, to the point at which assets under management now exceed US$3 billion. For liquidity purposes, May's chief investment officer (CIO) decides to lift the maximum permissible market-cap ceiling to US$500 million and change the firm's sales and marketing literature accordingly to inform prospective clients and third-party consultants.

Comment: Although May's CIO is correct about informing potentially interested parties as to the change in investment process, he must also notify May's existing clients. Among the latter group might be a number of clients who not only retained May as a small-cap manager but also retained mid-cap and large-cap specialists in a multiple-manager approach. Such clients could regard May's change of criteria as a style change that distorts their overall asset allocations.

Example 5 (Notification of Fund Mandate Change):

Rather than lifting the ceiling for its universe from US$250 million to US$500 million, May & Associates extends its small-cap universe to include a number of non-US companies.

Comment: Standard V(B) requires that May's CIO advise May's clients of this change because the firm may have been retained by some clients specifically for its prowess at investing in US small-cap stocks. Other changes that require client notification are introducing derivatives to emulate a certain market sector or relaxing various other constraints, such as portfolio beta. In all such cases, members and candidates must disclose changes to all interested parties.

Example 6 (Notification of Changes to the Investment Process):

RJZ Capital Management is an active value-style equity manager that selects stocks by using a combination of four multifactor models. The firm has found favorable results when back testing the most recent 10 years of available market data in a new dividend discount model (DDM) designed by the firm. This model is based on projected inflation rates, earnings growth rates, and interest rates. The president of RJZ decides to replace its simple model that uses price to trailing 12-month earnings with the new DDM.

Comment: Because the introduction of a new and different valuation model represents a material change in the investment process, RJZ's president must communicate the change to the firm's clients. RJZ is moving away from a model based on hard data toward a new model that is at least partly dependent on the firm's forecasting skills. Clients would likely view such a model as a significant change rather than a mere refinement of RJZ's process.

Example 7 (Notification of Changes to the Investment Process):

RJZ Capital Management loses the chief architect of its multifactor valuation system. Without informing its clients, the president of RJZ decides to redirect the firm's talents and resources toward developing a product for passive equity management—a product that will emulate the performance of a major market index.

Comment: By failing to disclose to clients a substantial change to its investment process, the president of RJZ has violated Standard V(B).

Example 8 (Notification of Changes to the Investment Process):

At Fundamental Asset Management, Inc., the responsibility for selecting stocks for addition to the firm's "approved" list has just shifted from individual security analysts to a committee consisting of the research director and three senior portfolio managers. Eleanor Morales, a portfolio manager with Fundamental Asset Management, thinks this change is not important enough to communicate to her clients.

Comment: Morales must disclose the process change to all her clients. Some of Fundamental's clients might be concerned about the morale and motivation among the firm's best research analysts after such a change. Moreover, clients might challenge the stock-picking track record of the portfolio managers and might even want to monitor the situation closely.

Example 9 (Sufficient Disclosure of Investment System):

Amanda Chinn is the investment director for Diversified Asset Management, which manages the endowment of a charitable organization. Because of recent staff departures, Diversified has decided to limit its direct investment focus to large-cap securities and supplement the needs for small-cap and mid-cap management by hiring outside fund managers. In describing the planned strategy change to the charity, Chinn's update letter states, "As investment director, I will directly oversee the investment team managing the endowment's large-capitalization allocation. I will coordinate the selection and ongoing review of external managers responsible for allocations to other classes." The letter also describes the reasons for the change and the characteristics external managers must have to be considered.

Comment: Standard V(B) requires the disclosure of the investment process used to construct the portfolio of the fund. Changing the investment process from managing all classes of investments within the firm to the use of external managers is one example of information that needs to be communicated to clients. Chinn and her firm have embraced the principles of Standard V(B) by providing their client with relevant information. The charity can now make a reasonable decision about whether Diversified Asset Management remains the appropriate manager for its fund.

Example 10 (Notification of Changes to the Investment Process):

Michael Papis is the chief investment officer of his state's retirement fund. The fund has always used outside advisers for the real estate allocation, and this information is clearly presented in all fund communications. Thomas Nagle, a recognized sell-side research analyst and Papis's business school classmate, recently left the investment bank he worked for to start his own asset management firm, Accessible Real Estate. Nagle is trying to build his assets under management and contacts Papis about gaining some of the retirement fund's allocation. In the previous few years, the performance of the retirement fund's real estate investments was in line with the fund's benchmark but was not extraordinary. Papis decides to help out his old friend and also to seek better returns by moving the real estate allocation to Accessible. The only notice of the change in adviser appears in the next annual report in the listing of associated advisers.

> *Comment*: Papis has violated Standard V(B). He attempted to hide the nature of his decision to change external managers by making only a limited disclosure. The plan recipients and the fund's trustees need to be aware when changes are made to ensure that operational procedures are being followed.
>
> See also Standard IV(C)–Responsibilities of Supervisors, Standard V(A)–Diligence and Reasonable Basis, and Standard VI(A)–Disclosure of Conflicts.

Example 11 (Notification of Errors):

Jérôme Dupont works for the credit research group of XYZ Asset Management, where he is in charge of developing and updating credit risk models. In order to perform accurately, his models need to be regularly updated with the latest market data.

Dupont does not interact with or manage money for any of the firm's clients. He is in contact with the firm's US corporate bond fund manager, John Smith, who has only very superficial knowledge of the model and who from time to time asks very basic questions regarding the output recommendations. Smith does not consult Dupont with respect to finalizing his clients' investment strategies.

Dupont's recently assigned objective is to develop a new emerging market corporate credit risk model. The firm is planning to expand into emerging credit, and the development of such a model is a critical step in this process. Because Smith seems to follow the model's recommendations without much concern for its quality as he develops his clients' investment strategies, Dupont decides to focus his time on the development of the new emerging market model and neglects to update the US model.

After several months without regular updates, Dupont's diagnostic statistics start to show alarming signs with respect to the quality of the US credit model. Instead of conducting the long and complicated data update, Dupont introduces new codes into his model with some limited new data as a quick "fix." He thinks this change will address the issue without needing to complete the full data update, so he continues working on the new emerging market model.

Several months following the quick "fix," another set of diagnostic statistics reveals nonsensical results and Dupont realizes that his earlier change contained an error. He quickly corrects the error and alerts Smith. Smith realizes that some of the prior trades he performed were due to erroneous model results. Smith rebalances the portfolio to remove the securities purchased on the basis of the questionable results without reporting the issue to anyone else.

> *Comment*: Smith violated V(B) by not disclosing a material error in the investment process. Clients should have been informed about the error and the corrective actions the firm was undertaking on their behalf.
>
> See also Standard V(A)–Diligence and Reasonable Basis.

Example 12 (Notification of Risks and Limitations):

Quantitative analyst Yuri Yakovlev has developed an investment strategy that selects small-cap stocks on the basis of quantitative signals. Yakovlev's strategy typically identifies only a small number of stocks (10–20) that tend to be illiquid, but according to his backtests, the strategy generates significant risk-adjusted returns. The partners at Yakovlev's firm, QSC Capital, are impressed by these results. After a thorough examination of the strategy's risks, stress testing, historical back testing, and scenario analysis, QSC decides to seed the strategy with US$10 million of internal capital in order for Yakovlev to create a track record for the strategy.

After two years, the strategy has generated performance returns greater than the appropriate benchmark and the Sharpe ratio of the fund is close to 1.0. On the basis of these results, QSC decides to actively market the fund to large institutional investors. While creating the offering materials, Yakovlev informs the marketing team that the capacity of the strategy is limited. The extent of the limitation is difficult to ascertain with precision; it depends on market liquidity and other factors in his model that can evolve over time. Yakovlev indicates that given the current market conditions, investments in the fund beyond US$100 million of capital could become more difficult and negatively affect expected fund returns.

Alan Wellard, the manager of the marketing team, is a partner with 30 years of marketing experience and explains to Yakovlev that these are complex technical issues that will muddy the marketing message. According to Wellard, the offering material should focus solely on the great track record of the fund. Yakovlev does not object because the fund has only US$12 million of capital, very far from the US$100 million threshold.

> *Comment*: Yakovlev and Wellard have not appropriately disclosed a significant limitation associated with the investment product. Yakovlev believes this limitation, once reached, will materially affect the returns of the fund. Although the fund is currently far from the US$100 million mark, current and prospective investors must be made aware of this capacity issue. If significant limitations are complicated to grasp and clients do not have the technical background required to understand them, Yakovlev and Wellard should either educate the clients or ascertain whether the fund is suitable for each client.

Example 13 (Notification of Risks and Limitations):

Brickell Advisers offers investment advisory services mainly to South American clients. Julietta Ramon, a risk analyst at Brickell, describes to clients how the firm uses value at risk (VaR) analysis to track the risk of its strategies. Ramon assures clients that calculating a VaR at a 99% confidence level, using a 20-day holding period, and applying a methodology based on an *ex ante* Monte Carlo simulation is extremely effective. The firm has never had losses greater than those predicted by this VaR analysis.

> *Comment*: Ramon has not sufficiently communicated the risks associated with the investment process to satisfy the requirements of Standard V(B). The losses predicted by a VaR analysis depend greatly on the inputs used in the model. The size and probability of losses can differ significantly from what an individual model predicts. Ramon must disclose how the inputs were selected and the potential limitations and risks associated with the investment strategy.

Example 14 (Notification of Risks and Limitations):

Lily Smith attended an industry conference and noticed that John Baker, an investment manager with Baker Associates, attracted a great deal of attention from the conference participants. On the basis of her knowledge of Baker's reputation and the interest he received at the conference, Smith recommends adding Baker Associates to the approved manager platform. Her recommendation to the approval committee included the statement "John Baker is well respected in the industry, and his insights are consistently sought after by investors. Our clients are sure to benefit from investing with Baker Associates."

> *Comment*: Smith is not appropriately separating facts from opinions in her recommendation to include the manager within the platform. Her actions conflict with the requirements of Standard V(B). Smith is relying on her opinions about Baker's reputation and the fact that many attendees were talking with him at the conference. Smith should also review the requirements of Standard V(A) regarding reasonable basis to determine the level of review necessary to recommend Baker Associates.

Standard V(C) Record Retention

Members and Candidates must develop and maintain appropriate records to support their investment analyses, recommendations, actions, and other investment-related communications with clients and prospective clients.

Guidance

Highlights:

- *New Media Records*
- *Records Are Property of the Firm*
- *Local Requirements*

Members and candidates must retain records that substantiate the scope of their research and reasons for their actions or conclusions. The retention requirement applies to decisions to buy or sell a security as well as reviews undertaken that do not lead to a change in position. Which records are required to support recommendations or investment actions depends on the role of the member or candidate in the investment decision-making process. Records may be maintained either in hard copy or electronic form.

Some examples of supporting documentation that assists the member or candidate in meeting the requirements for retention are as follows:

- personal notes from meetings with the covered company,
- press releases or presentations issued by the covered company,
- computer-based model outputs and analyses,
- computer-based model input parameters,
- risk analyses of securities' impacts on a portfolio,
- selection criteria for external advisers,

- notes from clients from meetings to review investment policy statements, and
- outside research reports.

New Media Records

The increased use of new and evolving technological formats (e.g., social media) for gathering and sharing information creates new challenges in maintaining the appropriate records and files. The nature or format of the information does not remove a member's or candidate's responsibility to maintain a record of information used in his or her analysis or communicated to clients.

Members and candidates should understand that although employers and local regulators are developing digital media retention policies, these policies may lag behind the advent of new communication channels. Such lag places greater responsibility on the individual for ensuring that all relevant information is retained. Examples of non-print media formats that should be retained include, but are not limited to,

- e-mails,
- text messages,
- blog posts, and
- Twitter posts.

Records Are Property of the Firm

As a general matter, records created as part of a member's or candidate's professional activity on behalf of his or her employer are the property of the firm. When a member or candidate leaves a firm to seek other employment, the member or candidate cannot take the property of the firm, including original forms or copies of supporting records of the member's or candidate's work, to the new employer without the express consent of the previous employer. The member or candidate cannot use historical recommendations or research reports created at the previous firm because the supporting documentation is unavailable. For future use, the member or candidate must re-create the supporting records at the new firm with information gathered through public sources or directly from the covered company and not from memory or sources obtained at the previous employer.

Local Requirements

Local regulators often impose requirements on members, candidates, and their firms related to record retention that must be followed. Firms may also implement policies detailing the applicable time frame for retaining research and client communication records. Fulfilling such regulatory and firm requirements satisfies the requirements of Standard V(C). In the absence of regulatory guidance or firm policies, CFA Institute recommends maintaining records for at least seven years.

Recommended Procedures for Compliance

The responsibility to maintain records that support investment action generally falls with the firm rather than individuals. Members and candidates must, however, archive research notes and other documents, either electronically or in hard copy, that support their current investment-related communications. Doing so will assist their firms in complying with requirements for preservation of internal or external records.

Application of the Standard

Example 1 (Record Retention and IPS Objectives and Recommendations):

One of Nikolas Lindstrom's clients is upset by the negative investment returns of his equity portfolio. The investment policy statement for the client requires that the portfolio manager follow a benchmark-oriented approach. The benchmark for the client includes a 35% investment allocation in the technology sector. The client acknowledges that this allocation was appropriate, but over the past three years, technology stocks have suffered severe losses. The client complains to the investment manager for allocating so much money to this sector.

> *Comment*: For Lindstrom, having appropriate records is important to show that over the past three years, the portion of technology stocks in the benchmark index was 35%, as called for in the IPS. Lindstrom should also have the client's IPS stating that the benchmark was appropriate for the client's investment objectives. He should also have records indicating that the investment has been explained appropriately to the client and that the IPS was updated on a regular basis. Taking these actions, Lindstrom would be in compliance with Standard V(C).

Example 2 (Record Retention and Research Process):

Malcolm Young is a research analyst who writes numerous reports rating companies in the luxury retail industry. His reports are based on a variety of sources, including interviews with company managers, manufacturers, and economists; on-site company visits; customer surveys; and secondary research from analysts covering related industries.

> *Comment*: Young must carefully document and keep copies of all the information that goes into his reports, including the secondary or third-party research of other analysts. Failure to maintain such files would violate Standard V(C).

Example 3 (Records as Firm, Not Employee, Property):

Martin Blank develops an analytical model while he is employed by Green Partners Investment Management, LLP (GPIM). While at the firm, he systematically documents the assumptions that make up the model as well as his reasoning behind the assumptions. As a result of the success of his model, Blank is hired to be the head of the research department of one of GPIM's competitors. Blank takes copies of the records supporting his model to his new firm.

> *Comment*: The records created by Blank supporting the research model he developed at GPIM are the records of GPIM. Taking the documents with him to his new employer without GPIM's permission violates Standard V(C). To use the model in the future, Blank must re-create the records supporting his model at the new firm.

STANDARD VI: CONFLICTS OF INTEREST

Standard VI(A) Disclosure of Conflicts

Members and Candidates must make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and employer. Members and Candidates must ensure that such disclosures are prominent, are delivered in plain language, and communicate the relevant information effectively.

Guidance

Highlights:

- *Disclosure of Conflicts to Employers*
- *Disclosure to Clients*
- *Cross-Departmental Conflicts*
- *Conflicts with Stock Ownership*
- *Conflicts as a Director*

Best practice is to avoid actual conflicts or the appearance of conflicts of interest when possible. Conflicts of interest often arise in the investment profession. Conflicts can occur between the interests of clients, the interests of employers, and the member's or candidate's own personal interests. Common sources for conflict are compensation structures, especially incentive and bonus structures that provide immediate returns for members and candidates with little or no consideration of long-term value creation.

Identifying and managing these conflicts is a critical part of working in the investment industry and can take many forms. When conflicts cannot be reasonably avoided, clear and complete disclosure of their existence is necessary.

Standard VI(A) protects investors and employers by requiring members and candidates to fully disclose to clients, potential clients, and employers all actual and potential conflicts of interest. Once a member or candidate has made full disclosure, the member's or candidate's employer, clients, and prospective clients will have the information needed to evaluate the objectivity of the investment advice or action taken on their behalf.

To be effective, disclosures must be prominent and must be made in plain language and in a manner designed to effectively communicate the information. Members and candidates have the responsibility of determining how often, in what manner, and in what particular circumstances the disclosure of conflicts must be made. Best practices dictate updating disclosures when the nature of a conflict of interest changes materially—for example, if the nature of a conflict of interest worsens through the introduction of bonuses based on each quarter's profits as to opposed annual profits. In making and updating disclosures of conflicts of interest, members and candidates should err on the side of caution to ensure that conflicts are effectively communicated.

Disclosure of Conflicts to Employers

Disclosure of conflicts to employers may be appropriate in many instances. When reporting conflicts of interest to employers, members and candidates must give their employers enough information to assess the impact of the conflict. By complying with employer guidelines, members and candidates allow their employers to avoid potentially embarrassing and costly ethical or regulatory violations.

Reportable situations include conflicts that would interfere with rendering unbiased investment advice and conflicts that would cause a member or candidate to act not in the employer's best interest. The same circumstances that generate conflicts to be reported to clients and prospective clients also would dictate reporting to employers. Ownership of stocks analyzed or recommended, participation on outside boards, and financial or other pressures that could influence a decision are to be promptly reported to the employer so that their impact can be assessed and a decision on how to resolve the conflict can be made.

The mere appearance of a conflict of interest may create problems for members, candidates, and their employers. Therefore, many of the conflicts previously mentioned could be explicitly prohibited by an employer. For example, many employers restrict personal trading, outside board membership, and related activities to prevent situations that might not normally be considered problematic from a conflict-of-interest point of view but that could give the appearance of a conflict of interest. Members and candidates must comply with these restrictions. Members and candidates must take reasonable steps to avoid conflicts and, if they occur inadvertently, must report them promptly so that the employer and the member or candidate can resolve them as quickly and effectively as possible.

Standard VI(A) also deals with a member's or candidate's conflicts of interest that might be detrimental to the employer's business. Any potential conflict situation that could prevent clear judgment about or full commitment to the execution of a member's or candidate's duties to the employer should be reported to the member's or candidate's employer and promptly resolved.

Disclosure to Clients

Members and candidates must maintain their objectivity when rendering investment advice or taking investment action. Investment advice or actions may be perceived to be tainted in numerous situations. Can a member or candidate remain objective if, on behalf of the firm, the member or candidate obtains or assists in obtaining fees for services? Can a member or candidate give objective advice if he or she owns stock in the company that is the subject of an investment recommendation or if the member or candidate has a close personal relationship with the company managers? Requiring members and candidates to disclose all matters that reasonably could be expected to impair the member's or candidate's objectivity allows clients and prospective clients to judge motives and possible biases for themselves.

Often in the investment industry, a conflict, or the perception of a conflict, cannot be avoided. The most obvious conflicts of interest, which should always be disclosed, are relationships between an issuer and the member, the candidate, or his or her firm (such as a directorship or consultancy by a member; investment banking, underwriting, and financial relationships; broker/dealer market-making activities; and material beneficial ownership of stock). For the purposes of Standard VI(A), members and candidates beneficially own securities or other investments if they have a direct or indirect pecuniary interest in the securities, have the power to vote or direct the voting of the shares of the securities or investments, or have the power to dispose or direct the disposition of the security or investment.

A member or candidate must take reasonable steps to determine whether a conflict of interest exists and disclose to clients any known conflicts of the member's or candidate's firm. Disclosure of broker/dealer market-making activities alerts clients that a purchase or sale might be made from or to the firm's principal account and that the firm has a special interest in the price of the stock.

Additionally, disclosures should be made to clients regarding fee arrangements, subadvisory agreements, or other situations involving nonstandard fee structures. Equally important is the disclosure of arrangements in which the firm benefits directly from investment recommendations. An obvious conflict of interest is the rebate of a portion of the service fee some classes of mutual funds charge to investors. Members and candidates should ensure that their firms disclose such relationships so clients can fully understand the costs of their investments and the benefits received by their investment manager's employer.

Cross-Departmental Conflicts

Other circumstances can give rise to actual or potential conflicts of interest. For instance, a sell-side analyst working for a broker/dealer may be encouraged, not only by members of her or his own firm but by corporate issuers themselves, to write research reports about particular companies. The buy-side analyst is likely to be faced with similar conflicts as banks exercise their underwriting and security-dealing powers. The marketing division may ask an analyst to recommend the stock of a certain company in order to obtain business from that company.

The potential for conflicts of interest also exists with broker-sponsored limited partnerships formed to invest venture capital. Increasingly, members and candidates are expected not only to follow issues from these partnerships once they are offered to the public but also to promote the issues in the secondary market after public offerings. Members, candidates, and their firms should attempt to resolve situations presenting potential conflicts of interest or disclose them in accordance with the principles set forth in Standard VI(A).

Conflicts with Stock Ownership

The most prevalent conflict requiring disclosure under Standard VI(A) is a member's or candidate's ownership of stock in companies that he or she recommends to clients or that clients hold. Clearly, the easiest method for preventing a conflict is to prohibit members and candidates from owning any such securities, but this approach is overly burdensome and discriminates against members and candidates.

Therefore, sell-side members and candidates should disclose any materially beneficial ownership interest in a security or other investment that the member or candidate is recommending. Buy-side members and candidates should disclose their procedures for reporting requirements for personal transactions. Conflicts arising from personal investing are discussed more fully in the guidance for Standard VI(B).

Conflicts as a Director

Service as a director poses three basic conflicts of interest. First, a conflict may exist between the duties owed to clients and the duties owed to shareholders of the company. Second, investment personnel who serve as directors may receive the securities or options to purchase securities of the company as compensation for serving on the board, which could raise questions about trading actions that might increase the value of those securities. Third, board service creates the opportunity to receive material nonpublic information involving the company. Even though the information is confidential, the perception could be that information not available to the public is being communicated to a director's firm—whether a broker, investment adviser, or other

type of organization. When members or candidates providing investment services also serve as directors, they should be isolated from those making investment decisions by the use of firewalls or similar restrictions.

Recommended Procedures for Compliance

Members or candidates should disclose special compensation arrangements with the employer that might conflict with client interests, such as bonuses based on short-term performance criteria, commissions, incentive fees, performance fees, and referral fees. If the member's or candidate's firm does not permit such disclosure, the member or candidate should document the request and may consider dissociating from the activity.

Members' and candidates' firms are encouraged to include information on compensation packages in firms' promotional literature. If a member or candidate manages a portfolio for which the fee is based on capital gains or capital appreciation (a performance fee), this information should be disclosed to clients. If a member, a candidate, or a member's or candidate's firm has outstanding agent options to buy stock as part of the compensation package for corporate financing activities, the amount and expiration date of these options should be disclosed as a footnote to any research report published by the member's or candidate's firm.

Application of the Standard

Example 1 (Conflict of Interest and Business Relationships):

Hunter Weiss is a research analyst with Farmington Company, a broker and investment banking firm. Farmington's merger and acquisition department has represented Vimco, a conglomerate, in all of Vimco's acquisitions for 20 years. From time to time, Farmington officers sit on the boards of directors of various Vimco subsidiaries. Weiss is writing a research report on Vimco.

> *Comment*: Weiss must disclose in his research report Farmington's special relationship with Vimco. Broker/dealer management of and participation in public offerings must be disclosed in research reports. Because the position of underwriter to a company entails a special past and potential future relationship with a company that is the subject of investment advice, it threatens the independence and objectivity of the report writer and must be disclosed.

Example 2 (Conflict of Interest and Business Stock Ownership):

The investment management firm of Dover & Roe sells a 25% interest in its partnership to a multinational bank holding company, First of New York. Immediately after the sale, Margaret Hobbs, president of Dover & Roe, changes her recommendation for First of New York's common stock from "sell" to "buy" and adds First of New York's commercial paper to Dover & Roe's approved list for purchase.

> *Comment*: Hobbs must disclose the new relationship with First of New York to all Dover & Roe clients. This relationship must also be disclosed to clients by the firm's portfolio managers when they make specific investment recommendations or take investment actions with respect to First of New York's securities.

Example 3 (Conflict of Interest and Personal Stock Ownership):

Carl Fargmon, a research analyst who follows firms producing office equipment, has been recommending purchase of Kincaid Printing because of its innovative new line of copiers. After his initial report on the company, Fargmon's wife inherits from a distant relative US$3 million of Kincaid stock. He has been asked to write a follow-up report on Kincaid.

> *Comment*: Fargmon must disclose his wife's ownership of the Kincaid stock to his employer and in his follow-up report. Best practice would be to avoid the conflict by asking his employer to assign another analyst to draft the follow-up report.

Example 4 (Conflict of Interest and Personal Stock Ownership):

Betty Roberts is speculating in penny stocks for her own account and purchases 100,000 shares of Drew Mining, Inc., for US$0.30 a share. She intends to sell these shares at the sign of any substantial upward price movement of the stock. A week later, her employer asks her to write a report on penny stocks in the mining industry to be published in two weeks. Even without owning the Drew stock, Roberts would recommend it in her report as a "buy." A surge in the price of the stock to the US$2 range is likely to result once the report is issued.

> *Comment*: Although this holding may not be material, Roberts must disclose it in the report and to her employer before writing the report because the gain for her will be substantial if the market responds strongly to her recommendation. The fact that she has only recently purchased the stock adds to the appearance that she is not entirely objective.

Example 5 (Conflict of Interest and Compensation Arrangements):

Samantha Snead, a portfolio manager for Thomas Investment Counsel, Inc., specializes in managing public retirement funds and defined benefit pension plan accounts, all of which have long-term investment objectives. A year ago, Snead's employer, in an attempt to motivate and retain key investment professionals, introduced a bonus compensation system that rewards portfolio managers on the basis of quarterly performance relative to their peers and to certain benchmark indices. In an attempt to improve the short-term performance of her accounts, Snead changes her investment strategy and purchases several high-beta stocks for client portfolios. These purchases are seemingly contrary to the clients' investment policy statements. Following their purchase, an officer of Griffin Corporation, one of Snead's pension fund clients, asks why Griffin Corporation's portfolio seems to be dominated by high-beta stocks of companies that often appear among the most actively traded issues. No change in objective or strategy has been recommended by Snead during the year.

> *Comment*: Snead has violated Standard VI(A) by failing to inform her clients of the changes in her compensation arrangement with her employer, which created a conflict of interest between her compensation and her clients' IPSs. Firms may pay employees on the basis of performance, but pressure by Thomas Investment Counsel to achieve short-term performance goals is in basic conflict with the objectives of Snead's accounts.
>
> See also Standard III(C)–Suitability.

Example 6 (Conflict of Interest, Options, and Compensation Arrangements):

Wayland Securities works with small companies doing IPOs or secondary offerings. Typically, these deals are in the US$10 million to US$50 million range, and as a result, the corporate finance fees are quite small. To compensate for the small fees, Wayland Securities usually takes "agent options"—that is, rights (exercisable within a two-year time frame) to acquire up to an additional 10% of the current offering. Following an IPO performed by Wayland for Falk Resources, Ltd., Darcy Hunter, the head of corporate finance at Wayland, is concerned about receiving value for her Falk Resources options. The options are due to expire in one month, and the stock is not doing well. She contacts John Fitzpatrick in the research department of Wayland Securities, reminds him that he is eligible for 30% of these options, and indicates that now would be a good time to give some additional coverage to Falk Resources. Fitzpatrick agrees and immediately issues a favorable report.

> *Comment*: For Fitzpatrick to avoid being in violation of Standard VI(A), he must indicate in the report the volume and expiration date of agent options outstanding. Furthermore, because he is personally eligible for some of the options, Fitzpatrick must disclose the extent of this compensation. He also must be careful to not violate his duty of independence and objectivity under Standard I(B).

Example 7 (Conflict of Interest and Compensation Arrangements):

Gary Carter is a representative with Bengal International, a registered broker/dealer. Carter is approached by a stock promoter for Badger Company, who offers to pay Carter additional compensation for sales of Badger Company's stock to Carter's clients. Carter accepts the stock promoter's offer but does not disclose the arrangements to his clients or to his employer. Carter sells shares of the stock to his clients.

> *Comment*: Carter has violated Standard VI(A) by failing to disclose to clients that he is receiving additional compensation for recommending and selling Badger stock. Because he did not disclose the arrangement with Badger to his clients, the clients were unable to evaluate whether Carter's recommendations to buy Badger were affected by this arrangement. Carter's conduct also violated Standard VI(A) by failing to disclose to his employer monetary compensation received in addition to the compensation and benefits conferred by his employer. Carter was required by Standard VI(A) to disclose the arrangement with Badger to his employer so that his employer could evaluate whether the arrangement affected Carter's objectivity and loyalty.

Example 8 (Conflict of Interest and Directorship):

Carol Corky, a senior portfolio manager for Universal Management, recently became involved as a trustee with the Chelsea Foundation, a large not-for-profit foundation in her hometown. Universal is a small money manager (with assets under management of approximately US$100 million) that caters to individual investors. Chelsea has assets in excess of US$2 billion. Corky does not believe informing Universal of her involvement with Chelsea is necessary.

> *Comment*: By failing to inform Universal of her involvement with Chelsea, Corky violated Standard VI(A). Given the large size of the endowment at Chelsea, Corky's new role as a trustee can reasonably be expected to be time consuming, to the possible detriment of Corky's portfolio responsibilities with Universal. Also, as a trustee, Corky may become involved in the investment decisions at Chelsea. Therefore, Standard VI(A) obligates Corky to discuss becoming a trustee at Chelsea with her compliance officer

or supervisor at Universal before accepting the position, and she should have disclosed the degree to which she would be involved in investment decisions at Chelsea.

Example 9 (Conflict of Interest and Personal Trading):

Bruce Smith covers eastern European equities for Marlborough Investments, an investment management firm with a strong presence in emerging markets. While on a business trip to Russia, Smith learns that investing in Russian equities directly is difficult but that equity-linked notes that replicate the performance of underlying Russian equities can be purchased from a New York–based investment bank. Believing that his firm would not be interested in such a security, Smith purchases a note linked to a Russian telecommunications company for his own account without informing Marlborough. A month later, Smith decides that the firm should consider investing in Russian equities by way of the equity-linked notes. He prepares a write-up on the market that concludes with a recommendation to purchase several of the notes. One note he recommends is linked to the same Russian telecom company that Smith holds in his personal account.

Comment: Smith has violated Standard VI(A) by failing to disclose his purchase and ownership of the note linked to the Russian telecom company. Smith is required by the standard to disclose the investment opportunity to his employer and look to his company's policies on personal trading to determine whether it was proper for him to purchase the note for his own account. By purchasing the note, Smith may or may not have impaired his ability to make an unbiased and objective assessment of the appropriateness of the derivative instrument for his firm, but Smith's failure to disclose the purchase to his employer impaired his employer's ability to decide whether his ownership of the security is a conflict of interest that might affect Smith's future recommendations. Then, when he recommended the particular telecom notes to his firm, Smith compounded his problems by not disclosing that he owned the notes in his personal account—a clear conflict of interest.

Example 10 (Conflict of Interest and Requested Favors):

Michael Papis is the chief investment officer of his state's retirement fund. The fund has always used outside advisers for the real estate allocation, and this information is clearly presented in all fund communications. Thomas Nagle, a recognized sell-side research analyst and Papis's business school classmate, recently left the investment bank he worked for to start his own asset management firm, Accessible Real Estate. Nagle is trying to build his assets under management and contacts Papis about gaining some of the retirement fund's allocation. In the previous few years, the performance of the retirement fund's real estate investments was in line with the fund's benchmark but was not extraordinary. Papis decides to help out his old friend and also to seek better returns by moving the real estate allocation to Accessible. The only notice of the change in adviser appears in the next annual report in the listing of associated advisers.

Comment: Papis has violated Standard VI(A) by not disclosing to his employer his personal relationship with Nagle. Disclosure of his past history with Nagle would allow his firm to determine whether the conflict may have impaired Papis's independence in deciding to change managers.

See also Standard IV(C)–Responsibilities of Supervisors, Standard V(A)–Diligence and Reasonable Basis, and Standard V(B)–Communication with Clients and Prospective Clients.

Example 11 (Conflict of Interest and Business Relationships):

Bob Wade, trust manager for Central Midas Bank, was approached by Western Funds about promoting its family of funds, with special interest in the service-fee class. To entice Central to promote this class, Western Funds offered to pay the bank a service fee of 0.25%. Without disclosing the fee being offered to the bank, Wade asked one of the investment managers to review the Western Funds family of funds to determine whether they were suitable for clients of Central. The manager completed the normal due diligence review and determined that the funds were fairly valued in the market with fee structures on a par with their competitors. Wade decided to accept Western's offer and instructed the team of portfolio managers to exclusively promote these funds and the service-fee class to clients seeking to invest new funds or transfer from their current investments. So as to not influence the investment managers, Wade did not disclose the fee offer and allowed that income to flow directly to the bank.

> *Comment*: Wade is violating Standard VI(A) by not disclosing the portion of the service fee being paid to Central. Although the investment managers may not be influenced by the fee, neither they nor the client have the proper information about Wade's decision to exclusively market this fund family and class of investments. Central may come to rely on the new fee as a component of the firm's profitability and may be unwilling to offer other products in the future that could affect the fees received.
>
> See also Standard I(B)–Independence and Objectivity.

Example 12 (Disclosure of Conflicts to Employers):

Yehudit Dagan is a portfolio manager for Risk Management Bank (RMB), whose clients include retirement plans and corporations. RMB provides a defined contribution retirement plan for its employees that offers 20 large diversified mutual fund investment options, including a mutual fund managed by Dagan's RMB colleagues. After being employed for six months, Dagan became eligible to participate in the retirement plan, and she intends to allocate her retirement plan assets in six of the investment options, including the fund managed by her RMB colleagues. Dagan is concerned that joining the plan will lead to a potentially significant amount of paperwork for her (e.g., disclosure of her retirement account holdings and needing preclearance for her transactions), especially with her investing in the in-house fund.

> *Comment*: Standard VI(A) would not require Dagan to disclosure her personal or retirement investments in large diversified mutual funds, unless specifically required by her employer. For practical reasons, the standard does not require Dagan to gain preclearance for ongoing payroll deduction contributions to retirement plan account investment options.
>
> Dagan should ensure that her firm does not have a specific policy regarding investment—whether personal or in the retirement account—for funds managed by the company's employees. These mutual funds may be subject to the company's disclosure, preclearance, and trading restriction procedures to identify possible conflicts prior to the execution of trades.

Standard VI(B) Priority of Transactions

Investment transactions for clients and employers must have priority over investment transactions in which a Member or Candidate is the beneficial owner.

Guidance

Highlights:

- *Avoiding Potential Conflicts*
- *Personal Trading Secondary to Trading for Clients*
- *Standards for Nonpublic Information*
- *Impact on All Accounts with Beneficial Ownership*

Standard VI(B) reinforces the responsibility of members and candidates to give the interests of their clients and employers priority over their personal financial interests. This standard is designed to prevent any potential conflict of interest or the appearance of a conflict of interest with respect to personal transactions. Client interests have priority. Client transactions must take precedence over transactions made on behalf of the member's or candidate's firm or personal transactions.

Avoiding Potential Conflicts

Conflicts between the client's interest and an investment professional's personal interest may occur. Although conflicts of interest exist, nothing is inherently unethical about individual managers, advisers, or mutual fund employees making money from personal investments as long as (1) the client is not disadvantaged by the trade, (2) the investment professional does not benefit personally from trades undertaken for clients, and (3) the investment professional complies with applicable regulatory requirements.

Some situations occur where a member or candidate may need to enter a personal transaction that runs counter to current recommendations or what the portfolio manager is doing for client portfolios. For example, a member or candidate may be required at some point to sell an asset to make a college tuition payment or a down payment on a home, to meet a margin call, or so on. The sale may be contrary to the long-term advice the member or candidate is currently providing to clients. In these situations, the same three criteria given in the preceding paragraph should be applied in the transaction so as to not violate Standard VI(B).

Personal Trading Secondary to Trading for Clients

Standard VI(B) states that transactions for clients and employers must have priority over transactions in securities or other investments for which a member or candidate is the beneficial owner. The objective of the standard is to prevent personal transactions from adversely affecting the interests of clients or employers. A member or candidate having the same investment positions or being co-invested with clients does not always create a conflict. Some clients in certain investment situations require members or candidates to have aligned interests. Personal investment positions or transactions of members or candidates or their firm should never, however, adversely affect client investments.

Standards for Nonpublic Information

Standard VI(B) covers the activities of members and candidates who have knowledge of pending transactions that may be made on behalf of their clients or employers, who have access to nonpublic information during the normal preparation of research recommendations, or who take investment actions. Members and candidates are prohibited from conveying nonpublic information to any person whose relationship to the member or candidate makes the member or candidate a beneficial owner of the person's securities. Members and candidates must not convey this information to any other person if the nonpublic information can be deemed material.

Impact on All Accounts with Beneficial Ownership

Members or candidates may undertake transactions in accounts for which they are a beneficial owner only after their clients and employers have had adequate opportunity to act on a recommendation. Personal transactions include those made for the member's or candidate's own account, for family (including spouse, children, and other immediate family members) accounts, and for accounts in which the member or candidate has a direct or indirect pecuniary interest, such as a trust or retirement account. Family accounts that are client accounts should be treated like any other firm account and should neither be given special treatment nor be disadvantaged because of the family relationship. If a member or candidate has a beneficial ownership in the account, however, the member or candidate may be subject to preclearance or reporting requirements of the employer or applicable law.

Recommended Procedures for Compliance

Policies and procedures designed to prevent potential conflicts of interest, and even the appearance of a conflict of interest, with respect to personal transactions are critical to establishing investor confidence in the securities industry. Therefore, members and candidates should urge their firms to establish such policies and procedures. Because investment firms vary greatly in assets under management, types of clients, number of employees, and so on, each firm should have policies regarding personal investing that are best suited to the firm. Members and candidates should then prominently disclose these policies to clients and prospective clients.

The specific provisions of each firm's standards will vary, but all firms should adopt certain basic procedures to address the conflict areas created by personal investing. These procedures include the following:

- *Limited participation in equity IPOs*: Some eagerly awaited IPOs rise significantly in value shortly after the issue is brought to market. Because the new issue may be highly attractive and sought after, the opportunity to participate in the IPO may be limited. Therefore, purchases of IPOs by investment personnel create conflicts of interest in two principal ways. First, participation in an IPO may have the appearance of taking away an attractive investment opportunity from clients for personal gain—a clear breach of the duty of loyalty to clients. Second, personal purchases in IPOs may have the appearance that the investment opportunity is being bestowed as an incentive to make future investment decisions for the benefit of the party providing the opportunity. Members and candidates can avoid these conflicts or appearances of conflicts of interest by not participating in IPOs.

  Reliable and systematic review procedures should be established to ensure that conflicts relating to IPOs are identified and appropriately dealt with by supervisors. Members and candidates should preclear their participation in IPOs, even in situations without any conflict of interest between a member's or candidate's participation in an IPO and the client's interests. Members and

candidates should not benefit from the position that their clients occupy in the marketplace—through preferred trading, the allocation of limited offerings, or oversubscription.

- *Restrictions on private placements*: Strict limits should be placed on investment personnel acquiring securities in private placements, and appropriate supervisory and review procedures should be established to prevent noncompliance.

  Firms do not routinely use private placements for clients (e.g., venture capital deals) because of the high risk associated with them. Conflicts related to private placements are more significant to members and candidates who manage large pools of assets or act as plan sponsors because these managers may be offered special opportunities, such as private placements, as a reward or an enticement for continuing to do business with a particular broker.

  Participation in private placements raises conflict-of-interest issues that are similar to issues surrounding IPOs. Investment personnel should not be involved in transactions, including (but not limited to) private placements, that could be perceived as favors or gifts that seem designed to influence future judgment or to reward past business deals.

  Whether the venture eventually proves to be good or bad, managers have an immediate conflict concerning private placement opportunities. If and when the investments go public, participants in private placements have an incentive to recommend the investments to clients regardless of the suitability of the investments for their clients. Doing so increases the value of the participants' personal portfolios.

- *Establish blackout/restricted periods*: Investment personnel involved in the investment decision-making process should establish blackout periods prior to trades for clients so that managers cannot take advantage of their knowledge of client activity by "front-running" client trades (trading for one's personal account before trading for client accounts).

  Individual firms must decide who within the firm should be required to comply with the trading restrictions. At a minimum, all individuals who are involved in the investment decision-making process should be subject to the same restricted period. Each firm must determine specific requirements related to blackout and restricted periods that are most relevant to the firm while ensuring that the procedures are governed by the guiding principles set forth in the Code and Standards. Size of firm and type of securities purchased are relevant factors. For example, in a large firm, a blackout requirement is, in effect, a total trading ban because the firm is continually trading in most securities. In a small firm, the blackout period is more likely to prevent the investment manager from front-running.

- *Reporting requirements*: Supervisors should establish reporting procedures for investment personnel, including disclosure of personal holdings/beneficial ownerships, confirmations of trades to the firm and the employee, and preclearance procedures. Once trading restrictions are in place, they must be enforced. The best method for monitoring and enforcing procedures to eliminate conflicts of interest in personal trading is through reporting requirements, including the following:

  - **Disclosure of holdings in which the employee has a beneficial interest**. Disclosure by investment personnel to the firm should be made upon commencement of the employment relationship and at least annually thereafter. To address privacy considerations, disclosure of personal holdings should be handled in a confidential manner by the firm.

- **Providing duplicate confirmations of transactions**. Investment personnel should be required to direct their brokers to supply to firms duplicate copies or confirmations of all their personal securities transactions and copies of periodic statements for all securities accounts. The duplicate confirmation requirement has two purposes: (1) The requirement sends a message that there is independent verification, which reduces the likelihood of unethical behavior, and (2) it enables verification of the accounting of the flow of personal investments that cannot be determined from merely looking at holdings.
- **Preclearance procedures**. Investment personnel should examine all planned personal trades to identify possible conflicts prior to the execution of the trades. Preclearance procedures are designed to identify possible conflicts before a problem arises.

■ *Disclosure of policies*: Upon request, members and candidates should fully disclose to investors their firm's policies regarding personal investing. The information about employees' personal investment activities and policies will foster an atmosphere of full and complete disclosure and calm the public's legitimate concerns about the conflicts of interest posed by investment personnel's personal trading. The disclosure must provide helpful information to investors; it should not be simply boilerplate language, such as "investment personnel are subject to policies and procedures regarding their personal trading."

Application of the Standard

Example 1 (Personal Trading):

Research analyst Marlon Long does not recommend purchase of a common stock for his employer's account because he wants to purchase the stock personally and does not want to wait until the recommendation is approved and the stock is purchased by his employer.

> *Comment*: Long has violated Standard VI(B) by taking advantage of his knowledge of the stock's value before allowing his employer to benefit from that information.

Example 2 (Trading for Family Member Account):

Carol Baker, the portfolio manager of an aggressive growth mutual fund, maintains an account in her husband's name at several brokerage firms with which the fund and a number of Baker's other individual clients do a substantial amount of business. Whenever a hot issue becomes available, she instructs the brokers to buy it for her husband's account. Because such issues normally are scarce, Baker often acquires shares in hot issues but her clients are not able to participate in them.

> *Comment*: To avoid violating Standard VI(B), Baker must acquire shares for her mutual fund first and acquire them for her husband's account only after doing so, even though she might miss out on participating in new issues via her husband's account. She also must disclose the trading for her husband's account to her employer because this activity creates a conflict between her personal interests and her employer's interests.

Example 3 (Family Accounts as Equals):

Erin Toffler, a portfolio manager at Esposito Investments, manages the retirement account established with the firm by her parents. Whenever IPOs become available, she first allocates shares to all her other clients for whom the investment is appropriate; only then does she place any remaining portion in her parents' account, if the issue is appropriate for them. She has adopted this procedure so that no one can accuse her of favoring her parents.

> *Comment*: Toffler has violated Standard VI(B) by breaching her duty to her parents by treating them differently from her other accounts simply because of the family relationship. As fee-paying clients of Esposito Investments, Toffler's parents are entitled to the same treatment as any other client of the firm. If Toffler has beneficial ownership in the account, however, and Esposito Investments has preclearance and reporting requirements for personal transactions, she may have to preclear the trades and report the transactions to Esposito.

Example 4 (Personal Trading and Disclosure):

Gary Michaels is an entry-level employee who holds a low-paying job serving both the research department and the investment management department of an active investment management firm. He purchases a sports car and begins to wear expensive clothes after only a year of employment with the firm. The director of the investment management department, who has responsibility for monitoring the personal stock transactions of all employees, investigates and discovers that Michaels has made substantial investment gains by purchasing stocks just before they were put on the firm's recommended "buy" list. Michaels was regularly given the firm's quarterly personal transaction form but declined to complete it.

> *Comment*: Michaels violated Standard VI(B) by placing personal transactions ahead of client transactions. In addition, his supervisor violated Standard IV(C)–Responsibilities of Supervisors by permitting Michaels to continue to perform his assigned tasks without having signed the quarterly personal transaction form. Note also that if Michaels had communicated information about the firm's recommendations to a person who traded the security, that action would be a misappropriation of the information and a violation of Standard II(A)–Material Nonpublic Information.

Example 5 (Trading Prior to Report Dissemination):

A brokerage's insurance analyst, Denise Wilson, makes a closed-circuit TV report to her firm's branches around the country. During the broadcast, she includes negative comments about a major company in the insurance industry. The following day, Wilson's report is printed and distributed to the sales force and public customers. The report recommends that both short-term traders and intermediate investors take profits by selling that insurance company's stock. Seven minutes after the broadcast, however, Ellen Riley, head of the firm's trading department, had closed out a long "call" position in the stock. Shortly thereafter, Riley established a sizable "put" position in the stock. When asked about her activities, Riley claimed she took the actions to facilitate anticipated sales by institutional clients.

> *Comment*: Riley did not give customers an opportunity to buy or sell in the options market before the firm itself did. By taking action before the report was disseminated, Riley's firm may have depressed the price of the calls and increased the price of the puts. The firm could have avoided a conflict

of interest if it had waited to trade for its own account until its clients had an opportunity to receive and assimilate Wilson's recommendations. As it is, Riley's actions violated Standard VI(B).

Standard VI(C) Referral Fees

Members and Candidates must disclose to their employer, clients, and prospective clients, as appropriate, any compensation, consideration, or benefit received from or paid to others for the recommendation of products or services.

Guidance

Standard VI(C) states the responsibility of members and candidates to inform their employer, clients, and prospective clients of any benefit received for referrals of customers and clients. Such disclosures allow clients or employers to evaluate (1) any partiality shown in any recommendation of services and (2) the full cost of the services. Members and candidates must disclose when they pay a fee or provide compensation to others who have referred prospective clients to the member or candidate.

Appropriate disclosure means that members and candidates must advise the client or prospective client, before entry into any formal agreement for services, of any benefit given or received for the recommendation of any services provided by the member or candidate. In addition, the member or candidate must disclose the nature of the consideration or benefit—for example, flat fee or percentage basis, one-time or continuing benefit, based on performance, benefit in the form of provision of research or other noncash benefit—together with the estimated dollar value. Consideration includes all fees, whether paid in cash, in soft dollars, or in kind.

Recommended Procedures for Compliance

Members and candidates should encourage their employers to develop procedures related to referral fees. The firm may completely restrict such fees. If the firm does not adopt a strict prohibition of such fees, the procedures should indicate the appropriate steps for requesting approval.

Employers should have investment professionals provide to the clients notification of approved referral fee programs and provide the employer regular (at least quarterly) updates on the amount and nature of compensation received.

Application of the Standard

Example 1 (Disclosure of Referral Arrangements and Outside Parties):

Brady Securities, Inc., a broker/dealer, has established a referral arrangement with Lewis Brothers, Ltd., an investment counseling firm. In this arrangement, Brady Securities refers all prospective tax-exempt accounts, including pension, profit-sharing, and endowment accounts, to Lewis Brothers. In return, Lewis Brothers makes available to Brady Securities on a regular basis the security recommendations and reports of its research staff, which registered representatives of Brady Securities use in serving customers. In addition, Lewis Brothers conducts monthly economic and market reviews for Brady Securities personnel and directs all stock commission business generated by referral accounts to Brady Securities.

Willard White, a partner in Lewis Brothers, calculates that the incremental costs involved in functioning as the research department of Brady Securities are US$20,000 annually.

Referrals from Brady Securities last year resulted in fee income of US$200,000 for Lewis Brothers, and directing all stock trades through Brady Securities resulted in additional costs to Lewis Brothers' clients of US$10,000.

Diane Branch, the chief financial officer of Maxwell Inc., contacts White and says that she is seeking an investment manager for Maxwell's profit-sharing plan. She adds, "My friend Harold Hill at Brady Securities recommended your firm without qualification, and that's good enough for me. Do we have a deal?" White accepts the new account but does not disclose his firm's referral arrangement with Brady Securities.

> *Comment*: White has violated Standard VI(C) by failing to inform the prospective customer of the referral fee payable in services and commissions for an indefinite period to Brady Securities. Such disclosure could have caused Branch to reassess Hill's recommendation and make a more critical evaluation of Lewis Brothers' services.

Example 2 (Disclosure of Interdepartmental Referral Arrangements):

James Handley works for the trust department of Central Trust Bank. He receives compensation for each referral he makes to Central Trust's brokerage department and personal financial management department that results in a sale. He refers several of his clients to the personal financial management department but does not disclose the arrangement within Central Trust to his clients.

> *Comment*: Handley has violated Standard VI(C) by not disclosing the referral arrangement at Central Trust Bank to his clients. Standard VI(C) does not distinguish between referral payments paid by a third party for referring clients to the third party and internal payments paid within the firm to attract new business to a subsidiary. Members and candidates must disclose all such referral fees. Therefore, Handley is required to disclose, at the time of referral, any referral fee agreement in place among Central Trust Bank's departments. The disclosure should include the nature and the value of the benefit and should be made in writing.

Example 3 (Disclosure of Referral Arrangements and Informing Firm):

Katherine Roberts is a portfolio manager at Katama Investments, an advisory firm specializing in managing assets for high-net-worth individuals. Katama's trading desk uses a variety of brokerage houses to execute trades on behalf of its clients. Roberts asks the trading desk to direct a large portion of its commissions to Naushon, Inc., a small broker/dealer run by one of Roberts' business school classmates. Katama's traders have found that Naushon is not very competitive on pricing, and although Naushon generates some research for its trading clients, Katama's other analysts have found most of Naushon's research to be not especially useful. Nevertheless, the traders do as Roberts asks, and in return for receiving a large portion of Katama's business, Naushon recommends the investment services of Roberts and Katama to its wealthiest clients. This arrangement is not disclosed to either Katama or the clients referred by Naushon.

> *Comment*: Roberts is violating Standard VI(C) by failing to inform her employer of the referral arrangement.

Example 4 (Disclosure of Referral Arrangements and Outside Organizations):

Alex Burl is a portfolio manager at Helpful Investments, a local investment advisory firm. Burl is on the advisory board of his child's school, which is looking for ways to raise money to purchase new playground equipment for the school. Burl discusses a plan with his supervisor in which he will donate to the school a portion of his service fee from new clients referred by the parents of students at the school. Upon getting the approval from Helpful, Burl presents the idea to the school's advisory board and directors. The school agrees to announce the program at the next parent event and asks Burl to provide the appropriate written materials to be distributed. A week following the distribution of the flyers, Burl receives the first school-related referral. In establishing the client's investment policy statement, Burl clearly discusses the school's referral and outlines the plans for distributing the donation back to the school.

> *Comment*: Burl has not violated Standard VI(C) because he secured the permission of his employer, Helpful Investments, and the school prior to beginning the program and because he discussed the arrangement with the client at the time the investment policy statement was designed.

Example 5 (Disclosure of Referral Arrangements and Outside Parties):

The sponsor of a state employee pension is seeking to hire a firm to manage the pension plan's emerging market allocation. To assist in the review process, the sponsor has hired Thomas Arrow as a consultant to solicit proposals from various advisers. Arrow is contracted by the sponsor to represent its best interest in selecting the most appropriate new manager. The process runs smoothly, and Overseas Investments is selected as the new manager.

The following year, news breaks that Arrow is under investigation by the local regulator for accepting kickbacks from investment managers after they are awarded new pension allocations. Overseas Investments is included in the list of firms allegedly making these payments. Although the sponsor is happy with the performance of Overseas since it has been managing the pension plan's emerging market funds, the sponsor still decides to have an independent review of the proposals and the selection process to ensure that Overseas was the appropriate firm for its needs. This review confirms that, even though Arrow was being paid by both parties, the recommendation of Overseas appeared to be objective and appropriate.

> *Comment*: Arrow has violated Standard VI(C) because he did not disclose the fee being paid by Overseas. Withholding this information raises the question of a potential lack of objectivity in the recommendation of Overseas by Arrow; this aspect is in addition to questions about the legality of having firms pay to be considered for an allocation.
>
> Regulators and governmental agencies may adopt requirements concerning allowable consultant activities. Local regulations sometimes include having a consultant register with the regulatory agency's ethics board. Regulator policies may include a prohibition on acceptance of payments from investment managers receiving allocations and require regular reporting of contributions made to political organizations and candidates. Arrow would have to adhere to these requirements as well as the Code and Standards.

STANDARD VII: RESPONSIBILITIES AS A CFA INSTITUTE MEMBER OR CFA CANDIDATE

Standard VII(A) Conduct as Participants in CFA Institute Programs

Members and Candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of CFA Institute programs.

Guidance

Highlights:

- *Confidential Program Information*
- *Additional CFA Program Restrictions*
- *Expressing an Opinion*

Standard VII(A) covers the conduct of CFA Institute members and candidates involved with the CFA Program and prohibits any conduct that undermines the public's confidence that the CFA charter represents a level of achievement based on merit and ethical conduct. There is an array of CFA Institute programs beyond the CFA Program that provide additional educational and credentialing opportunities, including the Certificate in Investment Performance Measurement (CIPM) Program and the CFA Institute Investment Foundations™ Program. The standard's function is to hold members and candidates to a high ethical criterion while they are participating in or involved with any CFA Institute program. Conduct covered includes but is not limited to

- giving or receiving assistance (cheating) on any CFA Institute examinations;
- violating the rules, regulations, and testing policies of CFA Institute programs;
- providing confidential program or exam information to candidates or the public;
- disregarding or attempting to circumvent security measures established for any CFA Institute examinations;
- improperly using an association with CFA Institute to further personal or professional goals; and
- misrepresenting information on the Professional Conduct Statement or in the CFA Institute Continuing Education Program.

Confidential Program Information

CFA Institute is vigilant about protecting the integrity of CFA Institute programs' content and examination processes. CFA Institute program rules, regulations, and policies prohibit candidates from disclosing confidential material gained during the exam process.

Examples of information that cannot be disclosed by candidates sitting for an exam include but are not limited to

- specific details of questions appearing on the exam and
- broad topical areas and formulas tested or not tested on the exam.

All aspects of the exam, including questions, broad topical areas, and formulas, tested or not tested, are considered confidential until such time as CFA Institute elects to release them publicly. This confidentiality requirement allows CFA Institute to maintain the integrity and rigor of exams for future candidates. Standard VII(A) does not prohibit candidates from discussing nonconfidential information or curriculum material with others or in study groups in preparation for the exam.

Candidates increasingly use online forums and new technology as part of their exam preparations. CFA Institute actively polices blogs, forums, and related social networking groups for information considered confidential. The organization works with both individual candidates and the sponsors of online or offline services to promptly remove any and all violations. As noted in the discussion of Standard I(A)–Knowledge of the Law, candidates, members, and the public are encouraged to report suspected violations to CFA Institute.

Additional CFA Program Restrictions

The CFA Program rules, regulations, and policies define additional allowed and disallowed actions concerning the exams. Violating any of the testing policies, such as the calculator policy, personal belongings policy, or the Candidate Pledge, constitutes a violation of Standard VII(A). Candidates will find all of these policies on the CFA Program portion of the CFA Institute website (www.cfainstitute.org). Exhibit 2 provides the Candidate Pledge, which highlights the respect candidates must have for the integrity, validity, and security of the CFA exam.

Members may participate as volunteers in various aspects of the CFA Program. Standard VII(A) prohibits members from disclosing and/or soliciting confidential material gained prior to or during the exam and grading processes with those outside the CFA exam development process.

Examples of information that cannot be shared by members involved in developing, administering, or grading the exams include but are not limited to

- questions appearing on the exam or under consideration,
- deliberation related to the exam process, and
- information related to the scoring of questions.

Members may also be asked to offer assistance with other CFA Institute programs, including but not limited to the CIPM and Investment Foundations programs. Members participating in any CFA Institute program should do so with the same level of integrity and confidentiality as is required of participation in the CFA Program.

Expressing an Opinion

Standard VII(A) does *not* cover expressing opinions regarding CFA Institute, the CFA Program, or other CFA Institute programs. Members and candidates are free to disagree and express their disagreement with CFA Institute on its policies, its procedures, or any advocacy positions taken by the organization. When expressing a personal opinion, a candidate is prohibited from disclosing content-specific information, including any actual exam question and the information as to subject matter covered or not covered in the exam.

Exhibit 2 Sample of CFA Program Testing Policies

Candidate Pledge	As a candidate in the CFA Program, I am obligated to follow Standard VII(A) of the CFA Institute Standards of Professional Conduct, which states that members and candidates must not engage in any conduct that compromises the reputation or integrity of CFA Institute or the CFA designation or the integrity, validity, or security of the CFA exam. ■ Prior to this exam, I have not given or received information regarding the content of this exam. During this exam, I will not give or receive any information regarding the content of this exam. ■ After this exam, I will not disclose **ANY** portion of this exam and I will not remove **ANY** exam materials from the testing room in original or copied form. I understand that all exam materials, including my answers, are the property of CFA Institute and will not be returned to me in any form. ■ I will follow **ALL** rules of the CFA Program as stated on the CFA Institute website and the back cover of the exam book. My violation of any rules of the CFA Program will result in CFA Institute voiding my exam results and may lead to suspension or termination of my candidacy in the CFA Program.

Application of the Standard

Example 1 (Sharing Exam Questions):

Travis Nero serves as a proctor for the administration of the CFA examination in his city. In the course of his service, he reviews a copy of the Level II exam on the evening prior to the exam's administration and provides information concerning the exam questions to two candidates who use it to prepare for the exam.

> *Comment*: Nero and the two candidates have violated Standard VII(A). By giving information about the exam questions to two candidates, Nero provided an unfair advantage to the two candidates and undermined the integrity and validity of the Level II exam as an accurate measure of the knowledge, skills, and abilities necessary to earn the right to use the CFA designation. By accepting the information, the candidates also compromised the integrity and validity of the Level II exam and undermined the ethical framework that is a key part of the designation.

Example 2 (Bringing Written Material into Exam Room):

Loren Sullivan is enrolled to take the Level II CFA examination. He has been having difficulty remembering a particular formula, so prior to entering the exam room, he writes the formula on the palm of his hand. During the afternoon section of the exam, a proctor notices Sullivan looking at the palm of his hand. She asks to see his hand and finds the formula.

> *Comment*: Because Sullivan wrote down information from the Candidate Body of Knowledge (CBOK) and took that written information into the exam room, his conduct compromised the validity of his exam performance and violated Standard VII(A). Sullivan's conduct was also in direct contradiction with the rules and regulations of the CFA Program, the Candidate Pledge, and the CFA Institute Code and Standards.

Example 3 (Writing after Exam Period End):

At the conclusion of the morning section of the Level I CFA examination, the proctors announce, "Stop writing now." John Davis has not completed the exam, so he continues to randomly fill in ovals on his answer sheet. A proctor approaches Davis's desk and reminds him that he should stop writing immediately. Davis, however, continues to complete the answer sheet. After the proctor asks him to stop writing two additional times, Davis finally puts down his pencil.

> *Comment*: By continuing to complete his exam after time was called, Davis has violated Standard VII(A). By continuing to write, Davis took an unfair advantage over other candidates, and his conduct compromised the validity of his exam performance. Additionally, by not heeding the proctor's repeated instructions, Davis violated the rules and regulations of the CFA Program.

Example 4 (Sharing Exam Content):

After completing Level II of the CFA exam, Annabelle Rossi posts on her blog about her experience. She posts the following: "Level II is complete! I think I did fairly well on the exam. It was really difficult, but fair. I think I did especially well on the derivatives questions. And there were tons of them! I think I counted 18! The ethics questions were really hard. I'm glad I spent so much time on the Code and Standards. I was surprised to see there were no questions at all about IPO allocations. I expected there to be a couple. Well, off to celebrate getting through it. See you tonight?"

> *Comment*: Rossi did not violate Standard VII(A) when she wrote about how difficult she found the exam or how well she thinks she may have done. By revealing portions of the CBOK covered on the exam and areas not covered, however, she did violate Standard VII(A) and the Candidate Pledge. Depending on the time frame in which the comments were posted, Rossi not only may have assisted future candidates but also may have provided an unfair advantage to candidates yet to sit for the same exam, thereby undermining the integrity and validity of the Level II exam.

Example 5 (Sharing Exam Content):

Level I candidate Etienne Gagne has been a frequent visitor to an internet forum designed specifically for CFA Program candidates. The week after completing the Level I examination, Gagne and several others begin a discussion thread on the forum about the most challenging questions and attempt to determine the correct answers.

> *Comment*: Gagne has violated Standard VII(A) by providing and soliciting confidential exam information, which compromises the integrity of the exam process and violates the Candidate Pledge. In trying to determine correct answers to specific questions, the group's discussion included question-specific details considered to be confidential to the CFA Program.

Example 6 (Sharing Exam Content):

CFA4Sure is a company that produces test-preparation materials for CFA Program candidates. Many candidates register for and use the company's products. The day after the CFA examination, CFA4Sure sends an e-mail to all its customers asking them to share with the company the hardest questions from the exam so that CFA4Sure can better prepare its customers for the next exam administration. Marisol Pena e-mails a summary of the questions she found most difficult on the exam.

Comment: Pena has violated Standard VII(A) by disclosing a portion of the exam questions. The information provided is considered confidential until publicly released by CFA Institute. CFA4Sure is likely to use such feedback to refine its review materials for future candidates. Pena's sharing of the specific questions undermines the integrity of the exam while potentially making the exam easier for future candidates.

If the CFA4Sure employees who participated in the solicitation of confidential CFA Program information are CFA Institute members or candidates, they also have violated Standard VII(A).

Example 7 (Discussion of Exam Grading Guidelines and Results):

Prior to participating in grading CFA examinations, Wesley Whitcomb is required to sign a CFA Institute Grader Agreement. As part of the Grader Agreement, Whitcomb agrees not to reveal or discuss the exam materials with anyone except CFA Institute staff or other graders. Several weeks after the conclusion of the CFA exam grading, Whitcomb tells several colleagues who are candidates in the CFA Program which question he graded. He also discusses the guideline answer and adds that few candidates scored well on the question.

Comment: Whitcomb violated Standard VII(A) by breaking the Grader Agreement and disclosing information related to a specific question on the exam, which compromised the integrity of the exam process.

Example 8 (Compromising CFA Institute Integrity as a Volunteer):

Jose Ramirez is an investor-relations consultant for several small companies that are seeking greater exposure to investors. He is also the program chair for the CFA Institute society in the city where he works. Ramirez schedules only companies that are his clients to make presentations to the society and excludes other companies.

Comment: Ramirez, by using his volunteer position at CFA Institute to benefit himself and his clients, compromises the reputation and integrity of CFA Institute and thus violates Standard VII(A).

Example 9 (Compromising CFA Institute Integrity as a Volunteer):

Marguerite Warrenski is a member of the CFA Institute GIPS Executive Committee, which oversees the creation, implementation, and revision of the GIPS standards. As a member of the Executive Committee, she has advance knowledge of confidential information regarding the GIPS standards, including any new or revised standards the committee is considering. She tells her clients that her Executive Committee membership will allow her to better assist her clients in keeping up with changes to the Standards and facilitating their compliance with the changes.

Comment: Warrenski is using her association with the GIPS Executive Committee to promote her firm's services to clients and potential clients. In defining her volunteer position at CFA Institute as a strategic business advantage over competing firms and implying to clients that she would use confidential information to further their interests, Warrenski is compromising the reputation and integrity of CFA Institute and thus violating Standard VII(A). She may factually state her involvement with the Executive Committee but cannot infer any special advantage to her clients from such participation.

Standard VII(B) Reference to CFA Institute, the CFA Designation, and the CFA Program

When referring to CFA Institute, CFA Institute membership, the CFA designation, or candidacy in the CFA Program, Members and Candidates must not misrepresent or exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA Program.

Guidance

Highlights:

- *CFA Institute Membership*
- *Using the CFA Designation*
- *Referring to Candidacy in the CFA Program*
- *Proper Usage of the CFA Marks*

Standard VII(B) is intended to prevent promotional efforts that make promises or guarantees that are tied to the CFA designation. Individuals may refer to their CFA designation, CFA Institute membership, or candidacy in the CFA Program but must not exaggerate the meaning or implications of membership in CFA Institute, holding the CFA designation, or candidacy in the CFA Program.

Standard VII(B) is not intended to prohibit factual statements related to the positive benefit of earning the CFA designation. However, statements referring to CFA Institute, the CFA designation, or the CFA Program that overstate the competency of an individual or imply, either directly or indirectly, that superior performance can be expected from someone with the CFA designation are not allowed under the standard.

Statements that highlight or emphasize the commitment of CFA Institute members, CFA charterholders, and CFA candidates to ethical and professional conduct or mention the thoroughness and rigor of the CFA Program are appropriate. Members and candidates may make claims about the relative merits of CFA Institute, the CFA Program, or the Code and Standards as long as those statements are implicitly or explicitly stated as the opinion of the speaker. Statements that do not express opinions have to be supported by facts.

Standard VII(B) applies to any form of communication, including but not limited to communications made in electronic or written form (such as on firm letterhead, business cards, professional biographies, directory listings, printed advertising, firm brochures, or personal resumes) and oral statements made to the public, clients, or prospects.

CFA Institute Membership

The term "CFA Institute member" refers to "regular" and "affiliate" members of CFA Institute who have met the membership requirements as defined in the CFA Institute Bylaws. Once accepted as a CFA Institute member, the member must satisfy the following requirements to maintain his or her status:

- remit annually to CFA Institute a completed Professional Conduct Statement, which renews the commitment to abide by the requirements of the Code and Standards and the CFA Institute Professional Conduct Program, and
- pay applicable CFA Institute membership dues on an annual basis.

If a CFA Institute member fails to meet any of these requirements, the individual is no longer considered an active member. Until membership is reactivated, individuals must not present themselves to others as active members. They may state, however, that they were CFA Institute members in the past or refer to the years when their membership was active.

Using the CFA Designation

Those who have earned the right to use the Chartered Financial Analyst designation may use the trademarks or registered marks "Chartered Financial Analyst" or "CFA" and are encouraged to do so but only in a manner that does not misrepresent or exaggerate the meaning or implications of the designation. The use of the designation may be accompanied by an accurate explanation of the requirements that have been met to earn the right to use the designation.

"CFA charterholders" are those individuals who have earned the right to use the CFA designation granted by CFA Institute. These people have satisfied certain requirements, including completion of the CFA Program and required years of acceptable work experience. Once granted the right to use the designation, individuals must also satisfy the CFA Institute membership requirements (see above) to maintain their right to use the designation.

If a CFA charterholder fails to meet any of the membership requirements, he or she forfeits the right to use the CFA designation. Until membership is reactivated, individuals must not present themselves to others as CFA charterholders. They may state, however, that they were charterholders in the past.

Given the growing popularity of social media, where individuals may anonymously express their opinions, pseudonyms or online profile names created to hide a member's identity should not be tagged with the CFA designation.

Referring to Candidacy in the CFA Program

Candidates in the CFA Program may refer to their participation in the CFA Program, but such references must clearly state that an individual is a *candidate* in the CFA Program and must not imply that the candidate has achieved any type of partial designation. A person is a candidate in the CFA Program if

- the person's application for registration in the CFA Program has been accepted by CFA Institute, as evidenced by issuance of a notice of acceptance, and the person is enrolled to sit for a specified examination or
- the registered person has sat for a specified examination but exam results have not yet been received.

If an individual is registered for the CFA Program but declines to sit for an exam or otherwise does not meet the definition of a candidate as described in the CFA Institute Bylaws, then that individual is no longer considered an active candidate. Once the person is enrolled to sit for a future examination, his or her CFA candidacy resumes.

CFA candidates must never state or imply that they have a partial designation as a result of passing one or more levels or cite an expected completion date of any level of the CFA Program. Final award of the charter is subject to meeting the CFA Program requirements and approval by the CFA Institute Board of Governors.

If a candidate passes each level of the exam in consecutive years and wants to state that he or she did so, that is not a violation of Standard VII(B) because it is a statement of fact. If the candidate then goes on to claim or imply superior ability by obtaining the designation in only three years, however, he or she is in violation of Standard VII(B).

Exhibit 3 provides examples of proper and improper references to the CFA designation.

Exhibit 3 Proper and Improper References to the CFA Designation

Proper References	Improper References
"Completion of the CFA Program has enhanced my portfolio management skills."	"CFA charterholders achieve better performance results."
"John Smith passed all three CFA examinations in three consecutive years."	"John Smith is among the elite, having passed all three CFA examinations in three consecutive attempts."
"The CFA designation is globally recognized and attests to a charterholder's success in a rigorous and comprehensive study program in the field of investment management and research analysis."	"As a CFA charterholder, I am the most qualified to manage client investments."
"The credibility that the CFA designation affords and the skills the CFA Program cultivates are key assets for my future career development."	"As a CFA charterholder, Jane White provides the best value in trade execution."
"I enrolled in the CFA Program to obtain the highest set of credentials in the global investment management industry."	"Enrolling as a candidate in the CFA Program ensures one of becoming better at valuing debt securities."
"I passed Level I of the CFA exam."	"CFA, Level II"
"I am a 2010 Level III candidate in the CFA Program."	"CFA, Expected 2011"
"I passed all three levels of the CFA Program and will be eligible for the CFA charter upon completion of the required work experience."	"CFA, Expected 2011" "John Smith, Charter Pending"
"As a CFA charterholder, I am committed to the highest ethical standards."	

Proper Usage of the CFA Marks

Upon obtaining the CFA charter from CFA Institute, charterholders are given the right to use the CFA marks, including Chartered Financial Analyst®, CFA®, and the CFA logo (a certification mark):

These marks are registered by CFA Institute in countries around the world.

The Chartered Financial Analyst and CFA marks must always be used either after a charterholder's name or as adjectives (never as nouns) in written documents or oral conversations. For example, to refer to oneself as "a CFA" or "a Chartered Financial Analyst" is improper.

Members and candidates must not use a pseudonym or fictitious phrase meant to hide their identity in conjunction with the CFA designation. CFA Institute can verify only that a specific individual has earned the designation according to the name that is maintained in the membership database.

The CFA logo certification mark is used by charterholders as a distinctive visual symbol of the CFA designation that can be easily recognized by employers, colleagues, and clients. As a certification mark, it must be used only to directly refer to an individual charterholder or group of charterholders.

Exhibit 4 provides examples of correct and incorrect use of the marks. CFA charterholders should refer to the complete guidelines published by CFA Institute for additional and up-to-date information and examples illustrating proper and improper use of the CFA logo, Chartered Financial Analyst mark, and CFA mark. These guidelines and the CFA logo are available on the CFA Institute website (www.cfainstitute.org).

Exhibit 4 Correct and Incorrect Use of the Chartered Financial Analyst and CFA Marks

Correct	Incorrect	Principle
He is one of two CFA charterholders in the company. He earned the right to use the Chartered Financial Analyst designation.	He is one of two CFAs in the company. He is a Chartered Financial Analyst.	The CFA and Chartered Financial Analyst designations must always be used as adjectives, never as nouns or common names.
Jane Smith, CFA	Jane Smith, C.F.A. John Doe, cfa	No periods. Always capitalize the letters "CFA".
John Jones, CFA	John, a CFA-type portfolio manager. The focus is on Chartered Financial Analysis. CFA-equivalent program. Swiss-CFA.	Do not alter the designation to create new words or phrases.
John Jones, Chartered Financial Analyst	Jones Chartered Financial Analysts, Inc.	The designation must not be used as part of the name of a firm.
Jane Smith, CFA John Doe, Chartered Financial Analyst	Jane Smith, **CFA** John Doe, **Chartered Financial Analyst**	The CFA designation should not be given more prominence (e.g., larger or bold font) than the charterholder's name.
Level I candidate in the CFA Program.	Chartered Financial Analyst (CFA), September 2011.	Candidates in the CFA Program must not cite the expected date of exam completion and award of charter.

(continued)

Exhibit 4 (Continued)

Correct	Incorrect	Principle
Passed Level I of the CFA examination in 2010.	CFA Level I. CFA degree expected in 2011.	No designation exists for someone who has passed Level I, Level II, or Level III of the exam. The CFA designation should not be referred to as a degree.
I have passed all three levels of the CFA Program and may be eligible for the CFA charter upon completion of the required work experience.	CFA (Passed Finalist) CFA Charter Pending Pending CFA Charterholder	A candidate who has passed Level III but has not yet received his or her charter cannot use the CFA or Chartered Financial Analyst designation.
CFA Charter, 2009, CFA Institute (optional: Charlottesville, Virginia, USA)	CFA Charter, 2009, CFA Society of the UK	In citing the designation in a resume, a charterholder should use the date that he or she received the designation and should cite CFA Institute as the conferring body.
John Smith, CFA	Crazy Bear CFA (Online social media user name)	Charterholders should not attach the CFA designation to anonymous or fictitious names meant to conceal their identity.

Recommended Procedures for Compliance

Misuse of a member's CFA designation or CFA candidacy or improper reference to it is common by those in a member's or candidate's firm who do not possess knowledge of the requirements of Standard VII(B). As an appropriate step to reduce this risk, members and candidates should disseminate written information about Standard VII(B) and the accompanying guidance to their firm's legal, compliance, public relations, and marketing departments (see www.cfainstitute.org).

For materials that refer to employees' affiliation with CFA Institute, members and candidates should encourage their firms to create templates that are approved by a central authority (such as the compliance department) as being consistent with Standard VII(B). This practice promotes consistency and accuracy in the firm of references to CFA Institute membership, the CFA designation, and CFA candidacy.

Application of the Standard

Example 1 (Passing Exams in Consecutive Years):

An advertisement for AZ Investment Advisors states that all the firm's principals are CFA charterholders and all passed the three examinations on their first attempt. The advertisement prominently links this fact to the notion that AZ's mutual funds have achieved superior performance.

> *Comment*: AZ may state that all principals passed the three examinations on the first try as long as this statement is true, but it must not be linked to performance or imply superior ability. Implying that (1) CFA

charterholders achieve better investment results and (2) those who pass the exams on the first try may be more successful than those who do not violates Standard VII(B).

Example 2 (Right to Use CFA Designation):

Five years after receiving his CFA charter, Louis Vasseur resigns his position as an investment analyst and spends the next two years traveling abroad. Because he is not actively engaged in the investment profession, he does not file a completed Professional Conduct Statement with CFA Institute and does not pay his CFA Institute membership dues. At the conclusion of his travels, Vasseur becomes a self-employed analyst accepting assignments as an independent contractor. Without reinstating his CFA Institute membership by filing his Professional Conduct Statement and paying his dues, he prints business cards that display "CFA" after his name.

Comment: Vasseur has violated Standard VII(B) because his right to use the CFA designation was suspended when he failed to file his Professional Conduct Statement and stopped paying dues. Therefore, he no longer is able to state or imply that he is an active CFA charterholder. When Vasseur files his Professional Conduct Statement, resumes paying CFA Institute dues to activate his membership, and completes the CFA Institute reinstatement procedures, he will be eligible to use the CFA designation.

Example 3 ("Retired" CFA Institute Membership Status):

After a 25-year career, James Simpson retires from his firm. Because he is not actively engaged in the investment profession, he does not file a completed Professional Conduct Statement with CFA Institute and does not pay his CFA Institute membership dues. Simpson designs a plain business card (without a corporate logo) to hand out to friends with his new contact details, and he continues to put "CFA" after his name.

Comment: Simpson has violated Standard VII(B). Because he failed to file his Professional Conduct Statement and ceased paying dues, his membership has been suspended and he has given up the right to use the CFA designation. CFA Institute has procedures, however, for reclassifying a member and charterholder as "retired" and reducing the annual dues. If he wants to obtain retired status, he needs to file the appropriate paperwork with CFA Institute. When Simpson receives his notification from CFA Institute that his membership has been reclassified as retired and he resumes paying reduced dues, his membership will be reactivated and his right to use the CFA designation will be reinstated.

Example 4 (CFA Logo—Individual Use Only):

Asia Futures Ltd. is a small quantitative investment advisory firm. The firm takes great pride in the fact that all its employees are CFA charterholders. To underscore this fact, the firm's senior partner is proposing to change the firm's letterhead to include the following:

Asia Futures Ltd. CHARTERED FINANCIAL ANALYST CFA

Comment: The CFA logo is a certification mark intended to identify *individual* charterholders and must not be incorporated in a company name, confused with a company logo, or placed in such close proximity to a

company name or logo as to give the reader the idea that the certification mark certifies the company. The only appropriate use of the CFA logo is on the business card or letterhead of each individual CFA charterholder.

Example 5 (Stating Facts about CFA Designation and Program):

Rhonda Reese has been a CFA charterholder since 2000. In a conversation with a friend who is considering enrolling in the CFA Program, she states that she has learned a great deal from the CFA Program and that many firms require their employees to be CFA charterholders. She would recommend the CFA Program to anyone pursuing a career in investment management.

Comment: Reese's comments comply with Standard VII(B). Her statements refer to facts: The CFA Program enhanced her knowledge, and many firms require the CFA designation for their investment professionals.

Example 6 (Order of Professional and Academic Designations):

Tatiana Prittima has earned both her CFA designation and a PhD in finance. She would like to cite both her accomplishments on her business card but is unsure of the proper method for doing so.

Comment: The order of designations cited on such items as resumes and business cards is a matter of personal preference. Prittima is free to cite the CFA designation either before or after citing her PhD.

Example 7 (Use of Fictitious Name):

Barry Glass is the lead quantitative analyst at CityCenter Hedge Fund. Glass is responsible for the development, maintenance, and enhancement of the proprietary models the fund uses to manage its investors' assets. Glass reads several high-level mathematical publications and blogs to stay informed on current developments. One blog, run by Expert CFA, presents some intriguing research that may benefit one of CityCenter's current models. Glass is under pressure from firm executives to improve the model's predictive abilities, and he incorporates the factors discussed in the online research. The updated output recommends several new investments to the fund's portfolio managers.

Comment: "Expert CFA" has violated Standard VII(B) by using the CFA designation inappropriately. As with any research report, authorship of online comments must include the charterholder's full name along with any reference to the CFA designation.

See also Standard V(A), which Glass has violated for guidance on diligence and reasonable basis.

PRACTICE PROBLEMS

Unless otherwise stated in the question, all individuals in the following questions are CFA Institute members or candidates in the CFA Program and, therefore, are subject to the CFA Institute Code of Ethics and Standards of Professional Conduct.

1 Smith, a research analyst with a brokerage firm, decides to change his recommendation for the common stock of Green Company, Inc., from a "buy" to a "sell." He mails this change in investment advice to all the firm's clients on Wednesday. The day after the mailing, a client calls with a buy order for 500 shares of Green Company. In this circumstance, Smith should:

A Accept the order.

B Advise the customer of the change in recommendation before accepting the order.

C Not accept the order because it is contrary to the firm's recommendation.

2 Which statement about a manager's use of client brokerage commissions violates the Code and Standards?

A A client may direct a manager to use that client's brokerage commissions to purchase goods and services for that client.

B Client brokerage commissions should be used to benefit the client and should be commensurate with the value of the brokerage and research services received.

C Client brokerage commissions may be directed to pay for the investment manager's operating expenses.

3 Jamison is a junior research analyst with Howard & Howard, a brokerage and investment banking firm. Howard & Howard's mergers and acquisitions department has represented the Britland Company in all of its acquisitions for the past 20 years. Two of Howard & Howard's senior officers are directors of various Britland subsidiaries. Jamison has been asked to write a research report on Britland. What is the best course of action for her to follow?

A Jamison may write the report but must refrain from expressing any opinions because of the special relationships between the two companies.

B Jamison should not write the report because the two Howard & Howard officers serve as directors for subsidiaries of Britland.

C Jamison may write the report if she discloses the special relationships with the company in the report.

4 Which of the following statements clearly *conflicts* with the recommended procedures for compliance presented in the CFA Institute *Standards of Practice Handbook*?

A Firms should disclose to clients the personal investing policies and procedures established for their employees.

B Prior approval must be obtained for the personal investment transactions of all employees.

C For confidentiality reasons, personal transactions and holdings should not be reported to employers unless mandated by regulatory organizations.

5 Bronson provides investment advice to the board of trustees of a private university endowment fund. The trustees have provided Bronson with the fund's financial information, including planned expenditures. Bronson receives a

© 2014 CFA Institute. All rights reserved.

phone call on Friday afternoon from Murdock, a prominent alumnus, requesting that Bronson fax him comprehensive financial information about the fund. According to Murdock, he has a potential contributor but needs the information that day to close the deal and cannot contact any of the trustees. Based on the CFA Institute Standards, Bronson should:

A Send Murdock the information because disclosure would benefit the client.

B Not send Murdock the information to preserve confidentiality.

C Send Murdock the information, provided Bronson promptly notifies the trustees.

6 Miller heads the research department of a large brokerage firm. The firm has many analysts, some of whom are subject to the Code and Standards. If Miller delegates some supervisory duties, which statement best describes her responsibilities under the Code and Standards?

A Miller's supervisory responsibilities do not apply to those subordinates who are not subject to the Code and Standards.

B Miller no longer has supervisory responsibility for those duties delegated to her subordinates.

C Miller retains supervisory responsibility for all subordinates despite her delegation of some duties.

7 Willier is the research analyst responsible for following Company X. All the information he has accumulated and documented suggests that the outlook for the company's new products is poor, so the stock should be rated a weak "hold." During lunch, however, Willier overhears a financial analyst from another firm whom he respects offer opinions that conflict with Willier's forecasts and expectations. Upon returning to his office, Willier releases a strong "buy" recommendation to the public. Willier:

A Violated the Standards by failing to distinguish between facts and opinions in his recommendation.

B Violated the Standards because he did not have a reasonable and adequate basis for his recommendation.

C Was in full compliance with the Standards.

8 An investment management firm has been hired by ETV Corporation to work on an additional public offering for the company. The firm's brokerage unit now has a "sell" recommendation on ETV, but the head of the investment banking department has asked the head of the brokerage unit to change the recommendation from "sell" to "buy." According to the Standards, the head of the brokerage unit would be permitted to:

A Increase the recommendation by no more than one increment (in this case, to a "hold" recommendation).

B Place the company on a restricted list and give only factual information about the company.

C Assign a new analyst to decide if the stock deserves a higher rating.

9 Albert and Tye, who recently started their own investment advisory business, have registered to take the Level III CFA examination. Albert's business card reads, "Judy Albert, CFA Level II." Tye has not put anything about the CFA designation on his business card, but promotional material that he designed for the business describes the CFA requirements and indicates that Tye participates in the CFA Program and has completed Levels I and II. According to the Standards:

A Albert has violated the Standards, but Tye has not.

B Tye has violated the Standards, but Albert has not.

C Both Albert and Tye have violated the Standards.

10 Scott works for a regional brokerage firm. He estimates that Walkton Industries will increase its dividend by US$1.50 a share during the next year. He realizes that this increase is contingent on pending legislation that would, if enacted, give Walkton a substantial tax break. The US representative for Walkton's home district has told Scott that, although she is lobbying hard for the bill and prospects for its passage are favorable, concern of the US Congress over the federal deficit could cause the tax bill to be voted down. Walkton Industries has not made any statements about a change in dividend policy. Scott writes in his research report, "We expect Walkton's stock price to rise by at least US$8.00 a share by the end of the year because the dividend will increase by US$1.50 a share. Investors buying the stock at the current time should expect to realize a total return of at least 15% on the stock." According to the Standards:

A Scott violated the Standards because he used material inside information.

B Scott violated the Standards because he failed to separate opinion from fact.

C Scott violated the Standards by basing his research on uncertain predictions of future government action.

11 Which one of the following actions will help to ensure the fair treatment of brokerage firm clients when a new investment recommendation is made?

A Informing all people in the firm in advance that a recommendation is to be disseminated.

B Distributing recommendations to institutional clients prior to individual accounts.

C Minimizing the time between the decision and the dissemination of a recommendation.

12 The mosaic theory holds that an analyst:

A Violates the Code and Standards if the analyst fails to have knowledge of and comply with applicable laws.

B Can use material public information and nonmaterial nonpublic information in the analyst's analysis.

C Should use all available and relevant information in support of an investment recommendation.

13 Jurgen is a portfolio manager. One of her firm's clients has told Jurgen that he will compensate her beyond the compensation provided by her firm on the basis of the capital appreciation of his portfolio each year. Jurgen should:

A Turn down the additional compensation because it will result in conflicts with the interests of other clients' accounts.

B Turn down the additional compensation because it will create undue pressure on her to achieve strong short-term performance.

C Obtain permission from her employer prior to accepting the compensation arrangement.

14 One of the discretionary accounts managed by Farnsworth is the Jones Corporation employee profit-sharing plan. Jones, the company president, recently asked Farnsworth to vote the shares in the profit-sharing plan in favor of the slate of directors nominated by Jones Corporation and against the directors sponsored by a dissident stockholder group. Farnsworth does not want to lose this account because he directs all the account's trades to a brokerage firm that provides Farnsworth with useful information about tax-free investments. Although this information is not of value in managing the Jones Corporation

account, it does help in managing several other accounts. The brokerage firm providing this information also offers the lowest commissions for trades and provides best execution. Farnsworth investigates the director issue, concludes that the management-nominated slate is better for the long-run performance of the company than the dissident group's slate, and votes accordingly. Farnsworth:

A Violated the Standards in voting the shares in the manner requested by Jones but not in directing trades to the brokerage firm.

B Did not violate the Standards in voting the shares in the manner requested by Jones or in directing trades to the brokerage firm.

C Violated the Standards in directing trades to the brokerage firm but not in voting the shares as requested by Jones.

15 Brown works for an investment counseling firm. Green, a new client of the firm, is meeting with Brown for the first time. Green used another counseling firm for financial advice for years, but she has switched her account to Brown's firm. After spending a few minutes getting acquainted, Brown explains to Green that she has discovered a highly undervalued stock that offers large potential gains. She recommends that Green purchase the stock. Brown has committed a violation of the Standards. What should she have done differently?

A Brown should have determined Green's needs, objectives, and tolerance for risk before making a recommendation of any type of security.

B Brown should have thoroughly explained the characteristics of the company to Green, including the characteristics of the industry in which the company operates.

C Brown should have explained her qualifications, including her education, training, and experience and the meaning of the CFA designation.

16 Grey recommends the purchase of a mutual fund that invests solely in long-term US Treasury bonds. He makes the following statements to his clients:

I. "The payment of the bonds is guaranteed by the US government; therefore, the default risk of the bonds is virtually zero."

II. "If you invest in the mutual fund, you will earn a 10% rate of return each year for the next several years based on historical performance of the market."

Did Grey's statements violate the CFA Institute Code and Standards?

A Neither statement violated the Code and Standards.

B Only statement I violated the Code and Standards.

C Only statement II violated the Code and Standards.

17 Anderb, a portfolio manager for XYZ Investment Management Company—a registered investment organization that advises investment firms and private accounts—was promoted to that position three years ago. Bates, her supervisor, is responsible for reviewing Anderb's portfolio account transactions and her required monthly reports of personal stock transactions. Anderb has been using Jonelli, a broker, almost exclusively for brokerage transactions for the portfolio account. For securities in which Jonelli's firm makes a market, Jonelli has been giving Anderb lower prices for personal purchases and higher prices for personal sales than Jonelli gives to Anderb's portfolio accounts and other investors. Anderb has been filing monthly reports with Bates only for those months in which she has no personal transactions, which is about every fourth month. Which of the following is *most likely* to be a violation of the Code and Standards?

A Anderb failed to disclose to her employer her personal transactions.

B Anderb owned the same securities as those of her clients.

C Bates allowed Anderb to use Jonelli as her broker for personal trades.

18 Which of the following is a correct statement of a member's or candidate's duty under the Code and Standards?

A In the absence of specific applicable law or other regulatory requirements, the Code and Standards govern the member's or candidate's actions.

B A member or candidate is required to comply only with applicable local laws, rules, regulations, or customs, even though the Code and Standards may impose a higher degree of responsibility or a higher duty on the member or candidate.

C A member or candidate who trades securities in a securities market where no applicable local laws or stock exchange rules regulate the use of material nonpublic information may take investment action based on material nonpublic information.

19 Ward is scheduled to visit the corporate headquarters of Evans Industries. Ward expects to use the information he obtains there to complete his research report on Evans stock. Ward learns that Evans plans to pay all of Ward's expenses for the trip, including costs of meals, hotel room, and air transportation. Which of the following actions would be the *best* course for Ward to take under the Code and Standards?

A Accept the expense-paid trip and write an objective report.

B Pay for all travel expenses, including costs of meals and incidental items.

C Accept the expense-paid trip but disclose the value of the services accepted in the report.

20 Which of the following statements is *correct* under the Code and Standards?

A CFA Institute members and candidates are prohibited from undertaking independent practice in competition with their employer.

B Written consent from the employer is necessary to permit independent practice that could result in compensation or other benefits in competition with a member's or candidate's employer.

C Members and candidates are prohibited from making arrangements or preparations to go into a competitive business before terminating their relationship with their employer.

21 Smith is a financial analyst with XYZ Brokerage Firm. She is preparing a purchase recommendation on JNI Corporation. Which of the following situations is *most likely* to represent a conflict of interest for Smith that would have to be disclosed?

A Smith frequently purchases items produced by JNI.

B XYZ holds for its own account a substantial common stock position in JNI.

C Smith's brother-in-law is a supplier to JNI.

22 Michelieu tells a prospective client, "I may not have a long-term track record yet, but I'm sure that you'll be very pleased with my recommendations and service. In the three years that I've been in the business, my equity-oriented clients have averaged a total return of more than 26% a year." The statement is true, but Michelieu only has a few clients, and one of his clients took a large position in a penny stock (against Michelieu's advice) and realized a huge gain. This large return caused the average of all of Michelieu's clients to exceed 26% a year. Without this one investment, the average gain would have been 8% a year. Has Michelieu violated the Standards?

A No, because Michelieu is not promising that he can earn a 26% return in the future.

B No, because the statement is a true and accurate description of Michelieu's track record.

C Yes, because the statement misrepresents Michelieu's track record.

23 An investment banking department of a brokerage firm often receives material nonpublic information that could have considerable value if used in advising the firm's brokerage clients. In order to conform to the Code and Standards, which one of the following is the best policy for the brokerage firm?

A Permanently prohibit both "buy" and "sell" recommendations of the stocks of clients of the investment banking department.

B Establish physical and informational barriers within the firm to prevent the exchange of information between the investment banking and brokerage operations.

C Monitor the exchange of information between the investment banking department and the brokerage operation.

24 Stewart has been hired by Goodner Industries, Inc., to manage its pension fund. Stewart's duty of loyalty, prudence, and care is owed to:

A The management of Goodner.

B The participants and beneficiaries of Goodner's pension plan.

C The shareholders of Goodner.

25 Which of the following statements is a stated purpose of disclosure in Standard VI(C)—Referral Fees?

A Disclosure will allow the client to request discounted service fees.

B Disclosure will help the client evaluate any possible partiality shown in the recommendation of services.

C Disclosure means advising a prospective client about the referral arrangement once a formal client relationship has been established.

26 Rose, a portfolio manager for a local investment advisory firm, is planning to sell a portion of his personal investment portfolio to cover the costs of his child's academic tuition. Rose wants to sell a portion of his holdings in Household Products, but his firm recently upgraded the stock to "strong buy." Which of the following describes Rose's options under the Code and Standards?

A Based on his firm's "buy" recommendation, Rose cannot sell the shares because he would be improperly prospering from the inflated recommendation.

B Rose is free to sell his personal holdings once his firm is properly informed of his intentions.

C Rose can sell his personal holdings but only when a client of the firm places an order to buy shares of Household.

27 A former hedge fund manager, Jackman, has decided to launch a new private wealth management firm. From his prior experiences, he believes the new firm needs to achieve US$1 million in assets under management in the first year. Jackman offers a $10,000 incentive to any adviser who joins his firm with the minimum of $200,000 in committed investments. Jackman places notice of the opening on several industry web portals and career search sites. Which of the following is *correct* according to the Code and Standards?

A A member or candidate is eligible for the new position and incentive if he or she can arrange for enough current clients to switch to the new firm and if the member or candidate discloses the incentive fee.

B A member or candidate may not accept employment with the new firm because Jackman's incentive offer violates the Code and Standards.

C A member or candidate is not eligible for the new position unless he or she is currently unemployed because soliciting the clients of the member's or candidate's current employer is prohibited.

28 Carter works for Invest Today, a local asset management firm. A broker that provides Carter with proprietary research through client brokerage arrangements is offering a new trading service. The broker is offering low-fee, execution-only trades to complement its traditional full-service, execution-and-research trades. To entice Carter and other asset managers to send additional business its way, the broker will apply the commissions paid on the new service toward satisfying the brokerage commitment of the prior full-service arrangements. Carter has always been satisfied with the execution provided on the full-service trades, and the new low-fee trades are comparable to the fees of other brokers currently used for the accounts that prohibit soft dollar arrangements.

A Carter can trade for his accounts that prohibit soft dollar arrangements under the new low-fee trading scheme.

B Carter cannot use the new trading scheme because the commissions are prohibited by the soft dollar restrictions of the accounts.

C Carter should trade only through the new low-fee scheme and should increase his trading volume to meet his required commission commitment.

29 Rule has worked as a portfolio manager for a large investment management firm for the past 10 years. Rule earned his CFA charter last year and has decided to open his own investment management firm. After leaving his current employer, Rule creates some marketing material for his new firm. He states in the material, "In earning the CFA charter, a highly regarded credential in the investment management industry, I further enhanced the portfolio management skills learned during my professional career. While completing the examination process in three consecutive years, I consistently received the highest possible scores on the topics of Ethics, Alternative Investments, and Portfolio Management." Has Rule violated Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program in his marketing material?

A Rule violated Standard VII(B) in stating that he completed the exams in three consecutive years.

B Rule violated Standard VII(B) in stating that he received the highest scores in the topics of Ethics, Alternative Investments, and Portfolio Management.

C Rule did not violate Standard VII(B).

30 Stafford is a portfolio manager for a specialized real estate mutual fund. Her firm clearly describes in the fund's prospectus its soft dollar policies. Stafford decides that entering the CFA Program will enhance her investment decision-making skill and decides to use the fund's soft dollar account to pay the registration and exam fees for the CFA Program. Which of the following statements is *most likely* correct?

A Stafford did not violate the Code and Standards because the prospectus informed investors of the fund's soft dollar policies.

B Stafford violated the Code and Standards because improving her investment skills is not a reasonable use of the soft dollar account.

C Stafford violated the Code and Standards because the CFA Program does not meet the definition of research allowed to be purchased with brokerage commissions.

31 Long has been asked to be the keynote speaker at an upcoming investment conference. The event is being hosted by one of the third-party investment managers currently used by his pension fund. The manager offers to cover all conference and travel costs for Long and make the conference registrations free for three additional members of his investment management team. To ensure that the conference obtains the best speakers, the host firm has arranged for an exclusive golf outing for the day following the conference on a local championship-caliber course. Which of the following is *least likely* to violate Standard I(B)?

A Long may accept only the offer to have his conference-related expenses paid by the host firm.

B Long may accept the offer to have his conference-related expenses paid and may attend the exclusive golf outing at the expense of the hosting firm.

C Long may accept the entire package of incentives offered to speak at this conference.

32 Andrews, a private wealth manager, is conducting interviews for a new research analyst for his firm. One of the candidates is Wright, an analyst with a local investment bank. During the interview, while Wright is describing his analytical skills, he mentions a current merger in which his firm is acting as the adviser. Andrews has heard rumors of a possible merger between the two companies, but no releases have been made by the companies concerned. Which of the following actions by Andrews is *least likely* a violation of the Code and Standards?

A Waiting until the next day before trading on the information to allow time for it to become public.

B Notifying all investment managers in his firm of the new information so none of their clients are disadvantaged.

C Placing the securities mentioned as part of the merger on the firm's restricted trading list.

33 Pietro, president of Local Bank, has hired the bank's market maker, Vogt, to seek a merger partner. Local is currently not listed on a stock exchange and has not reported that it is seeking strategic alternatives. Vogt has discussed the possibility of a merger with several firms, but they have all decided to wait until after the next period's financial data are available. The potential buyers believe the results will be worse than the results of prior periods and will allow them to pay less for Local Bank.

Pietro wants to increase the likelihood of structuring a merger deal quickly. Which of the following actions would *most likely* be a violation of the Code and Standards?

A Pietro could instruct Local Bank to issue a press release announcing that it has retained Vogt to find a merger partner.

B Pietro could place a buy order for 2,000 shares (or four times the average weekly volume) through Vogt for his personal account.

C After confirming with Local's chief financial officer, Pietro could instruct Local to issue a press release reaffirming the firm's prior announced earnings guidance for the full fiscal year.

34 ABC Investment Management acquires a new, very large account with two concentrated positions. The firm's current policy is to add new accounts for the purpose of performance calculation after the first full month of management.

Cupp is responsible for calculating the firm's performance returns. Before the end of the initial month, Cupp notices that one of the significant holdings of the new accounts is acquired by another company, causing the value of the investment to double. Because of this holding, Cupp decides to account for the new portfolio as of the date of transfer, thereby allowing ABC Investment to reap the positive impact of that month's portfolio return.

A Cupp did not violate the Code and Standards because the GIPS standards allow composites to be updated on the date of large external cash flows.

B Cupp did not violate the Code and Standards because companies are allowed to determine when to incorporate new accounts into their composite calculation.

C Cupp violated the Code and Standards because the inclusion of the new account produces an inaccurate calculation of the monthly results according to the firm's stated policies.

35 Cannan has been working from home on weekends and occasionally saves correspondence with clients and completed work on her home computer. Because of worsening market conditions, Cannan is one of several employees released by her firm. While Cannan is looking for a new job, she uses the files she saved at home to request letters of recommendation from former clients. She also provides to prospective clients some of the reports as examples of her abilities.

A Cannan violated the Code and Standards because she did not receive permission from her former employer to keep or use the files after her employment ended.

B Cannan did not violate the Code and Standards because the files were created and saved on her own time and computer.

C Cannan violated the Code and Standards because she is prohibited from saving files on her home computer.

36 Quinn sat for the Level III CFA exam this past weekend. He updates his resume with the following statement: "In finishing the CFA Program, I improved my skills related to researching investments and managing portfolios. I will be eligible for the CFA charter upon completion of the required work experience."

A Quinn violated the Code and Standards by claiming he improved his skills through the CFA Program.

B Quinn violated the Code and Standards by incorrectly stating that he is eligible for the CFA charter.

C Quinn did not violate the Code and Standards with his resume update.

37 During a round of golf, Rodriguez, chief financial officer of Mega Retail, mentions to Hart, a local investment adviser and long-time personal friend, that Mega is having an exceptional sales quarter. Rodriguez expects the results to be almost 10% above the current estimates. The next day, Hart initiates the purchase of a large stake in the local exchange-traded retail fund for her personal account.

A Hart violated the Code and Standards by investing in the exchange-traded fund that included Mega Retail.

B Hart did not violate the Code and Standards because she did not invest directly in securities of Mega Retail.

C Rodriguez did not violate the Code and Standards because the comments made to Hart were not intended to solicit an investment in Mega Retail.

38 Park is very frustrated after taking her Level II exam. While she was studying for the exam, to supplement the curriculum provided, she ordered and used study material from a third-party provider. Park believes the additional material focused her attention on specific topic areas that were not tested while ignoring other areas. She posts the following statement on the provider's discussion board: "I am very dissatisfied with your firm's CFA Program Level II material. I found the exam extremely difficult and myself unprepared for specific questions after using your product. How could your service provide such limited instructional resources on the analysis of inventories and taxes when the exam had multiple questions about them? I will not recommend your products to other candidates."

A Park violated the Code and Standards by purchasing third-party review material.

B Park violated the Code and Standards by providing her opinion on the difficulty of the exam.

C Park violated the Code and Standards by providing specific information on topics tested on the exam.

39 Paper was recently terminated as one of a team of five managers of an equity fund. The fund had two value-focused managers and terminated one of them to reduce costs. In a letter sent to prospective employers, Paper presents, with written permission of the firm, the performance history of the fund to demonstrate his past success.

A Paper did not violate the Code and Standards.

B Paper violated the Code and Standards by claiming the performance of the entire fund as his own.

C Paper violated the Code and Standards by including the historical results of his prior employer.

40 Townsend was recently appointed to the board of directors of a youth golf program that is the local chapter of a national not-for-profit organization. The program is beginning a new fund-raising campaign to expand the number of annual scholarships it provides. Townsend believes many of her clients make annual donations to charity. The next week in her regular newsletter to all clients, she includes a small section discussing the fund-raising campaign and her position on the organization's board.

A Townsend did not violate the Code and Standards.

B Townsend violated the Code and Standards by soliciting donations from her clients through the newsletter.

C Townsend violated the Code and Standards by not getting approval of the organization before soliciting her clients.

SOLUTIONS

1 The correct answer is B. This question involves Standard III(B)—Fair Dealing. Smith disseminated a change in the stock recommendation to his clients but then received a request contrary to that recommendation from a client who probably had not yet received the recommendation. Prior to executing the order, Smith should take additional steps to ensure that the customer has received the change of recommendation. Answer A is incorrect because the client placed the order prior to receiving the recommendation and, therefore, does not have the benefit of Smith's most recent recommendation. Answer C is also incorrect; simply because the client request is contrary to the firm's recommendation does not mean a member can override a direct request by a client. After Smith contacts the client to ensure that the client has received the changed recommendation, if the client still wants to place a buy order for the shares, Smith is obligated to comply with the client's directive.

2 The correct answer is C. This question involves Standard III(A)—Loyalty, Prudence, and Care and the specific topic of soft dollars or soft commissions. Answer C is the correct choice because client brokerage commissions may not be directed to pay for the investment manager's operating expenses. Answer B describes how members and candidates should determine how to use brokerage commissions—that is, if the use is in the best interests of clients and is commensurate with the value of the services provided. Answer A describes a practice that is commonly referred to as "directed brokerage." Because brokerage is an asset of the client and is used to benefit the client, not the manager, such practice does not violate a duty of loyalty to the client. Members and candidates are obligated in all situations to disclose to clients their practices in the use of client brokerage commissions.

3 The correct answer is C. This question involves Standard VI(A)—Disclosure of Conflicts. The question establishes a conflict of interest in which an analyst, Jamison, is asked to write a research report on a company that is a client of the analyst's employer. In addition, two directors of the company are senior officers of Jamison's employer. Both facts establish that there are conflicts of interest that must be disclosed by Jamison in her research report. Answer B is incorrect because an analyst is not prevented from writing a report simply because of the special relationship the analyst's employer has with the company as long as that relationship is disclosed. Answer A is incorrect because whether or not Jamison expresses any opinions in the report is irrelevant to her duty to disclose a conflict of interest. Not expressing opinions does not relieve the analyst of the responsibility to disclose the special relationships between the two companies.

4 The correct answer is C. This question asks about compliance procedures relating to personal investments of members and candidates. The statement in answer C clearly conflicts with the recommended procedures in the *Standards of Practice Handbook*. Employers should compare personal transactions of employees with those of clients on a regular basis regardless of the existence of a requirement by any regulatory organization. Such comparisons ensure that employees' personal trades do not conflict with their duty to their clients, and the comparisons can be conducted in a confidential manner. The statement in answer A does not conflict with the procedures in the *Handbook*. Disclosure of such policies will give full information to clients regarding potential conflicts of interest on the part of those entrusted to manage their money. Answer B is incorrect because firms are encouraged to establish policies whereby employees clear their personal holdings and transactions with their employers.

5 The correct answer is B. This question relates to Standard III(A)—Loyalty, Prudence, and Care and Standard III(E)—Preservation of Confidentiality. In this case, the member manages funds of a private endowment. Clients, who are, in this case, the trustees of the fund, must place some trust in members and candidates. Bronson cannot disclose confidential financial information to anyone without the permission of the fund, regardless of whether the disclosure may benefit the fund. Therefore, answer A is incorrect. Answer C is incorrect because Bronson must notify the fund and obtain the fund's permission before publicizing the information.

6 The correct answer is C. Under Standard IV(C)—Responsibilities of Supervisors, members and candidates may delegate supervisory duties to subordinates but such delegation does not relieve members or candidates of their supervisory responsibilities. As a result, answer B is incorrect. Moreover, whether or not Miller's subordinates are subject to the Code and Standards is irrelevant to her supervisory responsibilities. Therefore, answer A is incorrect.

7 The correct answer is B. This question relates to Standard V(A)—Diligence and Reasonable Basis. The opinion of another financial analyst is not an adequate basis for Willier's action in changing the recommendation. Answer C is thus incorrect. So is answer A because, although it is true that members and candidates must distinguish between facts and opinions in recommendations, the question does not illustrate a violation of that nature. If the opinion overheard by Willier had sparked him to conduct additional research and investigation that justified a change of opinion, then a changed recommendation would be appropriate.

8 The correct answer is B. This question relates to Standard I(B)—Independence and Objectivity. When asked to change a recommendation on a company stock to gain business for the firm, the head of the brokerage unit must refuse in order to maintain his independence and objectivity in making recommendations. He must not yield to pressure by the firm's investment banking department. To avoid the appearance of a conflict of interest, the firm should discontinue issuing recommendations about the company. Answer A is incorrect; changing the recommendation in any manner that is contrary to the analyst's opinion violates the duty to maintain independence and objectivity. Answer C is incorrect because merely assigning a new analyst to decide whether the stock deserves a higher rating will not address the conflict of interest.

9 The correct answer is A. Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program is the subject of this question. The reference on Albert's business card implies that there is a "CFA Level II" designation; Tye merely indicates in promotional material that he is participating in the CFA Program and has completed Levels I and II. Candidates may not imply that there is some sort of partial designation earned after passing a level of the CFA exam. Therefore, Albert has violated Standard VII(B). Candidates may communicate that they are participating in the CFA Program, however, and may state the levels that they have completed. Therefore, Tye has not violated Standard VII(B).

10 The correct answer is B. This question relates to Standard V(B)—Communication with Clients and Prospective Clients. Scott has issued a research report stating that he expects the price of Walkton Industries stock to rise by US$8 a share "because the dividend will increase" by US$1.50 per share. He has made this statement knowing that the dividend will increase only if Congress enacts certain legislation, an uncertain prospect. By stating that the dividend will increase, Scott failed to separate fact from opinion.

The information regarding passage of legislation is not material nonpublic information because it is conjecture, and the question does not state whether the US representative gave Scott her opinion on the passage of the legislation in confidence. She could have been offering this opinion to anyone who asked. Therefore, statement A is incorrect. It may be acceptable to base a recommendation, in part, on an expectation of future events, even though they may be uncertain. Therefore, answer C is incorrect.

11 The correct answer is C. This question, which relates to Standard III(B)—Fair Dealing, tests the knowledge of the procedures that will assist members and candidates in treating clients fairly when making investment recommendations. The step listed in C will help ensure the fair treatment of clients. Answer A may have negative effects on the fair treatment of clients. The more people who know about a pending change, the greater the chance that someone will inform some clients before the information's release. The firm should establish policies that limit the number of people who are aware in advance that a recommendation is to be disseminated. Answer B, distributing recommendations to institutional clients before distributing them to individual accounts, discriminates among clients on the basis of size and class of assets and is a violation of Standard III(B).

12 The correct answer is B. This question deals with Standard II(A)—Material Nonpublic Information. The mosaic theory states that an analyst may use material public information and nonmaterial nonpublic information in creating a larger picture than shown by any individual piece of information and the conclusions the analyst reaches become material only after the pieces are assembled. Answers A and C are accurate statements relating to the Code and Standards but do not describe the mosaic theory.

13 The correct answer is C. This question involves Standard IV(B)—Additional Compensation Arrangements. The arrangement described in the question—whereby Jurgen would be compensated beyond the compensation provided by her firm, on the basis of an account's performance—is not a violation of the Standards as long as Jurgen discloses the arrangement in writing to her employer and obtains permission from her employer prior to entering into the arrangement. Answers A and B are incorrect; although the private compensation arrangement could conflict with the interests of other clients and lead to short-term performance pressures, members and candidates may enter into such agreements as long as they have disclosed the arrangements to their employer and obtained permission for the arrangement from their employer.

14 The correct answer is B. This question relates to Standard III(A)—Loyalty, Prudence, and Care—specifically, a member's or candidate's responsibility for voting proxies and the use of client brokerage. According to the facts stated in the question, Farnsworth did not violate Standard III(A). Although the company president asked Farnsworth to vote the shares of the Jones Corporation profit-sharing plan a certain way, Farnsworth investigated the issue and concluded, independently, the best way to vote. Therefore, even though his decision coincided with the wishes of the company president, Farnsworth is not in violation of his responsibility to be loyal and to provide care to his clients. In this case, the participants and the beneficiaries of the profit-sharing plan are the clients, not the company's management. Had Farnsworth not investigated the issue or had he yielded to the president's wishes and voted for a slate of directors that he had determined was not in the best interest of the company, Farnsworth would have violated his responsibilities to the beneficiaries of the plan. In addition, because the brokerage firm provides the lowest commissions and best execution for securities transactions, Farnsworth has met his obligations to the client

in using this brokerage firm. It does not matter that the brokerage firm also provides research information that is not useful for the account generating the commission because Farnsworth is not paying extra money of the client's for that information.

15 The correct answer is A. In this question, Brown is providing investment recommendations before making inquiries about the client's financial situation, investment experience, or investment objectives. Brown is thus violating Standard III(C)—Suitability. Answers B and C provide examples of information members and candidates should discuss with their clients at the outset of the relationship, but these answers do not constitute a complete list of those factors. Answer A is the best answer.

16 The correct answer is C. This question involves Standard I(C)—Misrepresentation. Statement I is a factual statement that discloses to clients and prospects accurate information about the terms of the investment instrument. Statement II, which guarantees a specific rate of return for a mutual fund, is an opinion stated as a fact and, therefore, violates Standard I(C). If statement II were rephrased to include a qualifying statement, such as "in my opinion, investors may earn . . . ," it would not be in violation of the Standards.

17 The correct answer is A. This question involves three of the Standards. Anderb, the portfolio manager, has been obtaining more favorable prices for her personal securities transactions than she gets for her clients, which is a breach of Standard III(A)—Loyalty, Prudence, and Care. In addition, she violated Standard I(D)—Misconduct by failing to adhere to company policy and by hiding her personal transactions from her firm. Anderb's supervisor, Bates, violated Standard IV(C)—Responsibilities of Supervisors; although the company had requirements for reporting personal trading, Bates failed to adequately enforce those requirements. Answer B does not represent a violation because Standard VI(B)—Priority of Transactions requires that personal trading in a security be conducted after the trading in that security of clients and the employer. The Code and Standards do not prohibit owning such investments, although firms may establish policies that limit the investment opportunities of members and candidates. Answer C does not represent a violation because the Code and Standards do not contain a prohibition against employees using the same broker for their personal accounts that they use for their client accounts. This arrangement should be disclosed to the employer so that the employer may determine whether a conflict of interest exists.

18 The correct answer is A because this question relates to Standard I(A)—Knowledge of the Law—specifically, global application of the Code and Standards. Members and candidates who practice in multiple jurisdictions may be subject to various securities laws and regulations. If applicable law is more strict than the requirements of the Code and Standards, members and candidates must adhere to applicable law; otherwise, members and candidates must adhere to the Code and Standards. Therefore, answer A is correct. Answer B is incorrect because members and candidates must adhere to the higher standard set by the Code and Standards if local applicable law is less strict. Answer C is incorrect because when no applicable law exists, members and candidates are required to adhere to the Code and Standards, and the Code and Standards prohibit the use of material nonpublic information.

19 The correct answer is B. The best course of action under Standard I(B)—Independence and Objectivity is to avoid a conflict of interest whenever possible. Therefore, for Ward to pay for all his expenses is the correct answer. Answer C details a course of action in which the conflict would be disclosed, but the solution is not as appropriate as avoiding the conflict of interest.

Answer A would not be the best course because it would not remove the appearance of a conflict of interest; even though the report would not be affected by the reimbursement of expenses, it could appear to be.

20 The correct answer is B. Under Standard IV(A)—Loyalty, members and candidates may undertake independent practice that may result in compensation or other benefit in competition with their employer as long as they obtain consent from their employer. Answer C is not consistent with the Standards because the Standards allow members and candidates to make arrangements or preparations to go into competitive business as long as those arrangements do not interfere with their duty to their current employer. Answer A is not consistent with the Standards because the Standards do not include a complete prohibition against undertaking independent practice.

21 The correct answer is B. This question involves Standard VI(A)—Disclosure of Conflicts—specifically, the holdings of an analyst's employer in company stock. Answers A and C do not describe conflicts of interest that Smith would have to disclose. Answer A describes the use of a firm's products, which would not be a required disclosure. In answer C, the relationship between the analyst and the company through a relative is so tangential that it does not create a conflict of interest necessitating disclosure.

22 The correct answer is C. This question relates to Standard I(C)—Misrepresentation. Although Michelieu's statement about the total return of his clients' accounts on average may be technically true, it is misleading because the majority of the gain resulted from one client's large position taken against Michelieu's advice. Therefore, this statement misrepresents the investment performance the member is responsible for. He has not taken steps to present a fair, accurate, and complete presentation of performance. Answer B is thus incorrect. Answer A is incorrect because although Michelieu is not guaranteeing future results, his words are still a misrepresentation of his performance history.

23 The correct answer is B. The best policy to prevent violation of Standard II(A)—Material Nonpublic Information is the establishment of firewalls in a firm to prevent exchange of insider information. The physical and informational barrier of a firewall between the investment banking department and the brokerage operation prevents the investment banking department from providing information to analysts on the brokerage side who may be writing recommendations on a company stock. Prohibiting recommendations of the stock of companies that are clients of the investment banking department is an alternative, but answer A states that this prohibition would be permanent, which is not the best answer. Once an offering is complete and the material nonpublic information obtained by the investment banking department becomes public, resuming publishing recommendations on the stock is not a violation of the Code and Standards because the information of the investment banking department no longer gives the brokerage operation an advantage in writing the report. Answer C is incorrect because no exchange of information should be occurring between the investment banking department and the brokerage operation, so monitoring of such exchanges is not an effective compliance procedure for preventing the use of material nonpublic information.

24 The correct answer is B. Under Standard III(A)—Loyalty, Prudence, and Care, members and candidates who manage a company's pension fund owe these duties to the participants and beneficiaries of the pension plan, not the management of the company or the company's shareholders.

25 The correct answer is B. Answer B gives one of the two primary reasons listed in the *Handbook* for disclosing referral fees to clients under Standard VI(C)—Referral Fees. (The other is to allow clients and employers to evaluate the full cost of the services.) Answer A is incorrect because Standard VI(C) does not require members or candidates to discount their fees when they receive referral fees. Answer C is inconsistent with Standard VI(C) because disclosure of referral fees, to be effective, should be made to prospective clients before entering into a formal client relationship with them.

26 The correct answer is B. Standard VI(B)—Priority of Transactions does not limit transactions of company employees that differ from current recommendations as long as the sale does not disadvantage current clients. Thus, answer A is incorrect. Answer C is incorrect because the Standard does not require the matching of personal and client trades.

27 Answer C is correct. Standard IV(A)—Loyalty discusses activities permissible to members and candidates when they are leaving their current employer; soliciting clients is strictly prohibited. Thus, answer A is inconsistent with the Code and Standards even with the required disclosure. Answer B is incorrect because the offer does not directly violate the Code and Standards. There may be out-of-work members and candidates who can arrange the necessary commitments without violating the Code and Standards.

28 Answer A is correct. The question relates to Standard III(A)—Loyalty, Prudence, and Care. Carter believes the broker offers effective execution at a fee that is comparable with those of other brokers, so he is free to use the broker for all accounts. Answer B is incorrect because the accounts that prohibit soft dollar arrangements do not want to fund the purchase of research by Carter. The new trading scheme does not incur additional commissions from clients, so it would not go against the prohibitions. Answer C is incorrect because Carter should not incur unnecessary or excessive "churning" of the portfolios (excessive trading) for the purpose of meeting the brokerage commitments of soft dollar arrangements.

29 Answer B is correct according to Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program. CFA Program candidates do not receive their actual scores on the exam. Topic and subtopic results are grouped into three broad categories, and the exam is graded only as "pass" or "fail." Although a candidate may have achieved a topical score of "above 70%," she or he cannot factually state that she or he received the highest possible score because that information is not reported. Thus, answer C is incorrect. Answer A is incorrect as long as the member or candidate actually completed the exams consecutively. Standard VII(B) does not prohibit the communication of factual information about completing the CFA Program in three consecutive years.

30 Answer C is correct. According to Standard III(A)—Loyalty, Prudence, and Care, the CFA Program would be considered a personal or firm expense and should not be paid for with the fund's brokerage commissions. Soft dollar accounts should be used only to purchase research services that directly assist the investment manager in the investment decision-making process, not to assist the management of the firm or to further education. Thus, answer A is incorrect. Answer B is incorrect because the reasonableness of how the money is used is not an issue; the issue is that educational expense is not research.

31 Answer A is correct. Standard I(B)—Independence and Objectivity emphasizes the need for members and candidates to maintain their independence and objectivity. Best practices dictate that firms adopt a strict policy not to accept compensation for travel arrangements. At times, however, accepting

paid travel would not compromise one's independence and objectivity. Answers B and C are incorrect because the added benefits—free conference admission for additional staff members and an exclusive golf retreat for the speaker—could be viewed as inducements related to the firm's working arrangements and not solely related to the speaking engagement. Should Long wish to bring other team members or participate in the golf outing, he or his firm should be responsible for the associated fees.

32 Answer C is correct. The guidance to Standard II(A)—Material Nonpublic Information recommends adding securities to the firm's restricted list when the firm has or may have material nonpublic information. By adding these securities to this list, Andrews would uphold this standard. Because waiting until the next day will not ensure that news of the merger is made public, answer A is incorrect. Negotiations may take much longer between the two companies, and the merger may never happen. Andrews must wait until the information is disseminated to the market before he trades on that information. Answer B is incorrect because Andrews should not disclose the information to other managers; no trading is allowed on material nonpublic information.

33 Answer B is correct. Through placing a personal purchase order that is significantly greater than the average volume, Pietro is violating Standard IIB—Market Manipulation. He is attempting to manipulate an increase in the share price and thus bring a buyer to the negotiating table. The news of a possible merger and confirmation of the firm's earnings guidance may also have positive effects on the price of Local Bank, but Pietro's actions in instructing the release of the information does not represent a violation through market manipulation. Announcements of this nature are common and practical to keep investors informed. Thus, answers A and C are incorrect.

34 Answer C is correct. Cupp violated Standard III(D)—Performance Presentations when he deviated from the firm's stated policies solely to capture the gain from the holding being acquired. Answer A is incorrect because the firm does not claim GIPS compliance and the GIPS standards require external cash flows to be treated in a consistent manner with the firm's documented policies. Answer B is incorrect because the firm does not state that it is updating its composite policies. If such a change were to occur, all cash flows for the month would have to be reviewed to ensure their consistent treatment under the new policy.

35 Answer A is correct. According to Standard V(C)—Record Retention, Cannan needed the permission of her employer to maintain the files at home after her employment ended. Without that permission, she should have deleted the files. All files created as part of a member's or candidate's professional activity are the property of the firm, even those created outside normal work hours. Thus, answer B is incorrect. Answer C is incorrect because the Code and Standards do not prohibit using one's personal computer to complete work for one's employer.

36 Answer B is correct. According to Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program, Quinn cannot claim to have finished the CFA Program or be eligible for the CFA charter until he officially learns that he has passed the Level III exam. Until the results for the most recent exam are released, those who sat for the exam should continue to refer to themselves as "candidates." Thus, answer C is incorrect. Answer A is incorrect because members and candidates may discuss areas of practice in which they believe the CFA Program improved their personal skills.

37 Answer A is correct. Hart's decision to invest in the retail fund appears directly correlated with Rodriguez's statement about the successful quarter of Mega Retail and thus violates Standard II(A)—Material Nonpublic Information. Rodriguez's information would be considered material because it would influence the share price of Mega Retail and probably influence the price of the entire exchange-traded retail fund. Thus, answer B is incorrect. Answer C is also incorrect because Rodriguez shared information that was both material and nonpublic. Company officers regularly have such knowledge about their firms, which is not a violation. The sharing of such information, however, even in a conversation between friends, does violate Standard II(A).

38 Answer C is correct. Standard VII(A)—Conduct as Members and Candidates in the CFA Program prohibits providing information to candidates or the public that is considered confidential to the CFA Program. In revealing that questions related to the analysis of inventories and analysis of taxes were on the exam, Park has violated this standard. Answer B is incorrect because the guidance for the standard explicitly acknowledges that members and candidates are allowed to offer their opinions about the CFA Program. Answer A is incorrect because candidates are not prohibited from using outside resources.

39 Answer B is correct. Paper has violated Standard III(D)—Performance Presentation by not disclosing that he was part of a team of managers that achieved the results shown. If he had also included the return of the portion he directly managed, he would not have violated the standard. Thus, answer A is incorrect. Answer C is incorrect because Paper received written permission from his prior employer to include the results.

40 Answer A is correct. Townsend has not provided any information about her clients to the leaders or managers of the golf program; thus, she has not violated Standard III(E)—Preservation of Confidentiality. Providing contact information about her clients for a direct-mail solicitation would have been a violation. Answer B is incorrect because the notice in the newsletter does not violate Standard III(E). Answer C is incorrect because the golf program's fund-raising campaign had already begun, so discussing the opportunity to donate was appropriate.

ETHICAL AND PROFESSIONAL STANDARDS

STUDY SESSION

2

Ethical and Professional Standards in Practice

This study session uses case studies to demonstrate the practical application of the CFA Institute Code of Ethics and Standards of Professional Conduct (Code and Standards) in everyday situations. The session concludes with discussion on the Asset Manager Code of Professional Conduct.

The Asset Manager Code of Professional Conduct uses the basic tenets of the Code and Standards to establish ethical and professional standards for firms managing client assets. The Asset Manager Code of Professional Conduct also extends the Code and Standards to address investment management firm practices regarding trading, compliance, risk management, security pricing, and disclosure.

READING ASSIGNMENTS

Reading 3	Application of the Code and Standards *Ethics Cases*
Reading 4	Asset Manager Code of Professional Conduct by Kurt Schacht, JD, CFA, Jonathan J. Stokes, JD, and Glenn Doggett, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

3

Application of the Code and Standards

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** evaluate professional conduct and formulate an appropriate response to actions that violate the Code of Ethics and Standards of Professional Conduct;
☐	**b.** formulate appropriate policy and procedural changes needed to assure compliance with the Code of Ethics and Standards of Professional Conduct.

INTRODUCTION

1

The purpose of this reading is to provide examples of how the CFA Institute Code of Ethics and Standards of Professional Conduct (Code and Standards) can be applied in situations requiring professional and ethical judgment. Exhibit 1 presents a useful framework to help navigate the ethical decision-making process and apply the Code and Standards. The framework's components do not need to be addressed in the sequence shown, but a review of the outcome should conclude the process. This review provides insights for improved decision making in the future.

Exhibit 1 A Framework for Ethical Decision Making

- Identify the Important Facts and Issues
- Identify Others to Whom Duties are Owed
- Identify Potential Conflicts of Interest
- Identify Applicable Ethical Principles
- Consider Seeking Additional Guidance
- Consider Circumstances That Could Be Affecting Judgment
- Consider Alternative Actions
- Act and Review the Outcome

© 2015 CFA Institute. All rights reserved.

The first case, The Consultant,[1] demonstrates an application of the framework shown in Exhibit 1. Referencing the Code and Standards will help in identifying applicable ethical principles. The following cases, Pearl Investment Management (A), (B), and (C),[2] focus on identifying violations of the Code and Standards, taking needed corrective actions, and developing a policy statement to prevent future violations. The reading concludes with practice problems in item-set format.

2 THE CONSULTANT

Mark Vernley, CFA, is quite disturbed by Plains Pipeline Systems' recent allegation that he has, in essence, acted unethically—the first such accusation in Vernley's career. Although Vernley was exonerated of any allegation of wrongdoing by the authorities, he is worried that his personal reputation and integrity and those of his engineering consulting firm have been damaged. He has decided to make some changes in his personal portfolio and the procedures of the firm to prevent unethical conduct, breaches of the law, or the appearance of improprieties.

Mark Vernley

Vernley, a petroleum engineer with a doctorate in engineering and 30 years' business experience, began his career as a reservoir engineer with Deepwell Explorations. After 15 years with Deepwell, he joined a major brokerage firm as a securities analyst specializing in energy issues. During that time, he acquired his CFA charter and became a member of CFA Institute. Some eight years later, he set up his own consulting firm, Energetics, Inc., which currently employs 10 professional engineers. Energetics consults on a broad array of projects, including asset and project valuations.

During his years in the investment industry, Vernley invested actively in the stock market (with a concentration in energy stocks). When he worked for Deepwell Explorations, he participated in the employee stock purchase plan and exercised the stock options granted to him. As a result, a sizable portion of his wealth is now in energy stocks, most notably in Deepwell Explorations.

The market value and composition of his current portfolio is as follows:

Deepwell Explorations	$250,000
National Marketing and Refining	50,000
Integrated Energy Resources	45,000
Highridge Oil Pipeline	50,000
Interplains Gas Pipeline	75,000
Logline Well Service	35,000
Subtotal	$505,000
Shares in other industries	475,000
Total portfolio	$980,000

Vernley's practice during the past seven years has been quite profitable, and business is brisk. His peers generally consider him very successful. He has kept up his membership in CFA Institute and has taken an active part in energy industry

1 Jules A. Huot, CFA. *Ethics Cases*. Copyright © 1996, rev. 2005 by CFA Institute. Consistent with the Eleventh Edition of the *Standards of Practice Handbook*.
2 Glen A. Holden, Jr., CFA. *Ethics Cases*. Copyright © 1996, rev. 2005 by CFA Institute. Consistent with the Eleventh Edition of the *Standards of Practice Handbook*.

affairs. He is a long-standing member of his local and national professional engineers society. He has served as president of the local engineers society for several terms and as a member of the society's professional standards committee on the national level. Although he has never written down the professional standards he expects of the company's employees, all of the engineers belong to the professional engineers society, and he has made clear in personal communications that he expects them to meet high standards in honesty, fairness, and avoiding conflicts of interest. Vernley himself is known for his professionalism, expertise, and integrity.

The Consulting Contract

Energetics recently won a contract, for which Vernley wrote the proposal, from Highridge Oil Pipeline to devise a plan to resolve conflicts with Highridge's clients. Highridge has a long history of disputes with the users of its pipeline—the shippers of oil—over the tolls charged. Highridge wants to recover increases in its operating costs; the shippers want regulations that reflect the market-driven, competitive conditions of the industry. They believe such regulations will force Highridge to increase efficiency in its operations. Both parties have engaged in expensive and acrimonious hearings before the regulatory agency. Vernley's plan for Highridge consists of an incentive-based method to set pipeline tolls, which would give Highridge a financial incentive to operate its pipeline more economically than at present. Under the plan, Highridge will share with the oil companies, including Deepwell Explorations and Integrated Energy Resources, any increase in earnings that results from reduced costs. The result should lower pipeline tolls, eliminate contentious rate hearings, and increase Highridge's profits.

After lengthy hearings, the regulatory agency ratified this plan. But Plains Pipeline Systems, a consistently more efficient and profitable carrier than Highridge, filed an objection with the regulatory agency to the effect that Vernley's plan is flawed because he has a conflict of interest arising from his personal portfolio positions. At a subsequent hearing, the regulatory agency rejected Plains Pipeline Systems' objection and confirmed its prior decision.

Evaluate the situation using the ethical decision-making framework presented in Exhibit 1. As you do this, consider actions that Vernley could have taken to avoid any allegations of conflict of interest based on his holdings of energy company shares.

Evaluation of the Situation

Important Facts and Issues

Vernley, a professional engineer and CFA charterholder, has been charged with having a conflict of interest that prevented his company, Energetics, from offering objective advice to his client and the relevant regulatory agency. Vernley has spent his entire career in the oil industry and enjoyed an excellent reputation and strong financial success. This allegation is the first of any kind made against him or his firm. It has been dismissed, and he is confident that all his employees are honest and that he can rely on them to act in an ethical and professional manner, something he took for granted until now. He is disturbed, however, about the effect of the allegations on his and his firm's reputation, and he wants to avoid any further allegations in the future.

Others to Whom Duty is Owed

Vernley and Energetics have a duty to Highridge, the client, and may owe a duty to the regulatory agency that will ratify the suggested plan and to the citizens that the regulatory agency represents. No duty appears to be owed to Plains, a competitor to Highridge. It was Plains that filed the objection with the regulatory agency.

Potential Conflicts of Interest

Vernley may have or be perceived to have a conflict of interest because of his holdings in oil companies serviced by Highridge. The plan may not be in Highridge's best interest. Potential conflicts of interest exist between Highridge and the regulatory agency and between Highridge and Plains.

Applicable Ethical Principles

Vernley is expected to place clients' interests above his own. Other ethical principles addressed in the Code and Standards are more specific to the investment profession and the global capital markets.

Circumstances That Could Be Affecting Judgment

Vernley's holdings in oil companies, which Highridge services, may be affecting his judgment.

Alternative Actions

Vernley can deal with conflicts of interest in two ways. The ideal is to avoid all conflicts of interest, real or perceived. If a conflict of interest cannot be avoided, however, then full disclosure must be made to the interested parties. Each approach entails various options.

Avoidance Vernley can avoid any conflict between the interests of his clients and his personal investments if he refrains from investing in any energy-related securities. Because he already holds a portfolio heavily invested in such stock, the next logical step if he follows this course is divestiture. Selling his investments is an extreme option with potential tax consequences, which Vernley might find unreasonable.

Another option is to establish a "blind trust," an account in which investment decisions are made by an independent manager. The owner (Vernley) is not aware of the account's holdings until they are reported by the manager. Vernley's investment policy might specify that his account hold a certain percentage of energy-related issues. Vernley would not know the exact nature of future transactions in his portfolio, but he could reasonably anticipate their general direction (because of the account policies and guidelines). In any event, he could still be perceived as having a conflict, which would require that he disclose it to his clients.

Another option that would reduce Vernley's potential conflicts of interest would be to make his oil and gas investments by way of a mutual fund specializing in energy-related issues and managed by a third party over which Vernley has no influence. He would be sharing in a portfolio that is likely to be much more diversified than his current portfolio, thereby reducing the materiality of any one holding. He would also not take part in any investment decision making.

Disclosure Whenever Vernley has a real or perceived conflict of interest, he must disclose such conflicts to his clients. Disclosure can take many forms, depending on the circumstances. At a minimum, Vernley must disclose to clients of Energetics the existence and the nature of any conflict of interest surrounding a consulting assignment. Vernley must ensure that such disclosures are prominent and delivered in plain language and communicate the relevant information effectively. Then, it is up to the client

to evaluate the materiality of Vernley's conflict of interest and whether the conflict is significant enough to affect Vernley's ability to give advice or make recommendations that are unbiased and objective. If Vernley discloses conflicts to clients only when he considers them material, he may err in that his opinion of materiality may differ from that of the clients. Establishing what is material is difficult in any context because of the judgment required. Many people will perceive a conflict of interest no matter what the materiality.

Some of Energetics' consulting assignments may entail the preparation of a submission to the regulatory agency. In certain circumstances, Energetics would need to disclose in the submission a detailed list of Vernley's holdings. Because these documents are usually in the public domain, such declarations generally constitute public disclosure.

Review

Nothing in this case suggests that any member of Energetics acted unethically. On the contrary, the description of Vernley's activities, the engineers' affiliations, and the overall reputation of Vernley and his firm lead to the conclusion that ethical values permeate the company, infusing the organization and its operating systems with a self-sustaining ethical culture. However, Energetics operates in an environment in which the absence of a formal compliance program could expose it to costly liabilities in the event of a mishap. At a minimum, the perception of a potential conflict of interest could place the firm in an unfavorable light in the eyes of its clients.

Upon review, Vernley determines that Energetics needs to establish a comprehensive formal compliance program.

Create a plan that will enable Vernley to shield his company from unethical acts that his employees might commit.

The main objectives of the plan will be to deter unethical or illegal acts and to provide an "affirmative defense" in the event of employee violations. The fear of being caught and of being punished are prominent enforcement characteristics of a compliance program.

For proper implementation, a compliance program must have a number of features: communication, education, and compliance procedures.

Communication

The company must inform employees of the standards to which they must conform and must deliver to employees copies of these standards—whether statutes, codes of conduct, or standards of practice. In this case, Vernley could use the CFA Institute Code of Ethics and Standards of Professional Conduct as the basis for a formal compliance manual.

Education

The company must educate employees about the main features of the adopted standards and some of their intricacies through workshops and training sessions. Attendance at these sessions should be compulsory, and the sessions should include case studies to illustrate practical applications of the standards.

Compliance Procedures

Companies should have written documents that spell out their compliance procedures. A company can document several measures that are aids in managing its compliance program effectively, including:

- annual certification by employees that they have maintained familiarity with the standards and agree to abide by them;
- for the purpose of detecting conflicts of interest or insider trading, required reporting by employees, at least quarterly, of all securities transactions for their own personal accounts or those in which they have a beneficial interest;
- disclosing to management the existence and nature of any possible or actual compensation from sources other than the employer;
- certification by employees that they have not entered into an independent business activity in competition with their employer. The purpose of this measure is to protect the firm from, for example, misappropriation of trade secrets, misuse of confidential information, solicitation of customers prior to cessation of employment, or self-dealing; and
- employee memberships in organizations that maintain standards required for the practice of their professions—for example, continued affiliation by Energetics' engineers with the association of professional engineers.

Ethical Culture

Finally, Vernley should continue instilling an ethical culture in Energetics by developing a corporate credo and moral system based on his and his colleagues' professional standards, self-interest, values, and ideals. The intention is for the system to become a social arrangement among interdependent peers that is grounded in responsible conduct and self-governance according to the chosen values. The essential characteristic of this approach is that the culture be based on the collective integrity of the organization, with its members sharing a set of guiding principles and agreeing to joint accountability.

This recommended approach is leader driven. Leaders gain credibility when they develop and communicate their guiding values, integrate them in their operations, and imbue the company's decision-making processes with them.

3 PEARL INVESTMENT MANAGEMENT (A)

After obtaining an MBA in finance, Peter Sherman is offered a position as an account manager with Pearl Investment Management, an investment counseling firm specializing in equity portfolio management for pension and profit-sharing funds, endowment funds, and high-net-worth individuals' accounts. Sherman begins work in the firm's back office, handling administrative tasks for his assigned accounts, settling transactions, balancing the accounts to bank records, and ensuring that client guidelines are followed.

Pearl is a large firm with a number of different departments, including account administration, research, and portfolio management. Having its own research staff allows Pearl to temper its reliance on brokerage firm research, to weigh its conclusions against the opinions of others, and to perform security analysis on companies that are not well followed for Pearl's proprietary use in client portfolio recommendations.

Many of the portfolio managers and analysts at Pearl are CFA charterholders, and as a result, the firm has adopted the CFA Institute Code of Ethics and Standards of Professional Conduct as part of its policy for internal compliance. The firm policy manual also contains excerpts from laws and regulations that govern investment advisors such as Pearl (and its employees), including sections from the US Securities Act of 1933, the US Securities Exchange Act of 1934, the Investment Advisers Act of 1940, and the National Association of Securities Dealers manual. All employees must read and sign a statement when they join the firm that they have read Pearl's policies and must repeat this procedure at the beginning of each subsequent year as a reminder of their compliance responsibilities.

On Sherman's first day on the job, his department head gives him the policy manual as part of his orientation program, requests that he read it during the day before signing the compliance statement, and advises him that the firm's compliance department will answer any questions he may have. Sherman reads through the manual quickly and then signs the company's personnel policies statement.

After a few months, Sherman feels comfortable handling the administrative tasks related to the client accounts he manages at Pearl and ensuring that client investment guidelines are being followed. He enjoys the challenges of being the account manager for his (and Pearl's) clients, the close access to investment information and strategies, and the opportunity to invest his savings with greater insight and understanding than he had before this job. Previously, his personal investments had been in no-load mutual funds, but in his new position, he sees that he can achieve greater reward by building a portfolio of his own.

To further this goal, Sherman reads books about investments and portfolio strategy, as well as the company summaries generated by the firm's research department, and he follows the daily price changes of the firm's major holdings. He enjoys discussing his new-found knowledge with family and friends. To put his new knowledge to work in his own portfolio, Sherman decides to open an account with a national discount broker and purchase a few of the stocks that are Pearl's largest equity positions.

Identify violations or possible violations of the CFA Institute Code and Standards in this case; for each identified violation(s), state what actions are required by Sherman and/or his supervisor to correct the violations and make a short policy statement a firm could use to prevent the violations.

This case illustrates how easily a young, unwary analyst can slip into questionable actions. The potential violations evident in this case relate to the obligation to obey all laws and regulations, the responsibilities of supervisors, the standards for trading for personal accounts, and the prohibition against conveying confidential client information.

Knowledge of the Law and Obligation to Obey

Under the Code and Standards, the basis for Pearl's policy manual, Peter Sherman, his supervisor, and all employees at Pearl have certain fundamental responsibilities.

Governing Laws and Regulations

Standard I(A)—Knowledge of the Law requires Sherman to know about the laws and regulations governing his behavior and that of the firm. Allusions in the case to Sherman's use of information gained through employment at Pearl indicate that Sherman is not aware of all the regulations governing his behavior. Sherman is in a junior position, however, and the responsibility for educating junior employees

generally lies with their supervisors. In a large firm such as Pearl, the compliance department, in addition to the supervisor's training, should offer instruction and education in this critical area.

Legal and Ethical Violations

For supervisors, top managers, or any employees to knowingly participate in or assist in a violation of the Code and Standards gives rise to a violation of Standard I(A). The requirement "knowingly" is important: Although members are presumed to know all applicable laws, rules, and regulations, they may not recognize violations if they are not aware of all the facts giving rise to the violations.

Actions Required

Sherman's supervisor should monitor the activities of Sherman for any violations of the securities laws, the Code and Standards, or other firm policies and procedures.

Policy Statement for a Firm

"Supervisors shall exercise reasonable supervision over those employees subject to their control and shall monitor all actions of employees in their charge to determine that the firm's policies are being followed and to prevent any violation by such persons of applicable statutes, regulations, or provisions of the Code of Ethics and Standards of Professional Conduct. Supervisors shall review the contents of the compliance manual with all direct charges when they are hired and answer any questions or concerns the employees may have."

Responsibilities of Supervisors

Under Standard IV(C)—Responsibilities of Supervisors, those in a supervisory position must make reasonable efforts to detect and prevent violations of applicable laws, rules, regulations, and the Code and Standards by anyone subject to their supervision or authority. CFA Institute members who act in supervisory roles should understand what constitutes an adequate compliance system for the firm and make reasonable efforts to see that appropriate procedures are established, documented, and communicated to covered personnel and to the legal, compliance, and auditing departments. The facts that Pearl has a compliance manual as part of the employee handbook and that compliance is monitored by the compliance department do not release Sherman's department head from his supervisory duty. A supervisor must take steps to ensure that the compliance procedures are adequate and followed by the employees they supervise. Sherman's supervisor should have reviewed the contents of the compliance manual with Sherman when he was hired and answered any of Sherman's questions or concerns. The supervisor should have also monitored all Sherman's actions to ensure that he was following the firm's policies.

The actions required and policy statement suggested previously cover this.

Trading for Personal Accounts

Sherman may be trading in securities that the portfolio managers are purchasing (or selling) for the firm's client accounts and, in doing so, may be violating Standard III(B)—Fair Dealing and Standard VI(B)—Priority of Transactions. (Members also must not engage in trading ahead of the dissemination of research reports or investment recommendations to clients—a practice that creates a conflict with members' duties to clients.) The mutual funds that Sherman used previously would not violate these provisions because Sherman would not be privy to the mutual fund managers' investment actions or security selections. Now, any change in Sherman's investment

strategy may well be a result of gaining proprietary information. Under the Code and Standards, Sherman may not invest in the same or related securities for his personal account using proprietary information communicated to him in the course of his job in advance of such information being given to all the firm's clients or in advance of client trades. This restriction includes both Sherman's personal account and any other related account in which Sherman has a beneficial ownership (e.g., a direct or indirect pecuniary interest). Personal trades under the Code and Standards must not come before those for client portfolios, whether or not the employee is restricted from purchase for some specified period of time.

Actions Required

Before placing orders related to individual securities for his own account, Sherman should submit these plans to the compliance department for confirmation that his actions will not interfere with or take priority over client transactions.

Policy Statement for a Firm

"Employees shall submit personal trades to the compliance department for approval in advance of any personal investment action in order to clear the trades against client transactions. In the event that an employee wishes to transact in securities that are being traded for clients, the employee will be allowed to trade only after all client transactions have been processed, the compliance department has approved the request, and a 24-hour moratorium has expired. On a monthly basis, all personal trades (as shown on brokerage statements of account) must be submitted to the compliance department for review."

Maintaining Confidential Client Information

Sherman has a duty to see that the proprietary nature of Pearl's investment strategy is maintained and not communicated in the course of his investment activities. The fact that Sherman enjoys discussing his "new-found knowledge" with friends and family suggests a potential violation under Standard IV(A)—Duties to Employers: Loyalty and Standard III(A)—Loyalty, Prudence, and Care. Because of his relationship of special trust, Sherman is obligated to take care that he communicates no information that would breach this trust. This obligation is in force whether or not he acts on the information himself.

Actions Required

Sherman must take care not to divulge specific investment actions or information exclusive to client relationships that breach his responsibilities to the firm and its clients. When in doubt, Sherman should request guidance from the compliance department.

Policy Statement for a Firm

"Proprietary information shall not be communicated outside the firm. 'Proprietary' includes information about client portfolios, investment strategies, and portfolio actions and recommendations. Furthermore, employees should be mindful of the special relationship with Pearl's clients and ensure that the highest degree of care is preserved when investment action is taken on their behalf."

4 PEARL INVESTMENT MANAGEMENT (B)

Competition for the infrequent job openings at Pearl Investment Management is extensive, both from within the firm and from the outside. After a year in Pearl's back office as one of the account managers, Peter Sherman is told that obtaining a CFA charter would greatly enhance his chances of moving into the firm's research area. Sherman studies at length and passes Level I of the CFA exam.

In the next year, Sherman is helpful in clearing up problems related to the allocation of block trades among certain large client accounts. The most difficult problem is a misallocation related to an initial public offering (IPO) of Gene Alteration Research Corporation. Sherman was assigned this project because of his accounting experience and because none of his client portfolios was involved, although most of his institutional accounts and a few of his larger individual accounts are "total rate of return" portfolios.

Because his review is a rush project, Sherman does not have time to consult the clients' investment policy statements, but he feels certain that the portfolio managers would direct only trades suitable to their client accounts. Furthermore, he believes the trading desk would have acted as a second review for client investment guidelines. Sherman reconciles the transactions related to the block trades across all the portfolios in question. As a result, certain securities are shifted among accounts. Sherman believes that with the adjustments and with the transactions reversed and reallocated at the IPO price for the Gene Alteration issue, all clients have been treated fairly, but he wonders how the problems arose in the first place.

Several activities at Pearl are or could be in violation of the Code of Ethics and Standards of Professional Conduct. Identify violations and possible violations; state what actions are required by Sherman and/or the firm to correct the potential violations; and make a short policy statement a firm could use to prevent the violations.

The pressure of a rush project assigned by one's bosses and faulty assumptions can lead to inappropriate shortcuts even when intentions are good. This case involves violations or potential violations of the CFA candidate's responsibilities for compliance, fair dealing with clients, appropriateness or suitability of investment recommendations or investment action when dealing with clients, and correction of trading errors in client accounts.

Responsibility of Candidates to Comply with the Code and Standards

As an employee, Sherman was bound only by Pearl's own personnel policies. As a CFA candidate, he is subject to the Code and Standards, and he must rely more on his own knowledge of the Code and Standards to maintain compliance, with assistance from Pearl's compliance department, than on company explanations of the Code and Standards. As a CFA candidate, Sherman is now subject to disciplinary action by CFA Institute for violations of the Code and Standards, whether or not Pearl takes action.

Actions Required

Sherman should reacquaint himself with Pearl's personnel policies and read through the CFA Institute *Standards of Practice Handbook* to increase his familiarity with the Code and Standards and the subtleties of implementing the Standards on a day-to-day basis. The detailed discussion of Standards and examples in the *Handbook* provide

explanations and add depth to the meanings of the various standards. Finally, Sherman should document for his supervisor that, as a CFA candidate, he is obligated to comply with CFA Institute's Code and Standards and that he is subject to disciplinary sanctions for violations thereof.

Dealing with Clients

The case presents evidence of failure by Pearl Investment Management and its employees to carry out their duties to consider appropriateness or suitability of investment recommendations and their obligation to treat all clients equitably.

Responsibilities to Clients

Standard III(A)—Loyalty, Prudence, and Care requires members to take investment actions for the sole benefit of the client and in the best interest of the client *given the known facts and circumstances*. In other words, members must manage any pool of assets in their control in accordance with the needs and circumstances of clients. The case notes that Sherman did not consult the clients' investment policy statements, however, when reallocating the IPO trades. He assumed the portfolio managers and/or the trading desk would have done so. Therefore, Sherman violated his responsibilities to his clients by not making sure that the reallocations were in the best interests of all clients and suitable to each client.

Fair Dealing

In allocating or reallocating block trades, a member must ensure that Standard III(B)—Fair Dealing is upheld. The case notes that among the problems Sherman was asked to review was allocation of an IPO "among certain large client accounts." By favoring their large client accounts over others with similar investment objectives, the portfolio managers, the trading desk, and the account managers involved violated CFA Institute's and Pearl's standards on fair dealing.

Members have a duty to treat all clients *fairly* so that no one client is advantaged or disadvantaged—no matter what the size of the portfolio or other qualifications. Clients' investment guidelines often differ significantly, however, so portfolio managers and the trading desk must determine, in advance, which accounts have similar investment objectives and should receive similar allocations when new purchases are made. Even if clients have identical investment objectives, the accounts may have different cash reserves, dissimilar inclinations toward leverage through the use of margin, and distinct minimums for transaction size. All these factors must be taken into account in the decision-making process.

Ultimately, however, Pearl should treat portfolios with similar investment objectives and constraints similarly regardless of the size of the portfolios or the fees that they convey to Pearl. In making new securities purchases, firms should allocate the purchase for all suitable accounts, using a pro rata or similar system of distribution when less than the full order is received.

Actions Required

Sherman must reinvestigate the investment objectives for all affected client portfolios to make certain that orders were not entered in violation of client guidelines. He must also ensure that the allocation of block trades is made on an equitable basis for *all* client portfolios of similar objectives; in carrying out this assignment, he must keep in mind minimum transaction size but include all accounts that have similar investment criteria.

Policy Statement for a Firm

"Employees owe a duty of loyalty, prudence, and care to clients, and in all instances, the interests of clients shall come first. Action contrary to this policy is expressly prohibited. Allocation of trades shall be on a fair and equitable basis for all portfolios with similar investment objectives and constraints."

Errors in Client Accounts

When trades are made in error or are misallocated, under no circumstance should client portfolios bear the risk of an inappropriate transaction; nor should the firm shift the burden to another portfolio or client account. The burden or financial risk must be absorbed by the firm, not by the client (either directly or indirectly).

The reversal of trades described in the case and the reallocation of securities at the IPO price comes close to being a complete resolution of the problem Sherman was asked to solve, but Pearl should have credited short-term interest to those accounts from which transactions were removed because the clients' cash accounts were used to cover the trades.

In some instances, investment management firms shift financial risk to a client (or clients) indirectly by using such techniques as letting soft-dollar trades "cover" the financial aspects of a reversal, canceling an order through a "sale" from one account and a coincident "repurchase" in another account, or other transactions to compensate the firm for any loss it incurred by transacting at levels different from the market. Many client portfolios may be involved in order to spread the financial effects over a broad number of portfolios, which complicates the firm's or the manager's efforts to discern this ethical infraction. Any activity of this sort is a violation of the CFA Institute Code and Standards related to fair dealing and duty appropriateness or suitability of investment recommendations or action.

Actions Required

Pearl should see that no client bears a financial loss by the misallocation of transaction by any Pearl employee. As compensation for the use of the clients' funds, Pearl should credit short-term interest to all accounts for which trades were reversed, with Pearl bearing the loss. Short-term interest should *not* be charged against accounts that received shares.

Policy Statement for a Firm

"The firm will take all steps necessary to ensure the integrity of its client accounts. When errors do occur, the clients' portfolios will be restored with no loss of value to the client. To the extent that such losses occur, Pearl will indemnify its clients and make the appropriate restitution."

5 PEARL INVESTMENT MANAGEMENT (C)

After Peter Sherman passed Level II of the CFA exam, Tomas Champa, Pearl Investment Management's director of research, requested that Sherman be transferred to the research department with the understanding that his apprenticeship in the department as a junior analyst would last at least until he was awarded the CFA charter. Sherman was thrilled at the prospect of moving into research, and he accepted the transfer.

Champa came to Pearl when he decided to remain in the United States after completing a five-year US tour of duty for a major international bank with which he had served for 20 years. His background in international banking has made him

particularly well suited to be the research director at Pearl. Champa has seven analysts in his department—five senior analysts and two junior analysts. Sherman is one junior analyst, and the other is a Level III CFA candidate. Champa is anxious to lead the firm's research efforts into international securities and wants to begin with companies in the developing countries whose markets have experienced spectacular performance in recent years. He tells the analysts that Pearl must come up with research recommendations in emerging market equities quickly or the department will face criticism from senior management and the firm's clients. He also wants to be able to attract prospective clients by demonstrating the firm's expertise in this area.

Although Sherman is new to the department, Champa gives him difficult assignments because he believes Sherman's lack of preconceived notions about emerging market companies makes him an ideal analyst for this area. Sherman is to concentrate on Central and South America, areas where Champa believes he has special insight and can direct Sherman.

Sherman reads several brokerage reports on Latin American markets, spends time with Champa and other members of the research department discussing trends in these markets, and browses through the statistical section of Standard & Poor's *International Stock Guide*. For a briefing by someone with actual experience, Champa refers Sherman to one of his old banking contacts, Gonzalo Alves, who is well connected in Mexico and on the board of directors of a number of important Mexican corporations.

Sherman spends several hours speaking with Alves about the Mexican economy and the companies for which Alves serves as a director. Alves tells Sherman about the strategic direction of each company, some potential acquisition targets, and how changes in the Mexican economy will affect each company directly. Sherman now feels comfortable using this information in writing his research reports.

Champa asks Sherman to produce a research report on several Mexican telecommunications and cable companies. Because of the deadline Champa gives Sherman for the report, Sherman cannot develop the research easily on his own, so he plans to incorporate information from his reading of the brokerage firm reports, his conversation with Alves, and other sources. Sherman hastily finishes his two-page report, "Telecommunications Companies in Mexico," which includes excerpts from the brokerage reports, general trends and ratios from the S&P *International Stock Guide*, and paraphrased opinions from Alves. It concludes with an internal recommendation that stock in the Mexican telecommunications companies be bought for Pearl clients for which such stock is suitable. Sherman does not cite the brokerage reports as sources because they are so widely distributed in the investment community.

Pearl's upper managers applaud Champa and his staff for their quick response to the market demand for emerging market research, and the portfolio managers ask the research department for more recommendations. Jill Grant, however, the other junior research analyst, asks Sherman why his report did not include specific details about the Mexican economy or the historical exchange rate fluctuations between the Mexican peso and the US dollar. She questions the comparability of Mexican securities with US securities and notes that the diversification available from investing in global markets is achieved only if the correlation between the specific non-US market and the US market is low. Sherman's response, supported by Champa, is, "Our clients are sophisticated investors; they know these things already."

The case reveals several activities at Pearl that are or could be in violation of the CFA Institute Code of Ethics and Standards of Professional Conduct. Identify violations and possible violations; state what actions are required by Sherman or his supervisor to correct the potential violations; and make a short policy statement a firm could use to prevent the violations.

The pressures to succeed that come from one's self and one's boss can lead to noncompliance in perfectly ordinary business activities. The violations or potential violations in this case relate to using proper care and independent judgment, use of insider information (particularly under international applications of the Code and Standards and the obligation of members to comply with governing laws and regulations), several aspects of research and research reports, and misrepresentation of services.

Proper Care and Independent Judgment

A requirement stipulated in the CFA Institute Code of Ethics is to use reasonable care and exercise independent professional judgment when conducting investment analysis. When Sherman succumbed to the time pressures exerted by Tomas Champa, he was thus violating a basic provision of the Code and Standard V(A)—Diligence and Reasonable Basis.

Actions Required

Sherman must keep in mind the necessary steps in the research and portfolio decision-making process and resist attempts to rush his analysis.

Policy Statement for a Firm

"Analysts shall use proper care and exercise independent professional judgment in the preparation of research reports to ensure that reports are thorough, accurate, and include all relevant factors."

Use of Insider Information

Sherman must base any investment recommendations on his research alone, without incorporating material nonpublic information and without engaging in illegal or unethical actions. The situation in which Sherman found himself discussing a number of important corporations with Alves was compromising at best. Based on the local laws and customs with which they were most familiar, Champa and Alves may have found a candid discussion about the corporations where Alves served in a close relationship to be perfectly acceptable. In the course of conversation, however, Alves could have conveyed material nonpublic information to Sherman. If Sherman used such material nonpublic information in his report, which contained recommendations for investment actions, he violated Standard II(A)—Material Nonpublic Information.

One of the more difficult aspects for members is reconciling their obligations under the Code and Standards with the different laws, rules, regulations, and customs of various countries. CFA charterholders, CFA candidates, and CFA Institute members are held to the highest standards. Therefore, regardless of local laws, they are obligated by the Code and the Standards to refrain from using confidential information to their advantage or the advantage of their clients. Being compelled to hold to a higher standard than the local norm can be disadvantageous to CFA charterholders and, sometimes, their clients and customers. The higher standard, however, is what sets CFA charterholders apart in terms of the integrity of the investment profession.

Champa's referral of Sherman to Alves can aid Sherman in his research, but Sherman must use the information in an ethical manner. A consideration of the "mosaic theory" can add a useful perspective to judging proper and improper use of information. The mosaic theory states that a compilation of information that is *not material* or is *public* is not a violation of the Standards; it is the result of good analytical work. For example, if Sherman is doing a thorough review and analysis of all companies within a specific sector or industry, he may well develop a greater sense of the interrelationships

among companies than if he were studying only one or a few of them. In that case, Sherman may be able, based on public information gathered from a variety of sources *and* his unique understanding, to form conclusions about a particular company that may appear to be based on nonpublic information but are not.

Actions Required

If Sherman has come into possession of material nonpublic information in his contact with Alves, he must disclose this fact to Pearl's compliance department or compliance officer. If Sherman has used such information in his reports, either directly or indirectly, in order to use it on behalf of his clients, he has violated the Code and Standards.

Policy Statement for a Firm

"Analysts and portfolio managers are prohibited from using material nonpublic information in any form in making investment recommendations or taking investment action. Any employees who have come into possession of material nonpublic information (or who believe they have) shall contact the compliance department or compliance officer for guidance. If the information is determined to be material nonpublic information, the employee must refrain from acting on it and should take steps to disseminate the information publicly."

Using the Research of Others

Sherman's research reports must acknowledge and give credit to the research of others unless the information is of a statistical nature and widely held to be in the public domain. The case says that Sherman did "not cite the brokerage reports as sources because they are so widely distributed in the investment community." To use the proprietary research of others—brokerage reports, for example—without giving them due credit is a violation of Standard I(C)—Misrepresentation.

Actions Required

In order to avoid an ethical violation, Sherman must acknowledge the use of someone else's information and identify its author or publisher. In particular, Sherman must give credit to the author(s) of any brokerage reports he uses extensively in the preparation of internal recommendations.

Policy Statement for a Firm

"Analysts are prohibited from using the work of others without reference and are prohibited from plagiarizing the work of others by not giving due credit to the author, whether or not the author is employed by the firm."

Reasonable Basis for a Research Opinion

Standard V(A)—Diligence and Reasonable Basis requires Sherman to "exercise diligence, independence, and thoroughness in analyzing investments, making investment recommendations, and taking investment actions… [and] have a reasonable and adequate basis, supported by appropriate research and investigation, for any investment analysis." Sherman's lack of care and independent research in the preparation of his report is a violation of Standard V(A).

Sherman was essentially taking over the recommendations of others, which may or may not have had a reasonable basis. The research he used may have incorporated material misrepresentations that he did not identify or correct. By copying the work and ideas of others, Sherman may have been copying serious deficiencies and attaching his name and approval to them.

Because of the time pressure from Champa, Sherman did not adequately review the entire industry in the context of the overall economy and global markets (as evidenced by Jill Grant's questions). His reliance on a few brokerage firm reports and other sources is not sufficient to be considered, in the words of Standard V(A), "appropriate research and investigation." Furthermore, his report lacks documentation, not only in detail but also in substance.

Actions required and policy statement follow the section "Relevant Factors and Fact versus Opinion in Research Reports."

Relevant Factors and Fact versus Opinion in Research Reports

Grant was right to question the exclusion of relevant and basic risk factors in Sherman's report. Sherman has an obligation under Standard V(B.2)—Communication with Clients and Prospective Clients to use reasonable judgment in identifying which factors are important to his investment analyses, recommendations, or actions and include those factors in communications with his clients and prospective clients. By excluding important factors, he shirked his responsibility to the firm's clients and violated Standard V(B.2). Champa's contention that the firm's clients are sophisticated investors who are aware of the characteristics of markets and particular investments does not relieve Sherman of his duty to include relevant factors in his research report.

Actions Required

Sherman's reports should be as thorough as possible. When dealing with markets and economies that are significantly different from domestic markets and economies, Sherman should provide a full explanation. The research reports should provide a reasonable basis for decisions, include all relevant factors that reasonably come into play in an investment recommendation, and avoid material misrepresentation of investment characteristics so that the appropriateness of investments for various clients can be judged. Sherman also must maintain records to support his research reports.

Policy Statement for a Firm

"All relevant factors, including the basic characteristics involved in the investment, are to be included in a research report, with a corresponding discussion of the potential risks involved."

Misrepresentation of Services and Performance Presentation

The case raises the issue of potential violations of Standard I(C)—Misrepresentation. Whether violations are actual would depend, of course, on how the firm's current and prospective clients are made aware of the qualifications of the firm and the research department's experience in emerging markets. If Pearl's research is represented as a reaction to a changing marketplace and the increased globalization of securities markets, no violation has occurred. If Pearl is actively soliciting new and existing clients based on its "expertise" in the research and management of emerging market portfolios, however, then a violation of Standard I(C) has occurred.

The presentation of performance—that is, actual investment returns for its emerging market strategy—will be problematic for Pearl in the beginning. Pearl will not be able to report actual performance until it begins to manage portfolios made up of emerging market securities or portfolios that include some meaningful concentration of securities from emerging markets.

Actions Required

Pearl must not hold itself out as having experience or any "track record" in the management of emerging market portfolios until it actually manages assets in this area. It can suggest to clients, however, that the qualifications of the firm as demonstrated by its current efforts *might* produce returns that are comparable in a different environment because of the use of a similar methodology.

Policy Statement for a Firm

"Employees shall make only those statements, either verbally or in writing, about the firm and its qualifications that represent the firm properly and with the integrity it has tried to achieve. The firm shall not solicit clients, new or existing, for a new investment style without full disclosure of the firm's qualifications and expectations for both risk and potential return. Performance results for a new investment style will be in compliance with Standard III(D)—Performance Presentation, as discussed in the CFA Institute *Standards of Practice Handbook*."

PRACTICE PROBLEMS

The following information relates to Questions 1–6 and is based on "Guidance for Standards I–VII" and this reading

Jason Locke, CFA, has recently been hired as the Chief Investment Officer of the Escarpment Regional Government Employees' Pension Fund (the Fund). Currently, he is conducting evaluations of all external managers employed by the Fund to ensure that they are providing the highest possible returns for their mandates, while complying with all applicable laws and regulations.

Locke is evaluating the activity of Niagara Growth Managers (NGM), a local money manager allocated 10 percent of the Fund's assets. He realizes that any reduction in the allocation to this local manager will be met with considerable political pressure. The investment policy statement (IPS) for NGM's portion of the Fund's assets states that NGM is to actively manage an equity portfolio of local small-cap, high-tech companies.

Upon his review of NGM's activity, Locke is concerned about two items that he would like explained. At a meeting with NGM's portfolio manager, Emma Black, CFA, Locke asks her to comment on each item:

Commodities Positions

Locke "Over the last year, several large positions in commodities have been taken by the Fund's portfolio. This is inconsistent with the IPS."

Black "Commodities have significantly outperformed high-tech equities recently. I added commodities to larger clients' portfolios on a temporary basis. Clients were not informed because the positions will be sold once market sentiment shifts. I have not managed commodities before, but I am getting good returns."

Locke "I am uncomfortable with these investments in this portfolio."

IPO Share Allocation

Locke "The Fund's portfolio received 50,000 shares of an initial public offering (IPO) on 1 April. On 15 May, 30,000 shares were removed at the current market price."

Black "There was a problem with NGM's IPO allocation algorithm. Initially, you were over-allocated and when we discovered the error, your account was adjusted."

Locke "Short-term interest should have been credited to the Fund for use of its cash to cover the trade. In any case, this was an IPO of a large international high-tech company. It was not an appropriate investment for the portfolio."

© 2015 CFA Institute. All rights reserved.

After the meeting, Locke is not satisfied with Black's comments and decides that further action is required. He also decides that he will allow NGM to continue to manage Fund assets until he finishes his evaluation. This decision is based on the superior returns of the NGM-managed assets, the significant diversification this portfolio adds to the Fund, and also the political implications of firing the local money manager.

The next week, Locke calls Black and outlines several conditions that must be fulfilled for NGM to continue as a manager for the Fund. One of the conditions outlined relates to trade allocations.

Trade Allocation

Locke "Provide written trade allocation procedures consistent with the CFA Institute Standards of Professional Conduct."

Black "I will mail you a copy of our new procedures stating that trade allocations must be reviewed at the end of each month against clients' IPS. It also says that interest will be credited to accounts that have been incorrectly allocated shares and debited from those accounts that should have received shares."

With his evaluation complete, Locke must now consider whether to retain NGM as one of the Fund's asset managers.

1 According to the CFA Institute Standards of Professional Conduct, Locke owes his primary duty of loyalty in managing the Fund to:

A the plan trustees.

B all of the pension plan beneficiaries.

C the Escarpment Regional Government.

2 With respect to the commodities positions, which of the following actions *best* describes Black's violation of the CFA Institute Standards of Professional Conduct? Black violated CFA Institute Standards by:

A buying an asset class in which she has no prior management experience.

B buying assets that are inconsistent with the portfolio's Investment Policy Statement.

C failing to notify the client that she would temporarily deviate from the client's Investment Policy Statement.

3 With regard to the IPO share allocation, are both NGM's method of trade correction on 15 May and Locke's demand for a short-term interest credit, respectively, consistent with the CFA Institute Standards of Professional Conduct?

A Yes.

B No, only the method of trade correction is consistent.

C No, only the demand for a short-term interest credit is consistent.

4 After his initial meeting with Black, does Locke's decision to allow NGM to continue managing the portfolio violate the CFA Institute Standards of Professional Conduct?

A No.

B Yes, because he allowed political factors to influence his decision.

C Yes, because he is obligated to immediately suspend NGM until he finishes his evaluation.

5 With regard to Locke's condition regarding trade allocation, does Black's response violate the CFA Institute Standards of Professional Conduct with respect to allocation reviews *and* interest adjustments, respectively?

A Yes.

B No, it violates the standards only with respect to allocation reviews.

C No, it violates the standards only with respect to interest adjustments.

6 Based on his complete evaluation, what is Locke's *best* course of action with respect to NGM's management of the Fund's assets?

A Reduce NGM's allocation of the Fund's assets until NGM has demonstrated its compliance with Locke's conditions.

B Eliminate NGM as a manager since Locke cannot be sure that NGM will act fairly and in accordance with the Fund's IPS.

C Maintain NGM's allocation of the Fund's assets and concentrate on evaluating managers with larger proportions of the Fund's assets or with substandard performance.

The following information relates to Questions 7–12

Elias Nano, a recent MBA graduate and a CFA Level II candidate, is an unpaid summer intern with Patriarch Investment Counsel and expects to be offered a full-time paid position in the fall. Through his efforts, he is able to convince some family members and friends to become clients of the firm, and he now assists with the management of their accounts. His supervisor congratulates him and states: "These clients are the foundation from which you will be able to build your career as an investment advisor." After working hard all summer, Nano is told that Patriarch will not be able to offer him a paid position.

Nano interviews with a number of firms, and tells each one about the accounts that he is managing and expects to be able to bring with him. Because he was merely an intern at Patriarch, he does not think he owes any particular loyalty to Patriarch. He gains further assurance that he can keep the clients from the fact that his former supervisor implied that these were Nano's clients.

Nano subsequently joins Markoe Advisors as an assistant director with supervisory responsibilities. Markoe Advisors is an investment management firm that advertises that it provides customized portfolio solutions for individual and institutional clients. As a matter of policy, Markoe does not reject as a client any individual meeting the account minimum size. Markoe has two strategies—aggressive growth equity and growth equity—and is always fully invested. Nano asks his family and friends to transfer their accounts from Patriarch to Markoe.

As the first CFA candidate to be employed by Markoe, Nano has been asked to head a team that is reviewing the firm's compliance policies and procedures, which Nano considers inadequate and incomplete. He states his concerns to President Markoe: "Although Markoe Advisors, as a firm, cannot adopt the CFA Institute Code of Ethics and Standards of Professional Conduct, the firm can adopt the CFA Institute Asset Manager Code of Professional Conduct." President Markoe tells Nano that the firm is considering acquiring another advisory firm that has similar compliance policies and procedures. Markoe says: "We are not going to consider any compliance changes at this time."

Nano decides to draft a model compliance document to guide discussions about compliance issues at the firm in the future. Nano's initial draft includes the following components of a compliance policy statement:

- **Performance Presentation**

  Performance data must be documented for each of Markoe Advisors' active accounts, be disclosed upon request, and be compared with the firm's composite, which is composed of active accounts only. Performance data must be presented on a before-tax basis to all clients, with the disclosure that all performance data are presented gross of fees.
- **Suitability of Investments**

  Markoe Advisors, to maintain consistency of performance, assigns each client to one of the firm's two portfolios. Both of these portfolios are sufficiently broadly diversified to meet the investment objectives of all of our clients.
- **Disclosures of Conflicts**

  Markoe Advisors encourages its staff to be involved in the business and civic community. Only business or civic interests that relate to current portfolio holdings need to be reported to the firm.
- **Violations**

  Any violation of the Markoe Advisors compliance policy statement will be reported to the president, and employees will receive an official warning.
- **Compensation**

  All staff members of Markoe Advisors will discuss with their supervisor all outside compensation that they are receiving or may receive.

7 Does Nano comply with the CFA Institute Standards of Professional Conduct when he asks his clients to transfer their accounts to Markoe Advisors?

A No.

B Yes, because he contacted the clients after leaving Patriarch.

C Yes, because he was an intern and not a paid employee of Patriarch.

8 Is Nano's statement with respect to adoption of the CFA Institute Code of Ethics and Standards of Professional Conduct and the CFA Institute Asset Manager Code of Professional Conduct, respectively, correct?

	CFA Institute Code and Standards	CFA Institute Asset Manager Code of Professional Conduct
A	No	No
B	No	Yes
C	Yes	No

9 According to the CFA Institute Code and Standards, what action should Nano take after discussing the firm's compliance policy with President Markoe? Nano should:

A resign from the firm.

B notify the board of directors.

C decline to accept supervisory responsibilities.

10 Does Nano's draft compliance policy statement conform to the CFA Institute Code and Standards with respect to performance presentation?

A No, because terminated accounts are excluded.

B No, because performance is reported to all clients gross of fees.

C No, because performance data are presented on a before-tax basis.

11 Does Nano's draft compliance policy statement conform to the CFA Institute Code and Standards with respect to:

	suitability of investments?	disclosures of conflicts?
A	No	No
B	No	Yes
C	Yes	No

12 Does Nano's draft compliance policy statement conform to the CFA Institute Code and Standards with respect to:

	violations?	compensation?
A	No	No
B	No	Yes
C	Yes	No

The following information relates to Questions 13–18

Patricia Jollie, CFA, is the fixed-income analyst and portfolio manager at Mahsud Financial Corporation, a small investment firm.

On 5 April, a friend who works for a bond-rating agency mentions to Jollie that a bond the agency is analyzing will experience a rating change. That bond also happens to be in Mahsud Financial's portfolios. Not wanting to trade ahead of the rating change announcement, Jollie decides to wait for distribution of the information through her friend's scheduled interview on a business television program the afternoon of 8 April. On the morning of 8 April, the information is released on a worldwide financial news service. Jollie immediately changes her mind about waiting for the interview and trades the bonds in Mahsud Financial's portfolios.

On 8 April, Jollie also trades a second bond to rebalance one of Mahsud Financial's portfolios. Jollie knows before executing her transaction that the bond is thinly traded. Although Jollie's trade will materially affect the bond's market price, it is not her intention to create price movement. A colleague witnesses the trade and large bond price change and says, "What a market overreaction; the bond price appears to be distorted now!" The colleague also points out to Jollie that Mahsud Financial's policy on market manipulation states: "Mahsud Financial employees must refrain from making transactions that distort security prices or volume with the intent to mislead market participants."

In conducting fixed-income research, Jollie believes that insight into prospective corporate bond returns can be derived from information that is also relevant to a company's stock. She spends several hours a week in equity investment chat rooms on the internet, and she pays particular attention to the research reports posted by Jill Dean, CFA, a self-employed analyst, on www.Jill_Dean_the_Independent_Analyst.com. Prior to writing each report, Dean is paid a flat fee by the companies whose stocks she researches, but she does not reveal this fact to readers of her reports. She produces reports only for those companies whose stocks she can legitimately give

"buy" recommendations after conducting a thorough analysis. Otherwise, she returns the flat fee. Investors have come to recognize all her "buy" ratings as having a sound and reasonable basis.

Jollie considers Dean's summaries and forecasts to be very well-crafted. Dean has given Jollie written permission to use her summaries and forecasts, word for word and without attribution, in her own bond analysis reports. On occasion, Jollie has done so. In Dean's other internet postings, she reports the results of relevant academic finance studies. Once Jollie learns of a study by reading Dean's postings, she often reads the original study and mentions the results in her own reports. Jollie always cites the original study only and does not reveal that she learned of the study through Dean.

Mahsud Financial occasionally sponsors seminars on ethics. In the most recent seminar, the main speaker made statements about the relationship between ethics and the law, and also about potential sources of conflict of interest for research analysts. The seminar speaker's statements were:

Statement 1	An illegal action is unethical, and actions that are legal are ethically sound.
Statement 2	For analysts, a major source of conflict of interest is potential profit resulting from a weak barrier between the employer's research department and investment banking department.
Statement 3	For situations in which conflicts of interest cannot be avoided, Mahsud Financial's written compliance policy should include the following component: "For unavoidable conflicts of interest that the employee judges to be material, employees must disclose the conflicts of interest to clients prominently, and in plain language."
Statement 4	On the matter of gifts that might impair employees' objectivity, Mahsud Financial's written compliance policy should also include the following component: "Employees must disclose to Mahsud Financial all client gifts regardless of value."

13 Does Jollie violate the CFA Institute Standards of Professional Conduct by trading on the news of the bond rating change?

A No.

B Yes, only because she possessed material nonpublic information.

C Yes, only because she should have waited to trade until after her friend's television interview took place.

14 Are Jollie's 8 April trade of the second bond and Mahsud Financial's policy on market manipulation, respectively, consistent with CFA Institute Standards on market manipulation?

A Both Jollie's 8 April trade of the second bond and Mahsud Financial's policy on market manipulation are consistent with CFA Institute Standards.

B Jollie's 8 April trade of the second bond is inconsistent and Mahsud Financial's policy on market manipulation is consistent with CFA Institute Standards.

C Jollie's 8 April trade of the second bond is consistent and Mahsud Financial's policy on market manipulation is inconsistent with CFA Institute Standards.

15 Does Dean violate CFA Institute Standards in preparing and disseminating her equity reports?

A No.

B Yes, only by misrepresenting her recommendations as independent.

C Yes, only by accepting payment from the companies on which she produces reports.

16 In preparing investment reports, does Jollie violate the CFA Institute Standards with respect to her:

	use of Dean's summaries and forecasts?	citation of studies found in Dean's internet postings?
A	No	Yes
B	Yes	No
C	Yes	Yes

17 Are the seminar speaker's Statements 1 and 2, respectively, correct?

	Statement 1	Statement 2
A	No	No
B	No	Yes
C	Yes	No

18 Are the seminar speaker's Statements 3 and 4, respectively, sufficient to meet the requirements of related CFA Institute Standards?

	Statement 3	Statement 4
A	No	No
B	No	Yes
C	Yes	No

The following information relates to Questions 19–24

Stacia Finnegan, CFA, manages a regional office of Harvest Financial's brokerage business. Her responsibilities include training all personnel in compliance with the firm's standards, policies, procedures, and applicable laws and regulations.

Finnegan is currently providing training on the firm's new PlusAccount, a comprehensive fee-based brokerage account. "PlusAccounts," she tells the brokers, "are an excellent way to ensure that the financial advisor does not recommend trades for the purpose of generating commissions. The advisor and client's interests are aligned." She continues, "You will find that many clients will benefit from converting a traditional brokerage account to a PlusAccount. Be aware, however, that PlusAccounts are not appropriate for all categories of investors, including buy-and-hold clients and certain clients with assets less than $50,000." Finnegan distributes written compliance procedures for establishing and maintaining PlusAccounts. She carefully explains that regulatory rules "require that we have reasonable grounds for believing that the PlusAccount is appropriate for a particular customer. Additionally, we must review each account on an annual basis to determine whether PlusAccount status remains appropriate. The policies outlined in these documents are designed to ensure compliance with industry standards and regulatory requirements. You must follow these compliance procedures exactly."

Finnegan then distributes and explains the sales and disclosure materials for clients. The materials include the following fee structure:

PlusAccount Annual Fee (as a Percent of Assets)*		
Account Asset Level	**Equity (%)**	**Mutual Fund/Fixed Income (%)**
From 0–$250,000	2.00	1.00
Next $250,000	1.50	1.00
Next $250,000	1.25	1.00
Next $250,000	1.00	1.00
More than $1 million	0.75	0.75

*Minimum annual fee of $1,000 billed quarterly.

Finnegan spends the rest of the afternoon training the staff on detailed procedures and answering their questions.

Chris Klein is a registered broker and financial advisor with Harvest. He is also a Level II Candidate in the CFA Program. Klein is excited about the new PlusAccounts and believes that they will be attractive for many clients.

One of Klein's clients is Elaine Vanderon, who contributes weekly to her brokerage account. Under Vanderon's directions, Klein invests the weekly contributions in actively managed mutual funds (unit trusts). The funds have below-average management fees and average returns. Commissions for Vanderon average $35 per transaction.

When Vanderon's account reaches $50,000 in assets, Klein recommends conversion to a PlusAccount. He carefully explains that in a PlusAccount, both the cost of investment advice and many implementation costs are wrapped into the management fee billed on a quarterly basis. Stock and bond commissions, he tells Vanderon, are discounted by 70%. Klein informs Vanderon that in a PlusAccount, she can buy or sell thousands of mutual funds or unit trusts (including those in which she invests) for no commissions or transaction charges. He explains that PlusAccounts are ideal for clients who trade often—or as part of a periodic investment program such as hers. Vanderon reads through the disclosure material provided by Klein and accepts his recommendation.

Klein routinely informs clients about the benefits of PlusAccount status and presents them with all the disclosure materials. Another client Klein encourages to open a PlusAccount is Lee Brown. Brown has accumulated stock holdings of $300,000 and trades equities almost daily. His annual commissions for the previous twelve months equal $9,100. His portfolio is well-diversified. He has a high risk tolerance and prefers growth stocks. After explaining the fee structure, Klein tells Brown "The PlusAccount is ideal for an active trader like you."

One year later, Finnegan is promoted. She delegates supervisory responsibility for Klein and 15 other brokers to her assistant branch manager.

The same month, Klein meets with Vanderon and Brown to review their portfolios and financial situations. Both clients are happy with their PlusAccounts. Vanderon's commission costs have declined to zero. Her account continues to grow in line with her plans and expectations. Brown is also happy with his account. His annual commission costs have declined 70% to $2,700.

Two months later, Vanderon receives a $1 million inheritance and places it in her PlusAccount. Although he conducted a full review two months earlier, Klein meets with Vanderon to review her financial situation and discuss potential changes to her investment policy. During their meeting, Klein mentions that he has completed Level III of the CFA examination. He informs Vanderon "Completion of the CFA Program has enhanced my portfolio management skills." He tells Vanderon "As a

CFA charterholder, I am the best qualified to manage your investments." Vanderon congratulates Klein on his accomplishment and agrees to consider any changes he recommends to her PlusAccount.

The following month, Klein telephones Vanderon to recommend a highly-rated mutual fund. Klein states "The fund has an excellent performance history and is ranked in the top decile of comparable funds. For the past three- and five-year periods, its average annual return has exceeded the benchmark by 90 basis points. Of course, past performance is no guarantee of future returns, but several of my clients hold this fund and they are all very happy with it. One of them invested $50,000 five years ago. That investment is worth more than $100,000 today." When Vanderon asks about fees, Klein explains that the fund's management fees are 25 basis points higher than those of her existing investments. He adds "Because of your PlusAccount status, you won't incur a brokerage commission for this transaction even though I will receive a referral fee if you invest in the fund."

Six months later, Brown suffers serious medical and financial problems and stops trading. Klein telephones him to review his financial situation. Brown insists that he will make a full recovery and that he will be trading again shortly. During the next twelve months, Brown is too ill to trade. His growing expenses force him to withdraw large amounts from his PlusAccount. Within another 18 months, his PlusAccount value is less than $50,000.

19 When recommending Vanderon convert to a PlusAccount, does Klein violate any CFA Institute Standards of Professional Conduct?

A No.

B Yes, because he does not have a reasonable basis.

C Yes, because the account is unsuitable for Vanderon.

20 When recommending Brown convert to a PlusAccount, does Klein violate any CFA Institute Standards?

A No.

B Yes, relating to suitability.

C Yes, relating to reasonable basis.

21 When meeting with Vanderon, does Klein violate any CFA Standards?

A No.

B Yes, because he improperly references the CFA designation.

C Yes, because he claims enhanced portfolio management skills.

22 When recommending the mutual fund to Vanderon, does Klein violate any CFA Standards?

A No.

B Yes, relating to suitability.

C Yes, relating to referral fees.

23 In the eighteen months following Brown's change in financial situation, Klein is *least likely* to have violated the Standard relating to:

A loyalty, prudence, and care.

B diligence and reasonable basis.

C communication with clients and prospective clients.

24 In her supervisory duties, does Finnegan violate any CFA Standards?

A No.

B Yes, because she fails to ensure that compliance procedures are enforced.

C Yes, because she delegates supervisory authority to her assistant branch manager.

The following information relates to Questions 25–30

A.J. Vinken, CFA, manages the Stonebridge Fund at Silk Road Capital Management. He develops a growth-stock selection model which produces highly favorable simulated performance results. He would like to employ the model in managing the Stonebridge Fund, a large-capitalization equity fund. He drafts a letter for distribution to all shareholders. In it, he discusses in detail his approach to equity selection using the model. He includes both the actual and simulated performance results of the Stonebridge Fund for the past three years as seen in Exhibit 1:

Exhibit 1 Stonebridge Fund Annual Returns

Year	Stonebridge Fund (Simulated)	Stonebridge Fund (Actual)
1	10.71%	9.22%
2	2.83%	–4.13%
3	22.23%	22.23%
Average annual return	11.92%	9.11%

Vinken writes, "Using the proprietary selection model for the past three years, the Stonebridge Fund would have earned an average annual return of almost 300 basis points in excess of the fund's actual return. Based on these simulated results, I am confident that employing the model will yield better performance results in the future; however, Silk Road Capital Management can make no statement of assurances or guarantee regarding future investment returns."

D.S. Khadri, CFA, is also a portfolio manager at Silk Road. She recently assumed management of the small-cap Westlake Fund from Vinken.

Khadri implements an electronic record-retention policy when she becomes the Westlake manager. In accordance with her policy, all records for the fund, including investment analyses, transactions, and investment-related communications with clients and prospective clients, are scanned and electronically stored. Vinken maintained the same records in hard-copy format for the five years that he managed the Westlake Fund. Khadri has begun the process of scanning all of the past records of the Westlake Fund; however, Vinken complains that Khadri is wasting company resources by scanning old records. Vinken insists that he will continue to maintain only hard-copy records for the Stonebridge Fund for the five years required by regulators.

Khadri writes a performance review of the Westlake Fund for its quarterly newsletter. She reports that Silk Road Capital Management is moving toward compliance with the Global Investment Performance Standards (GIPS). She states, "The Westlake Fund is already partially GIPS compliant. We expect to be fully compliant with the GIPS standards within the next 12 months."

In the quarterly newsletter, Khadri makes the following statements:

Statement 1 "China's pegging of the yuan to the US dollar will end within the next 12 months which will lead to the yuan increasing in value by more than 40%, supporting our overweighting of Chinese-related stocks in the Westlake Fund."

Statement 2 "Increased geo-political uncertainty around the globe should keep oil prices above 3-year levels and supports our recommendation for an over-weighting of equities in the small-cap energy sector."

Khadri also reports:

> "The quarterly return of the Westlake Fund was 4.07%. The quarterly return exceeded the performance of its benchmark, the Russell 2000 Index by .16%. Investors should not expect this type of performance to continue into the foreseeable future.*
>
> * Additional detailed information available upon request."

After the quarterly newsletter is distributed, a client contacts Khadri claiming that the Westlake Fund actually underperformed the benchmark during the quarter. After researching the issue, Khadri confirms that the client is correct and sends him a letter in which she provides the corrected results. In her letter to the client, she blames the discrepancy—which was the result of a human typographical error—on a computer programming error.

25 In his letter regarding the stock-selection model, does Vinken violate any CFA Institute Standards of Professional Conduct?

A No.

B Yes, because he uses simulated performance results.

C Yes, because he claims that the new model will yield better performance results.

26 Are the record-retention policies of both Khadri and Vinken consistent with CFA Institute Standards?

A Yes.

B No, Khadri's policy is not consistent.

C No, Vinken's policy is not consistent.

27 Are Khadri's statements regarding compliance with the Global Investment Performance Standards consistent with CFA Institute Standards?

A Yes.

B No, because Khadri may not claim partial compliance.

C No, because Khadri fails to disclose the areas of noncompliance.

28 Are Khadri's statements in the quarterly newsletter consistent with CFA Institute Standards?

A Yes.

B No, because Statement 1 is opinion, not fact.

C No, because Statement 2 is opinion, not fact.

29 Are Khadri's newsletter comments regarding returns consistent with CFA Institute Standards?

A Yes.

B No, because Khadri used an inappropriate benchmark.

C No, because Khadri did not disclose whether the performance results are before or after fees.

30 When responding to the client complaint regarding Westlake's performance, Khadri *least likely* violates the Standard relating to:

A misconduct.

B misrepresentation.

C performance presentation.

The following information relates to Questions 31–36

Omega Financial, a large financial services firm, makes a market in more than 500 stocks. As a market-maker, the firm executes institutional orders as well as retail orders placed by its private wealth unit, its broker-dealer affiliate, and other third-party broker-dealers.

A page in Omega's compliance manual, which adheres to all legal and regulatory requirements, includes the following information:

OTC Stocks in Which Omega is a Market-Maker

Definitions:

Riskless principal transaction: an order in which a firm, after receiving a customer's order, executes the order on a principal basis from another market center.

Net Trade/Trade on a net basis: a principal transaction in which a market-maker, after having received an order, executes the order at one price with another broker-dealer or another customer and then sells to (buys from) the customer at a different price.

Compliance Policies:

Institutional Orders	Retail Orders
Riskless principal transactions may be traded on a net basis.	Riskless principal transactions may not be traded on a net basis. They receive the same execution price without mark-up, mark-down, commissions, or fees.

Consistent with regulatory requirements, Omega discloses the information about riskless principal transactions to all clients and third-party broker-dealers. In addition, Omega informs third-party broker-dealers that it will seek best execution on retail orders.

Omega is developing an automated order-handling system to improve efficiencies in order flow. Anticipated benefits of the new system include much faster execution speeds. Additionally, the system design includes a trading mechanism that will execute portions of certain large orders to reduce market impact. The trading mechanism delays some orders to allow the firm to obtain a better overall price.

Xavier Brown, CFA, is responsible for overseeing the project to ensure its timely completion. Brown enlists the compliance department to review the programming during the initial development phase and identify any potential problems. The compliance department compares the order-handling function of the new system to the third-party software currently in use. They identify a number of potential problems

including delays in execution of certain large market orders and embedded mark-ups and mark-downs on stocks in which the firm makes a market. According to the compliance department, changes are necessary to comply with regulatory requirements.

Brown directs the programmers to correct the problems and run tests and simulations. The programmers spend the next few months making changes to the system and adding comments throughout the code that clearly explain the purpose of particular functions. After several months, the programmers report that they have corrected all the identified problems and run the necessary tests and simulations. The following month, the firm switches to the automated order-handling system as planned.

Joy Chen, CFA, trades Xydeo stock for Omega. One month following the switch to the new order-handling system, Chen is able to execute a number of principal riskless transactions for both institutional and retail clients at $25.00 per share. When processing the customer buy orders totaling 500,000 shares, the new system automatically uses the best-publicized price of $25.01 and the firm issues client confirmations showing a purchase price of $25.01.

Stephen Smith, CFA, works across from Chen on the trading desk at Omega. His seat is close to a speaker for the company's squawk box, which is used to broadcast information about current analyst recommendations; news about market events; and information about pending block trades.

Smith's young brother-in-law, Adolfo Garcia, recently accepted a position as a broker at a third-party broker-dealer that trades with Omega. Garcia has a modest income and little savings. He is enthusiastic about investments and has enrolled as a CFA candidate. Smith calls Garcia early each morning to talk about the previous day's events. At the end of their conversation, Smith places the call on speakerphone and resumes his work.

In his office, Garcia can hear Omega's squawk box over the speakerphone. Garcia enjoys listening as Omega analysts discuss changes in ratings, economic forecasts, and capital market developments. He is careful not to trade in stocks mentioned explicitly on the squawk box. Rather, he sometimes researches competitors and other firms operating in the same industry. In one case, he immediately shorts the stock of Tefla Corporation after an Omega analyst downgrades a firm in the same industry.

Garcia frequently places large block orders for low-priced small-capitalization stocks at the market price. Once the new system is operational, Smith processes the orders through the new trading-system mechanism, which delays execution of portions of the orders and allows the firm to obtain a better price for Garcia.

31 For a CFA charterholder, would adhering to Omega's policies regarding riskless principal transactions result in a violation of the CFA Institute Standards of Professional Conduct?

A No.

B Yes, because Omega disadvantages institutional clients.

C Yes, because disclosure of the policy does not relieve Omega of its obligation to treat clients equally.

32 When overseeing the development of the automated-trading system, does Brown violate any CFA Institute Standards?

A No.

B Yes, because he accepted an assignment for which he was inadequately trained and skilled.

C Yes, because he did not ensure that the final system complied with regulatory requirements.

33 With regard to Chen's trades in Xydeo, do the institutional and retail trades both comply with CFA Institute Standards?

A Only the retail trades comply.

B Only the institutional trades comply.

C Neither the retail nor the institutional trades comply.

34 When placing the morning phone call on speakerphone, does Smith violate any CFA Institute Standards?

A No.

B Yes, his duty to Omega.

C Yes, his duty to clients and to Omega.

35 When listening to the Omega squawk box, does Garcia violate any CFA Institute Standards?

A No.

B Yes, the standard regarding professionalism.

C Yes, the standard regarding material nonpublic information.

36 When shorting Tefla stock, does Garcia violate any CFA Institute Standards?

A No.

B Yes, because he does not have a reasonable basis for the trade.

C Yes, because he is in possession of material nonpublic information.

The following information relates to Questions 37–42

Sebastian Riser, CFA, works as a portfolio manager for Swibank, a small private bank in Switzerland. Riser manages the accounts of his clients according to best practices, keeping clients' interests before those of the bank and his own. He allocates investments in a fair manner when he deems them consistent with the stated objectives and constraints of clients.

Swibank has a Luxembourg subsidiary, which distributes fund-of-funds products. Riser recently received a request to serve on the board of directors for the subsidiary. In this role, Riser would advise management on business strategies; market opportunities; potential clients; and current and prospective fund managers. For his role on the board, Riser would receive an annual payment directly from the subsidiary equivalent to 5% of his total portfolio manager salary in Switzerland.

The following month, Riser accepts the position on the board. The subsidiary registers each new fund-of-funds product with regulatory authorities in Luxembourg and discloses Riser's role as a board member in the required filings, which are public and readily available.

Riser serves as the contact person for the subsidiary's institutional clients in Switzerland and participates in the subsidiary's road shows in Switzerland. His role during these road shows varies. On some occasions, he simply attends the presentations while the operating management sells the products; on others he gives the actual presentation promoting the products. Riser's name does not appear in the promotional material distributed at the road shows.

Alexander Komm, a long-time colleague of Riser, is the founder of Komm Private Management, which provides asset management, advisory, and trust services to high-net-worth individuals. The firm has several well-managed proprietary funds. Komm offers Riser a position with the firm as managing partner. Riser is flattered, but declines the offer, explaining that he is very happy working at Swibank.

That same week, the subsidiary informs Riser that it needs an experienced fund manager to manage a new publicly-traded Japanese equity product. Riser is convinced that Komm Private Management would be qualified and recommends the firm for the new product. After a thorough search process, the subsidiary hires Komm Private Management for the new product.

Six months later, after numerous discussions, Komm finally convinces Riser to join Komm Private Management as a managing partner. The following week, Riser submits his resignation at the private bank. His position on the board of the subsidiary is not dependent on his employment at the bank, and he agrees to serve the remaining three years of his term.

After signing and submitting his employment contract to Komm, Riser takes three weeks of vacation before starting his new position. During this time he purchases 2,000 shares of the new Japanese equity product for his private account. When he begins working at Komm Private Management, he purchases a large block of shares in the Japanese equity product, which he allocates according to internal procedures to all accounts for which it is suitable.

37 According to the CFA Institute Standards of Professional Conduct, before accepting the position on the board of the subsidiary, Riser should:

A receive verbal consent from Swibank.

B receive verbal consent from his clients.

C disclose to his employer the financial compensation proposed by the subsidiary.

38 When participating in the road shows in Switzerland, Riser *least likely* violates the Standard relating to:

A Disclosure of Conflicts.

B Independence and Objectivity.

C Additional Compensation Arrangements.

39 When recommending Komm, does Riser violate any CFA Institute Standards?

A No.

B Yes, relating to duties to employer.

C Yes, relating to disclosure of conflicts.

40 When resigning from Swibank, does Riser violate any CFA Institute Standards?

A No.

B Yes, because he breaches his duty of loyalty to his employer.

C Yes, because he does not resign his position with the Luxembourg subsidiary.

41 In his original purchase of 2,000 shares of the Japanese equity product, Riser *least likely* violates the Standard relating to:

A Suitability.

B Priority of Transactions.

C Integrity of Capital Markets.

42 According to CFA Institute Standards, Riser is not required to disclose to clients his:

A holdings of the Japanese equity product.

B relationship with the Swibank subsidiary.

C compensation from the Swibank subsidiary.

The following information relates to Questions 43–48

Prudent Investment Associates (PIA) is a small-cap equity investment management company that uses fundamental equity analysis in its investment decision-making process. All portfolio managers at PIA manage both discretionary and non-discretionary accounts. Kevin Danko, CFA, is PIA's owner and chief investment officer and supervises May Chau, a recently hired portfolio manager. PIA has adopted the CFA Institute Code of Ethics and Standards of Professional Conduct.

Chau is enrolled to sit for the Level III CFA examination. In its marketing brochure, PIA states: "May Chau is a Level III candidate in the CFA Program." A colleague tells Chau this presentation may be incorrect according to the CFA Institute Code and Standards and suggests the following change: "May Chau has passed Level II of the CFA examination."

PIA has established a relationship with Fair Trading Incorporated (FTI), a regional investment bank and broker/dealer. FTI provides clients with access to research and analysts' recommendations via a user-registered website. This access is available on the condition that clients not forward any of the research and recommendations to any other parties. In exchange for this access and after concluding that FTI provides best execution, Danko directs to FTI most of his trade orders.

FTI also provides to a select group of brokerage clients, including PIA, information regarding several of its investment banking customers. This information includes the customers' own earnings projections. FTI instructs this select group of brokerage clients not to disseminate these earnings projections to the public until released by the investment banking customers.

On a regular basis, Danko reviews the list of "strong buys" on FTI's website to see if there have been any new "buy" recommendations. Danko quickly places orders for discretionary client accounts to purchase shares of any company for which the investment recommendation has been changed to a "strong buy." He takes this action so discretionary account clients do not miss any price appreciation. After each purchase, he instructs Chau to perform the appropriate fundamental analysis on these companies within five business days so the research file is adequately documented.

From time to time, PIA receives initial public offering (IPO) allocations from FTI. Danko allocates these IPOs to those discretionary accounts that normally participate in IPOs. If the IPO is oversubscribed, he excludes his wife's discretionary non-fee-paying account so that he is not accused of bias when allocating the oversubscribed IPOs.

During a recent presentation, Danko and Chau are asked what procedures PIA uses to ensure employees do not benefit from information prior to executing trades in client accounts. Danko responds that PIA has the following Trading Procedures:

Procedure 1	Investment personnel are not permitted to trade securities for five business days prior to trades executed in discretionary client accounts.
Procedure 2	Each quarter a randomly selected group of investment personnel must provide duplicate trade confirmations to the PIA compliance officer.

Procedure 3 Investment personnel must receive prior approval for personal trades only for those trades greater than $5,000.

43 Does the reference to Chau's participation in the CFA Program, as presented in the marketing brochure, or in the suggested change, violate CFA Institute Standards of Professional Conduct?

A No.

B The marketing brochure is a violation, but the suggested change is not a violation.

C The suggested change is a violation, but the marketing brochure is not a violation.

44 Does Danko violate CFA Institute Standards when he directs trades to FTI?

A No.

B Yes, because by trading with FTI, Danko is putting PIA's interests ahead of his clients.

C Yes, because Danko has a duty to provide FTI's research to PIA's clients before executing trades.

45 According to CFA Institute Standards, which of the following actions is the *most* appropriate for Danko to take with respect to the use of the earnings projections? Danko should:

A disclose the information to the public.

B terminate PIA's relationship with FTI.

C keep the information confidential and not use it in his analysis.

46 Does Danko's decision to purchase shares that are recommended as a "strong buy" violate the CFA Institute Standards?

A No.

B Yes, because Danko must have a reasonable and adequate basis prior to purchasing the shares.

C Yes, because Danko must give non-discretionary accounts the opportunity to purchase equities at the same time he purchases equities in the discretionary accounts.

47 Does Danko violate the CFA Institute Standards when he allocates oversubscribed IPO issues?

A No.

B Yes, because he should allocate the oversubscribed IPOs across all discretionary accounts.

C Yes, because he should treat his wife's account the same as other discretionary accounts and include it in the oversubscribed IPO allocations.

48 Which of PIA's Trading Procedures is *most* consistent with the CFA Institute Standards?

A Procedure 1.

B Procedure 2.

C Procedure 3.

SOLUTIONS

1 B is correct. Locke's primary duty is to his clients. In the case of a pension plan, the clients are all of the ultimate beneficiaries.

2 B is correct. Under no circumstances should a manager take investment action that is inconsistent with the client's IPS.

3 C is correct. Locke's interest claim is legitimate since the Fund's cash was employed to purchase equities that were later removed from the account. Therefore, the Fund is owed interest for the period in question.

4 A is correct. Until Locke's investigation is complete, he has no obligation to suspend the manager or take any other action. He believes the manager can and does add value through superior returns and diversification, and therefore it may be reasonable to retain NGM if Locke can be satisfied that the manager can act within the constraints of the IPS and CFA Institute Standards. Until the analysis is complete, it would not be practical, and Locke would be violating his duty to act in his clients' best interests by suspending the manager and leaving the assets unmanaged or to temporarily moving them to another manager for safe-keeping.

5 A is correct. Client suitability for an investment must be reviewed prior to allocation, not afterward. With respect to interest adjustments, clients who were incorrectly allocated shares must be paid for the use of their cash; however, in no instance should clients suffer a loss because of an allocation error by the manager (that is, have interest removed from their portfolio even though shares are put in their account on a back-dated basis).

6 B is correct. Locke has a duty to the pension plan beneficiaries to act in their best interests. He would be violating that duty if he continues to employ a manager who does not manage its mandate or demonstrate that it is aware of and complies with its own duties to clients. He must demonstrate his own professional competence by firing the manager.

7 B is correct. Standard IV(A) prohibits employees from soliciting the clients of employers prior to, but not subsequent to, their departure.

8 B is correct. The CFA Code and Standards apply to individual members and candidates of CFA Institute, but firms are encouraged to adopt the Code and Standards as part of their firm code of ethics. The CFA Institute Asset Manager Code of Professional Conduct has been drafted specifically for firms.

9 C is correct. Standard IV(C) states that the member or candidate should decline in writing to accept supervisory responsibility until the firm adopts reasonable procedures to allow him to adequately exercise such responsibility.

10 A is correct. Standard III(D) states that both terminated and active accounts must be included as part of the performance history.

11 A is correct. By placing all clients in one of the two specialized portfolios it operates, Markoe Advisors is not giving adequate consideration to the individual needs, circumstances, and objectives of each client as required by the Standards. In addition, the Standards require that members and candidates disclose all actual and potential conflicts of interest, not just those that relate to current portfolio holdings.

12 A is correct. The Standards require that the supervisor promptly initiate an investigation to ascertain the extent of the violation and should take steps to ensure that violations will not be repeated by limiting or monitoring the

employees' activities. The Standards also require that members and candidates obtain written permission from their employer before accepting any compensation or benefits from third parties that may create a conflict of interest.

13 A is correct. Jollie did not act on the material nonpublic information she possessed but waited until it became public. According to the *Standards of Practice Handbook*, "It is not necessary … to wait for the slowest methods of delivery."

14 A is correct. Jollie's transaction is a legitimate market order in a thinly-traded security, and Mahsud Financial's policy statement is consistent with CFA Institute Standards relating to the Integrity of Capital Markets.

15 B is correct. It is not a violation to accept compensation from an issuer in exchange for research but such arrangements must be disclosed prominently and in plain language.

16 B is correct. Receiving Dean's written permission does not absolve Jollie of her responsibility to provide attribution. Because Jollie uses the results of the research studies and does not use Dean's interpretation of the studies, it is appropriate to cite the original authors only.

17 B is correct. The first statement is incorrect and the second statement is correct. What is legal is not necessarily ethical. A weak barrier between the employer's research department and investment banking department is a potential source of conflicts.

18 B is correct. Statement 3 is incorrect. The disclosure of a conflict should be made—prominently and in plain language—regardless of whether the member views the conflict as material, so the client can determine the materiality of the conflict. Statement 4 is in compliance with CFA Institute Standards. The Mahsud Financial disclosure requirement meets CFA Institute Standards. Gifts from clients should be disclosed to the employer, which is responsible for determining whether the gift could affect the employee's independence and objectivity.

19 A is correct. Klein does not violate the CFA Standards of Professional Conduct when recommending a PlusAccount to Vanderon. His actions comply with Standard III(A)—Loyalty, Prudence, and Care; Standard III(C)—Suitability; and Standard V(A)—Diligence and Reasonable Basis. As required, Klein discloses the fee structure associated with the PlusAccount. Based on the fee structure and Vanderon's trading activity, the PlusAccount appears to be a suitable investment vehicle. By converting to PlusAccount status, Vanderon will incur an annual fee of $1,000 and eliminate approximately $1,800 in annual brokerage commissions. The potential savings of approximately $800 provides a reasonable basis for recommending PlusAccount status.

20 A is correct. Klein does not violate CFA Standards when recommending a PlusAccount to Brown. His actions comply with Standard III(A)—Loyalty, Prudence, and Care; Standard III(C)—Suitability; and Standard V(A)—Diligence and Reasonable Basis. As required, he discloses the fee structure. Based on the fee structure and Brown's annual commissions, the PlusAccount appears to be a suitable investment vehicle. By converting to PlusAccount status, Brown will incur an annual fee of $5,750 and save approximately $6,400 in annual brokerage commissions. The potential savings of approximately $650 provides a reasonable basis for recommending PlusAccount status.

21 B is correct. Klein improperly references the CFA designation when he states "As a CFA charterholder, I am the best qualified to manage your investments." He is in violation of Standard VII(B)—Reference to CFA Institute, the CFA Designation, and the CFA Program.

22 C is correct. Klein violates Standard VI(C) relating to Referral Fees because he fails to provide appropriate disclosure. The Standard states that members must disclose the nature of the consideration or benefit—for example, whether flat fee or percentage basis; one-time or continuing benefit; based on performance—together with the estimated monetary value. Although Klein acknowledges receipt of referral fees from the fund, he does not disclose an estimated dollar value or the nature of the consideration.

23 C is correct. In the months following Brown's change in financial status, Klein is least likely to violate Standard V(B) relating to communication with clients because he disclosed the basic format and other pertinent information regarding PlusAccounts and he distinguished between fact and opinions. During the time period, Klein does not make any new recommendations to Brown and thus is least likely to violate the Standard relating to Communication with Clients and Prospective Clients. During the period, Klein is in jeopardy of violating several other standards including those relating to Loyalty, Prudence, and Care; Suitability; and Diligence and Reasonable Basis. Because of the fee structure, PlusAccount status is not suitable for a client who trades infrequently. Klein neglects his duty of loyalty, prudence, and care by maintaining the PlusAccount Status for more than one year after Brown's change in trading activity. A diligent review of the account would indicate whether a client has a reasonable basis for maintaining PlusAccount status. Thus, Klein is most likely to violate Standards III(A), III(C), and V(A) during the period in question.

24 B is correct. Finnegan violates Standard IV(C)—Responsibilities of Supervisors by failing to ensure that compliance procedures are enforced. As she informed her staff, Harvest "must review each account on an annual basis to determine whether PlusAccount status remains appropriate." Had Vanderon's and Brown's accounts been reviewed annually in accordance with compliance procedures, it would have been clear that the PlusAccount was no longer suitable for either. Delegating supervisory authority to another individual does not violate the Standards.

25 A is correct. Vinken does not violate any CFA Standards of Professional Conduct in his letter. In accordance with Standard III(D)—Performance Presentation, he presents fair, accurate, and complete information when he identifies actual and simulated performance results. Also in accordance with the Standard, he does not guarantee superior future investment returns. In accordance with Standard V(B)—Communication with Clients and Prospective Clients, Vinken describes to his clients and prospective clients the process and logic of the new investment model. By providing the basic details of the model, Vinken provides his clients the basis for understanding the limitations or inherent risks of the investment strategy.

26 A is correct. The policies of both Khadri and Vinken are consistent with Standard V(C)—Record Retention, which states that members and candidates must develop and maintain appropriate records to support their investment analyses, recommendation, actions, performance and other communications with clients and prospective clients. The records required to support recommendations and/or investment actions depend on the role of the member or candidate in the investment decision-making process. Records can be maintained either in hard copy or electronic form. Even though they use different methods, Khadri and Vinken each maintain the appropriate records and have adequate systems of record control.

27 B is correct. Khadri is in violation of Standard III(D). When claiming compliance with GIPS, firms must meet all the requirements. GIPS standards, while voluntary, only apply on a firm-wide basis. Neither a firm nor a fund can claim partial compliance with GIPS standards.

28 B is correct. Standard V(B)—Communication with Clients and Prospective Clients requires the member or candidate to separate and distinguish "facts from opinions" in the presentation of analyses and investment recommendations. Statement 1 in the newsletter states that "China's pegging of the yuan to the US dollar *will* end within the next 12 months which *will* lead to the yuan increasing in value by more than 40%, supporting our over-weighting of Chinese-related stocks in the portfolio." Khadri does not clearly differentiate between opinion and fact. The statement about the future of oil pricing is not as questionable because Khadri uses the term "should" which helps clients understand that this is an opinion and not a certainty. Members may communicate opinions, estimates, and assumptions about future values and possible events but they must take care to differentiate fact from opinion.

29 C is correct. Khadri violates the Standard relating to Performance Presentation because he does not disclose whether the performance results are before or after fees. Standard III(D) requires that members make reasonable efforts to ensure that investment performance information is "fair, accurate, and complete." According to the guidance provided in the *Standards of Practice Handbook*, members should include disclosures that fully explain the performance results (for example, whether the performance is gross of fees, net of fees, or after tax).

30 C is correct. As Khadri provides the corrected information in her letter to the client, she is least likely to violate the Standard relating to performance presentation. She is more likely to violate the Standards relating to Misconduct and Misrepresentation because she knowingly misrepresents the cause of the error. Standard I(D)—Misconduct requires that members not engage in any professional conduct involving dishonesty. Standard I(C) prohibits members from knowingly making any misrepresentation relating to investment actions and professional activities.

31 A is correct. Mark-ups and mark-downs in net trades are considered fees paid by clients. Standard III(B)—Fair Dealing requires that members treat all clients fairly in light of their investment objectives and circumstances. Treating institutional and retail investors differently is not a violation. According to the Standards, members can differentiate their services to clients but different levels of service must be disclosed and should not negatively affect clients. Omega has made the appropriate disclosures to its clients in compliance with legal and regulatory requirements as well as the Standards.

32 C is correct. Brown is in violation of Standard IV(C)—Responsibilities of Supervisors because he did not ensure that the final system complied with regulatory requirements. According to the Standard, Brown has a responsibility to make reasonable efforts to detect and prevent violations of applicable laws, rules, and regulations. Alerted to potential problems by the compliance department, he had a responsibility to ensure that the modifications corrected the potential problems without introducing new problems.

33 B is correct. Only the institutional trades comply with CFA Institute Standards. All the trades were processed on a net basis. Because the firm disclosed that institutional orders may be executed on a net basis, the institutional trades did not result in a violation. The firm disclosed to clients that in riskless principal trades, retail clients will receive the same execution price without mark-up.

Executing the retail orders on a net basis with a $.01 mark-up resulted in a violation of Standards I(C) and III(B) relating to misrepresentation and fair dealing.

34 C is correct. Smith violated his duties to both clients and Omega by not protecting confidential information. By providing Garcia access to confidential information such as changes in recommendations and information regarding block trades, Smith provided Garcia the opportunity to front-run, which could cause harm to both Omega and its clients. Thus, Smith's actions violate his duty of loyalty, prudence, and care to his clients and his duty of loyalty to his employer, Standards III(A) and IV(A), respectively.

35 B is correct. Garcia violated the Standard of Professionalism by engaging in eavesdropping on confidential information including changes in analyst recommendations and pending block trades. According to Standard I(D) members must not engage in professional conduct involving dishonesty, deceit, or fraud or commit any act that reflects adversely on their professional reputation, integrity, or competence. Garcia engages in deceitful conduct in obtaining information from the squawk box. His actions reflect adversely on his professional reputation and integrity and thus violate Standard I(D). Garcia is not in violation of Standard II(A)—Material Nonpublic Information, although he listens to the material nonpublic information on pending block trades. Possession of such material nonpublic information is not a violation of the Standard, which prohibits acting on the information.

36 C is correct. Garcia is in possession of material nonpublic information and acted on it in violation of Standard II(A). After the analyst's recommendation has been issued and/or distributed publicly, Garcia would be free to make the trade. Because this is a personal purchase, the standard relating to diligence and reasonable basis is not applicable.

37 C is correct. According to Standard IV(B), members must not accept compensation that competes with their employers' interest unless they obtain written consent from all parties involved. Thus Riser must receive written, not verbal, consent from his employer before accepting the position on the subsidiary's board. According to the recommended procedures for compliance, Riser should make an immediate written report to his employer specifying the terms of the agreement; the nature of the compensation; the approximate amount of the compensation; and the duration of the agreement. The Standards do not require that members receive permission from clients before accepting board positions.

38 C is correct. Riser least likely violates Standard IV(B)—Additional Compensation Arrangements when participating in the road shows. The Standard provides guidance regarding the acceptance and disclosure of compensation that might conflict with an employer's interests. Participating in the road shows and receiving compensation from the subsidiary do not appear to conflict with his employer's interests.

When participating in the road shows, Riser may violate Standards I(B)—Independence and Objectivity and VI(A)—Disclosure of Conflicts. The Standard relating to Independence and Objectivity requires that members use reasonable care and judgment to achieve and maintain independence and objectivity in their professional activities. Riser's role as board member could jeopardize his objectivity and create a conflict of interest. Standard VI(A)—Disclosure of Conflicts requires that members make full and fair disclosure of all matters that could reasonably be expected to impair the independence and

objectivity or interfere with respective duties to the clients, and prospective clients. Full disclosure allows clients to judge motives and possible biases for themselves. Riser does not appear to make adequate disclosure.

39 A is correct. No violation occurred. Riser's recommendation is based on his knowledge of Komm and the firm's "well-managed proprietary funds." He does not have a conflict when he makes the recommendation.

40 A is correct. No violation occurred. Riser is not required to resign his position with the subsidiary. Riser did not engage in any activities that would conflict with his employer's interest before his resignation became effective.

41 A is correct. Riser least likely violates Standard III(C) relating to suitability when purchasing shares for his own account. Riser may violate Standard II(A)—Material Nonpublic Information and possibly Standard VI(B)—Priority of Transactions when making the purchase. If, when trading for his own account, Riser knows that he will place a large block trade for Komm clients, he may be in possession of material nonpublic information. Standard VI(B) covers the activities of all members who have knowledge of pending transactions that may be made on behalf of their clients or employers. Riser has accepted the position of managing partner, has recommended the manager for the product, and knows, or should know, that he will purchase the product for at least some Komm clients once he begins work at Komm. His purchase ahead of Komm's clients might be front-running. Best practice would be to delay his private account purchase until after he purchases shares for clients.

42 C is correct. Standard VI(A)—Disclosure of Conflicts requires that members and candidates make full and fair disclosure of all matters that could reasonably be expected to impair their independence and objectivity or interfere with respective duties to their clients, prospective clients, and their employer. Riser's holdings of the Japanese equity product and his position on the board of the subsidiary could impair his objectivity and must be disclosed to clients. He need not disclose his compensation from the subsidiary because it is not a referral fee.

43 A is correct. Both the first and second presentations are consistent with the CFA Institute Code and Standards. According to the Standards, candidates may reference their participation in the CFA Program as long as they are active, but they cannot imply a partial designation. A statement about the level of the exam successfully passed or a level of the exam upcoming is appropriate, whereas indicating or implying a partial designation or citing a future date of expected completion of a level in the CFA Program is prohibited.

44 A is correct. Danko directs his trading with FTI only after taking into account FTI's ability to provide best execution. There is no indication that FTI requires a certain amount of trading for access to the website, only that access is provided in exchange for orders. This arrangement for trading in return for research services is discussed in the Guidance to the Standards under Standard III(A).

45 C is correct. The information that Danko received is material non-public information. Disclosing the information to the public is not his role; further, earning gains for his clients does not excuse the violation and is not a justifiable reason for taking action on the material non-public information. The only entities that should release the information are the corporations or another entity with their permission, perhaps FTI.

46 B is correct. Investment decision-making due to speed or based on third-party research alone is insufficient for meeting the standard set by Standard V(A).

47 A is correct. When an issue is oversubscribed, allocations cannot be made to accounts where members and candidates have beneficial interest; client orders must be filled first.

48 A is correct. A blackout period is appropriate for investment decision-making personnel so that managers do not take advantage of their knowledge of trading activity and 'front run' the trade. The actual detail of the blackout period is not specified in the Standards, only that one should exist.

CUSTOMER SERVICE

68

READING

4

Asset Manager Code of Professional Conduct

by Kurt N. Schacht, JD, CFA, Jonathan J. Stokes, JD, and Glenn Doggett, CFA

Kurt N. Schacht, JD, CFA, is at CFA Institute (USA). Jonathan J. Stokes, JD (USA). Glenn Doggett, CFA (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to*
☐	**a.** explain the purpose of the Asset Manager Code and the benefits that may accrue to a firm that adopts the Code;
☐	**b.** explain the ethical and professional responsibilities required by the six General Principles of Conduct of the Asset Manager Code;
☐	**c.** determine whether an asset manager's practices and procedures are consistent with the Asset Manager Code;
☐	**d.** recommend practices and procedures designed to prevent violations of the Asset Manager Code.

INTRODUCTION

Asset managers hold a unique place of trust in the lives of millions of investors. Investment professionals and firms that undertake and perform their responsibilities with honesty and integrity are critical to maintaining investors' trust and confidence and to upholding the client covenant of trust, loyalty, prudence, and care. CFA Institute and its members are committed to reinforcing those principles. The CFA Institute mission is to lead the investment profession globally by setting the highest standards of ethics, education, and professional excellence. To foster this culture of ethics and professionalism, CFA Institute offers this voluntary code of conduct. It is designed to be broadly adopted within the industry as a template and guidepost for investors seeking managers who adhere to sound ethical practice.

The Asset Manager Code of Professional Conduct outlines the ethical and professional responsibilities of firms that manage assets on behalf of clients. Whereas the CFA Institute Code of Ethics and Standards of Professional Conduct address individual conduct, this Code is meant to apply, on a global basis, to firms that manage

© 2010 CFA Institute. All rights reserved.

client assets as separate accounts or pooled funds (including collective investment schemes, mutual funds, and fund of funds organizations); we refer to such firms as "Managers." In part, this document responds to requests from Managers to extend the scope of the Code and Standards to the firm level. Although many institutional asset managers, particularly those in well-regulated jurisdictions, already have such a code in place, they should use this Code to evaluate their own code and ensure that all of this Code's principles have been included. This Code also has been developed for use by asset managers, including hedge fund managers, who may not already have such a code in place. This second edition of the Code includes provisions relating to risk management as well as guidance for Managers seeking to claim compliance.

Ethical leadership begins at the highest level of an organization; therefore, the Code should be adopted by the Manager's senior management, board of directors, and similar oversight bodies. Such adoption sends a strong message regarding the importance of ethical behavior at the firm. Rather than creating rules that apply only to certain people or groups, this Code is intended to cover all employees of the firm. Although not every employee is actively involved in conduct covered in the Code, a code that is broadly applied reinforces the need for all employees to understand the ethical issues involved in the asset management business. By adopting and enforcing a code of conduct for their organizations, Managers demonstrate their commitment to ethical behavior and the protection of investors' interests. In doing so, the Managers also protect and enhance the reputation of their organizations.

The Code sets forth minimum ethical standards for providing asset management services for clients. It is meant to be general in nature and allows flexibility for asset managers of various sizes and structures to develop the particular policies and procedures necessary to implement the Code. The goal of this Code is to set forth a useful framework for all asset managers to provide services in a fair and professional manner and to fully disclose key elements of those services to clients, regardless of whether individual Managers are required to register or comply with applicable securities laws or regulations. Unregistered hedge fund managers, in particular, are encouraged to adopt the Code and implement its provisions to ensure fair dealing and integrity and to promote self-regulation in this dynamic sector.

We recognize that in the highly regulated and complex business of investment management, the adoption of a code of ethics by itself is not sufficient to ensure ethical conduct. To be implemented effectively, the principles and standards embodied in the Code must be supported by appropriate compliance procedures. The specific procedures that translate principle into practice will depend on a variety of factors, including the business of the Manager, the type of clients, the size of the Manager (based on assets under management and on number of employees), the regulatory régime with which the Manager must comply, and other factors.

Managers must adhere to all applicable laws and regulations governing their activities. Thus, the provisions of this Code may need to be supplemented with additional provisions to meet the requirements of applicable security regulation in markets around the world. Inevitably, in some markets, the Code will closely reflect or be aligned with existing regulation or accepted best practice and in other markets, the Code will expand on the existing work of regulatory authorities or may even break new ground. Furthermore, Managers operate in different types of market structures, which may affect the manner in which the Code can be applied. Despite these differences, the Code provides a universal set of principles and standards relevant to all asset managers.

Clients have a responsibility to be aware of, understand, and monitor how their assets are invested. Yet, to fulfill this responsibility, clients must be able to count on full and fair disclosure from their Managers. Providing clients with a code of ethics

that sets a framework for how the Manager conducts business is an important step toward developing the trust and confidence necessary for a successful investment management relationship.

Adopting the Code and Claiming Compliance

Adoption of or compliance with the Asset Manager Code of Professional Conduct requires firms to adhere to all the principles of conduct and provisions set forth in the Code. Many asset management firms already have codes of ethics and other policies and procedures that address or go beyond the principles and provisions of the Code. Adoption of or compliance with the Code does not require a firm to amend its existing code of ethics or other policies and procedures as long as they are at least consistent with the principles and provisions set forth in the Code. Managers are strongly encouraged to review and consider the material in the Appendix when developing and reviewing their codes and other policies and procedures, although because of the many variables in size and complexity among asset management firms, compliance with the Code does not require strict adherence to this guidance.

If the Manager has not complied with each of the principles of conduct and provisions of the Code, the Manager cannot represent that it is in compliance with the Code. Statements referring to partial or incomplete compliance (e.g., "the firm complies with the Asset Manager Code *except for . . .*" or "the firm complies with parts A, B, and C of the Asset Manager Code") are prohibited.

Once a Manager has met each of the required elements of the Code, the firm must make the following statement whenever the firm claims compliance with the Code:

> "[Insert name of Firm] claims compliance with the CFA Institute Asset Manager Code of Professional Conduct. This claim has not been verified by CFA Institute."

Acknowledgement of Claim of Compliance to CFA Institute

Managers also must notify CFA Institute of their claim of compliance with the Asset Manager Code of Professional Conduct through the CFA Institute online notification process at www.cfainstitute.org/assetcode. This acknowledgement form is for communication and information-gathering purposes only and does not represent that CFA Institute engages in enforcement or quality control of an organization's claim of compliance. CFA Institute does not verify either the Manager's claim of compliance or actual compliance with the Code.

GENERAL PRINCIPLES OF CONDUCT

Managers have the following responsibilities to their clients. Managers must:

1. Act in a professional and ethical manner at all times.
2. Act for the benefit of clients.
3. Act with independence and objectivity.
4. Act with skill, competence, and diligence.
5. Communicate with clients in a timely and accurate manner.
6. Uphold the applicable rules governing capital markets.

ASSET MANAGER CODE OF PROFESSIONAL CONDUCT

A. Loyalty to Clients

Managers must:

1. Place client interests before their own.
2. Preserve the confidentiality of information communicated by clients within the scope of the Manager–client relationship.
3. Refuse to participate in any business relationship or accept any gift that could reasonably be expected to affect their independence, objectivity, or loyalty to clients.

B. Investment Process and Actions

Managers must:

1. Use reasonable care and prudent judgment when managing client assets.
2. Not engage in practices designed to distort prices or artificially inflate trading volume with the intent to mislead market participants.
3. Deal fairly and objectively with all clients when providing investment information, making investment recommendations, or taking investment action.
4. Have a reasonable and adequate basis for investment decisions.
5. When managing a portfolio or pooled fund according to a specific mandate, strategy, or style:
   - **a** Take only investment actions that are consistent with the stated objectives and constraints of that portfolio or fund.
   - **b** Provide adequate disclosures and information so investors can consider whether any proposed changes in the investment style or strategy meet their investment needs.
6. When managing separate accounts and before providing investment advice or taking investment action on behalf of the client:
   - **a** Evaluate and understand the client's investment objectives, tolerance for risk, time horizon, liquidity needs, financial constraints, any unique circumstances (including tax considerations, legal or regulatory constraints, etc.) and any other relevant information that would affect investment policy.
   - **b** Determine that an investment is suitable to a client's financial situation.

C. Trading

Managers must:

1. Not act or cause others to act on material nonpublic information that could affect the value of a publicly traded investment.
2. Give priority to investments made on behalf of the client over those that benefit the Managers' own interests.

3 Use commissions generated from client trades to pay for only investment-related products or services that directly assist the Manager in its investment decision making process, and not in the management of the firm.
4 Maximize client portfolio value by seeking best execution for all client transactions.
5 Establish policies to ensure fair and equitable trade allocation among client accounts.

D. Risk Management, Compliance, and Support

Managers must:

1 Develop and maintain policies and procedures to ensure that their activities comply with the provisions of this Code and all applicable legal and regulatory requirements.
2 Appoint a compliance officer responsible for administering the policies and procedures and for investigating complaints regarding the conduct of the Manager or its personnel.
3 Ensure that portfolio information provided to clients by the Manager is accurate and complete and arrange for independent third-party confirmation or review of such information.
4 Maintain records for an appropriate period of time in an easily accessible format.
5 Employ qualified staff and sufficient human and technological resources to thoroughly investigate, analyze, implement, and monitor investment decisions and actions.
6 Establish a business-continuity plan to address disaster recovery or periodic disruptions of the financial markets.
7 Establish a firmwide risk management process that identifies, measures, and manages the risk position of the Manager and its investments, including the sources, nature, and degree of risk exposure.

E. Performance and Valuation

Managers must:

1 Present performance information that is fair, accurate, relevant, timely, and complete. Managers must not misrepresent the performance of individual portfolios or of their firm.
2 Use fair-market prices to value client holdings and apply, in good faith, methods to determine the fair value of any securities for which no independent, third-party market quotation is readily available.

F. Disclosures

Managers must:

1 Communicate with clients on an ongoing and timely basis.
2 Ensure that disclosures are truthful, accurate, complete, and understandable and are presented in a format that communicates the information effectively.

3 Include any material facts when making disclosures or providing information to clients regarding themselves, their personnel, investments, or the investment process.

4 Disclose the following:

- **a** Conflicts of interests generated by any relationships with brokers or other entities, other client accounts, fee structures, or other matters.
- **b** Regulatory or disciplinary action taken against the Manager or its personnel related to professional conduct.
- **c** The investment process, including information regarding lock-up periods, strategies, risk factors, and use of derivatives and leverage.
- **d** Management fees and other investment costs charged to investors, including what costs are included in the fees and the methodologies for determining fees and costs.
- **e** The amount of any soft or bundled commissions, the goods and/or services received in return, and how those goods and/or services benefit the client.
- **f** The performance of clients' investments on a regular and timely basis.
- **g** Valuation methods used to make investment decisions and value client holdings.
- **h** Shareholder voting policies.
- **i** Trade allocation policies.
- **j** Results of the review or audit of the fund or account.
- **k** Significant personnel or organizational changes that have occurred at the Manager.
- **l** Risk management processes.

APPENDIX 6—RECOMMENDATIONS AND GUIDANCE

Adoption of the Code is insufficient by itself for a Manager to meet its ethical and regulatory responsibilities. Managers must adopt detailed policies and procedures to effectively implement the Code. This section provides guidance explaining the Code and includes recommendations and illustrative examples to assist Managers that are seeking to implement the Code. These examples are not meant to be exhaustive, and the policies and procedures needed to support the Code will depend on the particular circumstances of each organization and the legal and regulatory environment in which the Manager operates.

The following guidance highlights particular issues that Managers should consider when developing their internal policies and procedures that accompany the Code. The guidance is not intended to cover all issues or aspects of a Manager's operations that would have to be included in such policies and procedures to fully implement and support the Code.

A. Loyalty to Clients

Managers must:

1 **Place client interests before their own.**

Client interests are paramount. Managers should institute policies and procedures to ensure that client interests supersede Manager interests in all aspects of the Manager–client relationship, including (but not limited to) investment selection, transactions, monitoring, and custody. Managers should take reasonable steps to avoid situations in which the Manager's interests and client interests conflict and should institute operational safeguards to protect client interests. Managers should implement compensation arrangements that align the financial interests of clients and Managers and avoid incentives that could result in Managers taking action in conflict with client interests.

2 **Preserve the confidentiality of information communicated by clients within the scope of the Manager–client relationship.**

As part of their ethical duties, Managers must hold information communicated to them by clients or other sources within the context of the Manager–client relationship strictly confidential and must take all reasonable measures to preserve that confidentiality. This duty applies when Managers obtain information on the basis of their confidential relationship with the client or their special ability to conduct a portion of the client's business or personal affairs. Managers should create a privacy policy that addresses how confidential client information will be collected, stored, protected, and used.

The duty to maintain confidentiality does not supersede a duty (and in some cases the legal requirement) to report suspected illegal activities involving client accounts to the appropriate authorities. Where appropriate, Managers should consider creating and implementing a written anti-money-laundering policy to prevent their organizations from being used for money laundering or the financing of any illegal activities.

3 **Refuse to participate in any business relationship or accept any gift that could reasonably be expected to affect their independence, objectivity, or loyalty to clients.**

As part of holding clients' interests paramount, Managers must establish policies for accepting gifts or entertainment in a variety of contexts. To avoid the appearance of a conflict, Managers must refuse to accept gifts or entertainment from service providers, potential investment targets, or other business partners of more than a minimal value. Managers should define what the minimum value is and should confer with local regulations which may also establish limits.

Managers should establish a written policy limiting the acceptance of gifts and entertainment to items of minimal value. Managers should consider creating specific limits for accepting gifts (e.g., amount per time period per vendor) and prohibit the acceptance of any cash gifts. Employees should be required to document and disclose to the Manager, through their supervisor, the firm's compliance office, or senior management, the acceptance of any gift or entertainment.

This provision is not meant to preclude Managers from maintaining multiple business relationships with a client as long as potential conflicts of interest are managed and disclosed.

B. Investment Process and Actions

Managers must:

1 **Use reasonable care and prudent judgment when managing client assets.**

Managers must exhibit the care and prudence necessary to meet their obligations to clients. Prudence requires caution and discretion. The exercise of prudence requires acting with the care, skill, and diligence that a person acting

in a like capacity and familiar with such matters would use under the same circumstances. In the context of managing a client's portfolio, prudence requires following the investment parameters set forth by the client and balancing risk and return. Acting with care requires Managers to act in a prudent and judicious manner in avoiding harm to clients.

2 **Not engage in practices designed to distort prices or artificially inflate trading volume with the intent to mislead market participants.**

Market manipulation is illegal in most jurisdictions and damages the interests of all investors by disrupting the efficient functioning of financial markets and causing deterioration in investor confidence.

Market manipulation includes practices that distort security prices or values or artificially inflate trading volumes with the intent to deceive persons or entities that rely on information in the market. Such practices may involve, for example, transactions that deceive market participants by distorting the price-setting mechanism of financial instruments and the dissemination of false or misleading information. Transaction-based manipulation includes, but is not limited to, transactions that artificially distort prices or volume to give the impression of activity or price movement in a financial instrument (e.g., trading in illiquid stocks at the end of a measurement period to drive up the price and improve Manager performance) and securing a large position with the intent to exploit and manipulate the price of an asset and/or a related derivative. Information-based manipulation includes, but is not limited to, spreading knowingly false rumors to induce trading by others and pressuring sell-side analysts to rate or recommend a security in such a way that benefits the Manager or the Manager's clients.

3 **Deal fairly and objectively with all clients when providing investment information, making investment recommendations, or taking investment action.**

To maintain the trust that clients place in them, Managers must deal with all clients in a fair and objective manner. Managers must not give preferential treatment to favored clients to the detriment of other clients. In some cases, clients may pay for a higher level of service or certain services and certain products may only be made available to certain qualifying clients (e.g., certain funds may be open only to clients with assets above a certain level). These practices are permitted as long as they are disclosed and made available to all clients.

This provision is not intended to prevent Managers from engaging in secondary investment opportunities—referred to in some jurisdictions as "side-letter," "sidecar," or "tag-along" arrangements—with certain clients as long as such opportunities are fairly allocated among similarly situated clients for whom the opportunity is suitable.

4 **Have a reasonable and adequate basis for investment decisions.**

Managers must act with prudence and make sure their decisions have a reasonable and adequate basis. Prior to taking action on behalf of their clients, Managers must analyze the investment opportunities in question and should act only after undertaking due diligence to ensure there is sufficient knowledge about specific investments or strategies. Such analysis will depend on the style and strategy being used. For example, a Manager implementing a passive strategy will have a very different basis for investment actions from that of a Manager that uses an active strategy.

Managers can rely on external third-party research as long as Managers have made reasonable and diligent efforts to determine that such research has a reasonable basis. When evaluating investment research, Managers should consider the assumptions used, the thoroughness of the analysis performed, the timeliness of the information, and the objectivity and independence of the source.

Managers should have a thorough understanding of the securities in which they invest and the strategies they use on behalf of clients. Managers should understand the structure and function of the securities, how they are traded, their liquidity, and any other risks (including counterparty risk).

Managers who implement complex and sophisticated investment strategies should understand the structure and potential vulnerabilities of such strategies and communicate these in an understandable manner to their clients. For example, when implementing complex derivative strategies, Managers should understand the various risks and conduct statistical analysis (i.e., stress testing) to determine how the strategy will perform under different conditions. By undertaking adequate due diligence, Managers can better judge the suitability of investments for their clients.

5 **When managing a portfolio or pooled fund according to a specific mandate, strategy, or style:**

a **Take only investment actions that are consistent with the stated objectives and constraints of that portfolio or fund.**

When Managers are given a specific mandate by clients or offer a product, such as a pooled fund for which the Managers do not know the specific financial situation of each client, the Managers must manage the funds or portfolios within the stated mandates or strategies. Clients need to be able to evaluate the suitability of the investment funds or strategies for themselves. Subsequently, they must be able to trust that Managers will not diverge from the stated or agreed-on mandates or strategies. When market events or opportunities change to such a degree that Managers wish to have flexibility to take advantage of those occurrences, such flexibility is not improper but should be expressly understood and agreed to by Managers and clients. Best practice is for Managers to disclose such events to clients when they occur or, at the very least, in the course of normal client reporting.

b **Provide adequate disclosures and information so investors can consider whether any proposed changes in the investment style or strategy meet their investment needs.**

To give clients an opportunity to evaluate the suitability of investments, Managers need to provide adequate information to them about any proposed material changes to their investment strategies or styles. They must provide this information well in advance of such changes. Clients should be given enough time to consider the proposed changes and take any actions that may be necessary. If the Manager decides to make a material change in the investment strategy or style, clients should be permitted to redeem their investment, if desired, without incurring any undue penalties.

6 **When managing separate accounts and before providing investment advice or taking investment action on behalf of the client:**

a **Evaluate and understand the client's investment objectives, tolerance for risk, time horizon, liquidity needs, financial constraints, any unique circumstances (including tax considerations, legal or regulatory constraints, etc.) and any other relevant information that would affect investment policy.**

Prior to taking any investment actions for clients, Managers must take the necessary steps to understand and evaluate the client's financial situation, constraints, and other relevant factors. Without understanding the client's situation, the Manager cannot select and implement an appropriate investment strategy. Ideally, each client will have an investment policy statement (IPS) that includes a discussion of risk tolerances (both the ability and willingness of the client to bear risk), return objectives, time horizon, liquidity requirements, liabilities, tax considerations, and any legal, regulatory, or other unique circumstances.

The purpose of the IPS is to provide Managers with written strategic plans to direct investment decisions for each client. The Manager should take an opportunity to review the IPS for each client, offer any suggestions on clarifying the IPS, and discuss with the client the various techniques and strategies to be used to meet the client's investment goals. Managers should review each client's IPS with the client at least annually and whenever circumstances suggest changes may be needed.

The information contained in an IPS allows Managers to assess whether a particular strategy or security is suitable for a client (in the context of the rest of the client's portfolio), and the IPS serves as the basis for establishing the client's strategic asset allocation. (Note: In some cases, the client will determine the strategic asset allocation; in other cases, that duty will be delegated to the Manager). The IPS should also specify the Manager's role and responsibilities in managing the client's assets and establish schedules for review and evaluation. The Manager should reach agreement with the client as to an appropriate benchmark or benchmarks by which the Manager's performance will be measured and any other details of the performance evaluation process (e.g., when performance measurement should begin).

b Determine that an investment is suitable to a client's financial situation.

Managers must evaluate investment actions and strategies in light of each client's circumstances. Not all investments are suitable for every client, and Managers have a responsibility to ensure that only appropriate investments and investment strategies are included in a client's portfolio. Ideally, individual investments should be evaluated in the context of clients' total assets and liabilities, which may include assets held outside of the Manager's account, to the extent that such information is made available to the Manager and is explicitly included in the context of the client's IPS.

C. Trading

Managers must:

1 Not act or cause others to act on material nonpublic information that could affect the value of a publicly traded investment.

Trading on material nonpublic information, which is illegal in most jurisdictions, erodes confidence in capital markets, institutions, and investment professionals and promotes the perception that those with inside and special access can take unfair advantage of the general investing public. Although trading on such information may lead to short-term profitability, over time, individuals and the profession as a whole suffer if investors avoid capital markets because they perceive them to be unfair by favoring the knowledgeable insider.

Different jurisdictions and regulatory regimes may define materiality differently, but in general, information is "material" if it is likely that a reasonable investor would consider it important and if it would be viewed as significantly altering the total mix of information available. Information is "nonpublic" until it has been widely disseminated to the marketplace (as opposed to a select group of investors).

Managers must adopt compliance procedures, such as establishing information barriers (e.g., fire walls), to prevent the disclosure and misuse of material nonpublic information. In many cases, pending trades or client or fund holdings may be considered material nonpublic information, and Managers must be sure to keep such information confidential. In addition, merger and acquisition information, prior to its public disclosure, is generally considered material nonpublic information. Managers should evaluate company-specific information that they may receive and determine whether it meets the definition of material nonpublic information.

This provision is not meant to prevent Managers from using the mosaic theory to draw conclusions—that is, combine pieces of material public information with pieces of nonmaterial nonpublic information to draw conclusions that are actionable.

2 **Give priority to investments made on behalf of the client over those that benefit the Managers' own interests.**

Managers must not execute their own trades in a security prior to client transactions in the same security. Investment activities that benefit the Manager must not adversely affect client interests. Managers must not engage in trading activities that work to the disadvantage of clients (e.g., front-running client trades).

In some investment arrangements, such as limited partnerships or pooled funds, Managers put their own capital at risk alongside that of their clients to align their interests with the interests of their clients. These arrangements are permissible only if clients are not disadvantaged.

Managers should develop policies and procedures to monitor and, where appropriate, limit the personal trading of their employees. In particular, Managers should require employees to receive approval prior to any personal investments in initial public offerings or private placements. Managers should develop policies and processes designed to ensure that client transactions take precedence over employee or firm transactions. One method is to create a restricted list and/or watch list of securities that are owned in client accounts or may be bought or sold on behalf of clients in the near future; prior to trading securities on such a list, employees would be required to seek approval. In addition, Managers could require employees to provide the compliance officer with copies of trade confirmations each quarter and annual statements of personal holdings.

3 **Use commissions generated from client trades to pay for only investment-related products or services that directly assist the Manager in its investment decision-making process, and not in the management of the firm.**

Managers must recognize that commissions paid (and any benefits received in return for commissions paid) are the property of the client. Consequently, any benefits offered in return for commissions must benefit the Manager's clients.

To determine whether a benefit generated from client commissions is appropriate, Managers must determine whether it will directly assist in the Manager's investment decision-making process. The investment decision-making process can be considered the qualitative and quantitative process and the related tools

used by the Manager in rendering investment advice to clients. The process includes financial analysis, trading and risk analysis, securities selection, broker selection, asset allocation, and suitability analysis.

Some Managers have chosen to eliminate the use of soft commissions (also known as soft dollars) to avoid any conflicts of interest that may exist. Managers should disclose their policy on how benefits are evaluated and used for the client's benefit. If Managers choose to use a soft commission or bundled brokerage arrangement, they should disclose this use to their clients. Managers should consider complying with industry best practices regarding the use and reporting of such an arrangement, which can be found in the CFA Institute Soft Dollar Standards.

4 **Maximize client portfolio value by seeking best execution for all client transactions.**

When placing client trades, Managers have a duty to seek terms that secure best execution for and maximize the value of each client's portfolio (i.e., ensure the best possible result overall). Managers must seek the most favorable terms for client trades within each trades' particular circumstances (such as transaction size, market characteristics, liquidity of security, and security type). Managers also must decide which brokers or venues provide best execution while considering, among other things, commission rates, timeliness of trade executions, and the ability to maintain anonymity, minimize incomplete trades, and minimize market impact.

When a client directs the Manager to place trades through a specific broker or through a particular type of broker, Managers should alert the client that by limiting the Manager's ability to select the broker, the client may not be receiving best execution. The Manager should seek written acknowledgment from the client of receiving this information.

5 **Establish policies to ensure fair and equitable trade allocation among client accounts.**

When placing trades for client accounts, Managers must allocate trades fairly so that some client accounts are not routinely traded first or receive preferential treatment. Where possible, Managers should use block trades and allocate shares on a pro-rata basis by using an average price or some other method that ensures fair and equitable allocations. When allocating shares of an initial or secondary offering, Managers should strive to ensure that all clients for whom the security is suitable are given opportunities to participate. When Managers do not receive a large enough allocation to allow all eligible clients to participate fully in a particular offering, they must ensure that certain clients are not given preferential treatment and should establish a system to ensure that new issues are allocated fairly (e.g., pro rata). Manager's trade allocation policies should specifically address how initial public offerings and private placements are to be handled.

D. Risk Management, Compliance, and Support

Managers must:

1 **Develop and maintain policies and procedures to ensure that their activities comply with the provisions of this Code and all applicable legal and regulatory requirements.**

Detailed and firmwide compliance policies and procedures are critical tools to ensure that Managers meet their legal requirements when managing client assets. In addition, the fundamental, principle-based, ethical concepts embodied in the Code should be put into operation by the implementation of specific policies and procedures.

Documented compliance procedures assist Managers in fulfilling the responsibilities enumerated in the Code and ensure that the standards expressed in the Code are adhered to in the day-to-day operation of the firms. The appropriate compliance programs, internal controls, and self-assessment tools for each Manager will depend on such factors as the size of the firm and the nature of its investment management business.

2 **Appoint a compliance officer responsible for administering the policies and procedures and for investigating complaints regarding the conduct of the Manager or its personnel.**

Effective compliance programs require Managers to appoint a compliance officer who is competent, knowledgeable, and credible and is empowered to carry out his or her duties. Depending on the size and complexity of the Manager's operations, Managers may designate an existing employee to also serve as the compliance officer, may hire a separate individual for that role, or may establish an entire compliance department. Where possible, the compliance officer should be independent from the investment and operations personnel and should report directly to the CEO or board of directors.

The compliance officer and senior management should regularly make clear to all employees that adherence to compliance policies and procedures is crucial and that anyone who violates them will be held liable. Managers should consider requiring all employees to acknowledge that they have received a copy of the Code (as well as any subsequent material amendments), that they understand and agree to comply with it, and that they will report any suspected violations of the Code to the designated compliance officer. Compliance officers should take steps to implement appropriate employee training and conduct continuing self-evaluation of the Manager's compliance practices to assess the effectiveness of the practices.

Among other things, the compliance officer should be charged with reviewing firm and employee transactions to ensure the priority of client interests. Because personnel, regulations, business practices, and products constantly change, the role of the compliance officer (particularly the role of keeping the firm up to date on such matters) is particularly important.

The compliance officer should document and act expeditiously to address any compliance breaches and work with management to take appropriate disciplinary action.

3 **Ensure that portfolio information provided to clients by the Manager is accurate and complete and arrange for independent third-party confirmation or review of such information.**

Managers have a responsibility to ensure that the information they provide to clients is accurate and complete. By receiving an independent third-party confirmation or review of that information, clients have an additional level of confidence that the information is correct, which may enhance the Manager's credibility. Such verification is also good business practice because it may serve as a risk management tool to help the Manager identify potential problems. The confirmation of portfolio information may take the form of an audit or review,

as is the case with most pooled vehicles, or may take the form of copies of account statements and trade confirmations from the custodian bank where the client assets are held.

4 **Maintain records for an appropriate period of time in an easily accessible format.**

Managers must retain records that substantiate their investment activities, the scope of their research, the basis for their conclusions, and the reasons for actions taken on behalf of their clients. Managers should also retain copies of other compliance-related records that support and substantiate the implementation of the Code and related policies and procedures, as well as records of any violations and resulting actions taken. Records can be maintained either in hard copy or electronic form.

Regulators often impose requirements related to record retention. In the absence of such regulation, Managers must determine the appropriate minimum time frame for keeping the organization's records. Unless otherwise required by local law or regulation Managers should keep records for at least seven years.

5 **Employ qualified staff and sufficient human and technological resources to thoroughly investigate, analyze, implement, and monitor investment decisions and actions.**

To safeguard the Manager–client relationship, Managers need to allocate all the resources necessary to ensure that client interests are not compromised. Clients pay significant sums to Managers for professional asset management services, and client assets should be handled with the greatest possible care.

Managers of all sizes and investment styles struggle with issues of cost and efficiency and tend to be cautious about adding staff in important operational areas. Nevertheless, adequate protection of client assets requires appropriate administrative, back-office, and compliance support. Managers should ensure that adequate internal controls are in place to prevent fraudulent behavior.

A critical consideration is employing only *qualified* staff. Managers must ensure that client assets are invested, administered, and protected by qualified and experienced staff. Employing qualified staff reflects a client-first attitude and helps ensure that Managers are applying the care and prudence necessary to meet their obligations to clients. This provision is not meant to prohibit the outsourcing of certain functions, but the Manager retains the liability and responsibility for any outsourced work.

Managers have a responsibility to clients to deliver the actual services they claim to offer. Managers must use adequate resources to carry out the necessary research and analysis to implement their investment strategies with due diligence and care. Also, Managers must have adequate resources to monitor the portfolio holdings and investment strategies. As investment strategies and instruments become increasingly sophisticated, the need for sufficient resources to analyze and monitor them becomes ever more important.

6 **Establish a business-continuity plan to address disaster recovery or periodic disruptions of the financial markets.**

Part of safeguarding client interests is establishing procedures for handling client accounts and inquiries in situations of national, regional, or local emergency or market disruption. Commonly referred to as business-continuity or disaster-recovery planning, such preparation is increasingly important in an industry and world highly susceptible to a wide variety of disasters and disruptions.

The level and complexity of business-continuity planning depends on the size, nature, and complexity of the organization. At a minimum, Managers should consider having the following:

- adequate backup, preferably off-site, for all account information;
- alternative plans for monitoring, analyzing, and trading investments if primary systems become unavailable;
- plans for communicating with critical vendors and suppliers;
- plans for employee communication and coverage of critical business functions in the event of a facility or communication disruption; and
- plans for contacting and communicating with clients during a period of extended disruption.

Numerous other factors may need to be considered when creating the plan. According to the needs of the organization, these factors may include establishing backup office and operational space in the event of an extended disruption and dealing with key employee deaths or departures.

As with any important business planning, Managers should ensure that employees and staff are knowledgeable about the plan and are specifically trained in areas of responsibility. Plans should be tested on a firmwide basis at intervals to promote employee understanding and identify any needed adjustments.

7 Establish a firmwide risk management process that identifies, measures, and manages the risk position of the Manager and its investments, including the sources, nature, and degree of risk exposure.

Many investors, including those investing in hedge funds and alternative investments or leveraged strategies, invest specifically to increase their risk-adjusted returns. Assuming some risk is a necessary part of that process. The key to sound risk management by Managers is seeking to ensure that the risk profile desired by clients matches the risk profile of their investments. Risk management should complement rather than compete with the investment management process. Investment managers must implement risk management techniques that are consistent with their investment style and philosophy.

The types of risks faced by Managers include, but are not limited to, market risk, credit risk, liquidity risk, counterparty risk, concentration risk, and various types of operational risk. Such types of risks should be analyzed by Managers as part of a comprehensive risk management process for portfolios, investment strategies, and the firm. These examples are illustrative only and may not be applicable to all investment organizations.

Although portfolio managers consider risk issues as part of formulating an investment strategy, the firm's risk management process must be objective, independent, and insulated from influence of portfolio managers. Managers may wish to describe to clients how the risk management framework complements the portfolio management process while remaining separate from that process. Managers should consider outsourcing risk management activities if a separate risk management function is not appropriate or feasible because of the size of the organization.

An effective risk management process will identify risk factors for individual portfolios as well as for the Manager's activities as whole. It will often be appropriate for managers to perform stress tests, scenario tests, and backtests as part of developing risk models that comprehensively capture the full range of their actual and contingent risk exposures. The goal of such models is to determine how various changes in market and investment conditions could affect investments. The risk models should be continuously evaluated and challenged,

and Managers should be prepared to describe the models to clients. Despite the importance of risk models, however, effective risk management ultimately depends on the experience, judgment, and ability of the Managers in analyzing their risk metrics.

E. Performance and Valuation

Managers must:

1 **Present performance information that is fair, accurate, relevant, timely, and complete. Managers must not misrepresent the performance of individual portfolios or of their firm.**

Although past performance is not necessarily indicative of future performance, historical performance records are often used by prospective clients as part of the evaluation process when hiring asset managers. Managers have a duty to present performance information that is a fair representation of their record and includes all relevant factors. In particular, Managers should be certain not to misrepresent their track records by taking credit for performance that is not their own (i.e., when they were not managing a particular portfolio or product) or by selectively presenting certain time periods or investments (i.e., cherry picking). Any hypothetical or backtested performance must be clearly identified as such. Managers should provide as much additional portfolio transparency as feasibly possible. Any forward-looking information provided to clients must also be fair, accurate, and complete.

A model for fair, accurate, and complete performance reporting is embodied in the Global Investment Performance Standards (GIPS®), which are based on the principles of fair representation and full disclosure and are designed to meet the needs of a broad range of global markets. By adhering to these standards for reporting investment performance, Managers help assure investors that the performance information being provided is both complete and fairly presented. When Managers comply with the GIPS standards, both prospective and existing clients benefit because they can have a high degree of confidence in the reliability of the performance numbers the Managers are presenting. This confidence may, in turn, enhance clients' sense of trust in their Managers.

2 **Use fair-market prices to value client holdings and apply, in good faith, methods to determine the fair value of any securities for which no independent, third-party market quotation is readily available.**

In general, fund Managers' fees are calculated as a percentage of assets under management. In some cases, an additional fee is calculated as a percentage of the annual returns earned on the assets. Consequently, a conflict of interest may arise where the portfolio Manager has the additional responsibility of determining end-of-period valuations and returns on the assets.

These conflicts may be overcome by transferring responsibility for the valuation of assets (including foreign currencies) to an independent third party. For pooled funds that have boards of directors comprising independent members, the independent members should have the responsibility of approving the asset valuation policies and procedures and reviewing the valuations. For pooled funds without independent directors, we recommend that this function be undertaken by independent third parties who are expert in providing such valuations.

Managers should use widely accepted valuation methods and techniques to appraise portfolio holdings of securities and other investments and should apply these methods on a consistent basis.

F. Disclosures

Managers must:

1 **Communicate with clients on an ongoing and timely basis.**

Developing and maintaining clear, frequent, and thorough communication practices is critical to providing high-quality financial services to clients. Understanding the information communicated to them allows clients to know how Managers are acting on their behalf and gives clients the opportunity to make well-informed decisions regarding their investments. Managers must determine how best to establish lines of communication that fit their circumstances and that enable clients to evaluate their financial status.

2 **Ensure that disclosures are truthful, accurate, complete, and understandable and are presented in a format that communicates the information effectively.**

Managers must not misrepresent any aspect of their services or activities, including (but not limited to) their qualifications or credentials, the services they provide, their performance records, and characteristics of the investments or strategies they use. A misrepresentation is any untrue statement or omission of fact or any statement that is otherwise false or misleading. Managers must ensure that misrepresentation does not occur in oral representations, marketing (whether through mass media or printed brochures), electronic communications, or written materials (whether publicly disseminated or not).

To be effective, disclosures must be made in plain language and in a manner designed to effectively communicate the information to clients and prospective clients. Managers must determine how often, in what manner, and under what particular circumstances disclosures must be made.

3 **Include any material facts when making disclosures or providing information to clients regarding themselves, their personnel, investments, or the investment process.**

Clients must have full and complete information to judge the abilities of Managers and their actions in investing client assets. "Material" information is information that reasonable investors would want to know relative to whether or not they would choose to use or continue to use the Manager.

4 **Disclose the following:**

a **Conflicts of interests generated by any relationships with brokers or other entities, other client accounts, fee structures, or other matters.**

Conflicts of interests often arise in the investment management profession and can take many forms. Best practice is to avoid such conflicts if possible. When Managers cannot reasonably avoid conflicts, they must carefully manage them and disclose them to clients. Disclosure of conflicts of interests protects investors by providing them with the information they need to evaluate the objectivity of their Managers' investment advice and actions taken on behalf of clients and by giving them the information to judge the circumstances, motives, and possible Manager bias for themselves. Examples of some of the types of activities that can constitute actual or potential conflicts of interest are the use of soft dollars or bundled

commissions, referral and placement fees, trailing commissions, sales incentives, directed brokerage arrangements, allocation of investment opportunities among similar portfolios, Manager or employee holdings in the same securities as clients, whether the Manager co-invests alongside clients, and use of affiliated brokers.

b Regulatory or disciplinary action taken against the Manager or its personnel related to professional conduct.

Past professional conduct records are an important factor in an investor's selection of a Manager. Such records include actions taken against a Manager by any regulator or other organization. Managers must fully disclose any significant instances in which the Manager or an employee was found to have violated standards of conduct or other standards in such a way that reflects badly on the integrity, ethics, or competence of the organization or the individual.

c The investment process, including information regarding lock-up periods, strategies, risk factors, and use of derivatives and leverage.

Managers must disclose to clients and prospects the manner in which investment decisions are made and implemented. Such disclosures should address the overall investment strategy and should include a discussion of the specific risk factors inherent in such a strategy.

Understanding the basic characteristics of an investment is an important factor in judging the suitability of each investment on a stand-alone basis, but it is especially important in determining the effect each investment will have on the characteristics of the client's portfolio. Only by thoroughly understanding the nature of the investment product or service can a client determine whether changes to that product or service could materially affect his or her investment objectives.

d Management fees and other investment costs charged to investors, including what costs are included in the fees and the methodologies for determining fees and costs.

Investors are entitled to full and fair disclosures of costs associated with the investment management services provided. Material that should be disclosed includes information relating to any fees to be paid to the Managers on an ongoing basis and periodic costs that are known to the Managers and that will affect investors' overall investment expenses. At a minimum, Managers should provide clients with gross- and net-of-fees returns and disclose any unusual expenses.

A general statement that certain fees and other costs will be assessed to investors may not adequately communicate the total amount of expenses that investors may incur as a result of investing. Therefore, Managers must not only use plain language in presenting this information but must clearly explain the methods for determining all fixed and contingent fees and costs that will be borne by investors and also must explain the transactions that will trigger the imposition of these expenses.

Managers should also retrospectively disclose to each client the actual fees and other costs charged to the clients, together with itemizations of such charges when requested by clients. This disclosure should include the specific management fee, any incentive fee, and the amount of commissions Managers paid on behalf of clients during the period. In addition, Managers must disclose to prospective clients the average or expected expenses or fees clients are likely to incur.

e The amount of any soft or bundled commissions, the goods and/or services received in return, and how those goods and/or services benefit the client.

Commissions belong to the client and should be used in their best interests. Any soft or bundled commissions should be used only to benefit the client. Clients deserve to know how their commissions are spent, what is received in return for them, and how those goods and/or services benefit them.

f The performance of clients' investments on a regular and timely basis.

Clients may reasonably expect to receive regular performance reporting about their accounts. Without such performance information, even for investment vehicles with lock-up periods, clients cannot evaluate their overall asset allocations (i.e., including assets not held or managed by the Managers) and determine whether rebalancing is necessary. Accordingly, unless otherwise specified by the client, Managers must provide regular, ongoing performance reporting. Managers should report to clients at least quarterly, and when possible, such reporting should be provided within 30 days after the end of the quarter.

g Valuation methods used to make investment decisions and value client holdings.

Clients deserve to know whether the assets in their portfolios are valued on the basis of closing market values, third-party valuations, internal valuation models, or other methods. This type of disclosure allows clients to compare performance results and determine whether different valuation sources and methods may explain differences in performance results. This disclosure should be made by asset class and must be meaningful (i.e., not general or boilerplate) so that clients can understand how the securities are valued.

h Shareholder voting policies.

As part of their fiduciary duties, Managers that exercise voting authority over client shares must vote them in an informed and responsible manner. This obligation includes the paramount duty to vote shares in the best interests of clients.

To fulfill their duties, Managers must adopt policies and procedures for the voting of shares and disclose those policies and procedures to clients. These disclosures should specify, among other things, guidelines for instituting regular reviews for new or controversial issues, mechanisms for reviewing unusual proposals, guidance in deciding whether additional actions are warranted when votes are against corporate management, and systems to monitor any delegation of share-voting responsibilities to others. Managers also must disclose to clients how to obtain information on the manner in which their shares were voted.

i Trade allocation policies.

By disclosing their trade allocation policies, Managers give clients a clear understanding of how trades are allocated and provide realistic expectations of what priority they will receive in the investment allocation process. Managers must disclose to clients any changes in the trade allocation policies. By establishing and disclosing trade allocation policies that treat clients fairly, Managers foster an atmosphere of openness and trust with their clients.

j Results of the review or audit of the fund or account.

If a Manager submits its funds or accounts (generally pooled or mutual funds) for an annual review or audit, it must disclose the results to clients. Such disclosure enables clients to hold Managers accountable and alerts them to any potential problems.

k **Significant personnel or organizational changes that have occurred at the Manager.**

Clients should be made aware of significant changes at the Manager in a timely manner. "Significant" changes would include personnel turnover, merger and acquisition activities of the Manager, and similar actions.

l **Risk management processes.**

Managers must disclose their risk management processes to clients. Material changes to the risk management process also must be disclosed. Managers should further consider regularly disclosing specific risk information and specific information regarding investment strategies related to each client. Managers must provide clients information detailing what relevant risk metrics they can expect to receive at the individual product/portfolio level.

PRACTICE PROBLEMS

The following information relates to Questions 1–6

Bornelli Asset Management offers traditional long-only funds as well as a variety of hedge funds for both private and institutional clients. Bornelli is a well-managed firm of more than 100 employees. Its board of directors has voted to adopt the Asset Manager Code of Professional Conduct (the Code).

Bornelli has hired Ava Campanelli as chief compliance officer with responsibility for implementing the Code. Campanelli develops a plan to evaluate the firm's current policies and procedures for compliance with the Code. Campanelli begins by reviewing three of the firm's compliance procedures:

Portfolio review	Portfolio information provided to clients is reviewed by an independent third-party.
Record retention	The firm retains records to substantiate all investment decisions for seven years. In compliance with regulatory requirements, the firm also retains copies of all emails for the same period. The firm retains its records in a combination of both hard-copy and electronic formats.
Investigation of complaints	The chief compliance officer (CCO) is responsible for investigating and documenting all complaints. The CCO reports to the chief investment officer and works with management to take appropriate disciplinary action in cases of compliance breaches.

Campanelli then evaluates the firm's business-continuity plan. Under the current plan, the technology division backs up all of the firm's computer systems and client records twice daily. The back-ups are stored in a fireproof storage facility offsite. Bornelli outsources certain emergency plans to a disaster recovery firm. The disaster recovery firm is responsible for developing and implementing plans to communicate with employees and mission-critical vendors and suppliers in the event of a facility or communication disruption. The same firm also provides plans for contacting and communicating with clients in event of an extended disruption.

For her next project, Campanelli reviews the disclosures provided to both prospective and current clients. The disclosures regarding management fees state:

> Bornelli charges a 2% asset-based management fee. In addition to the management fee, clients may pay an incentive fee at the end of each year. The incentive fee is equal to 20% of the account's net investment income and net realized and unrealized capital gains for the year.
>
> No incentive fee will be paid unless the Fund has offset all prior net realized capital losses and net investment losses with realized capital gains, unrealized appreciation, and net investment income from all securities held by the Fund.

Campanelli's evaluation of the management fee disclosures is interrupted by a more urgent matter involving a client. The client has requested monthly performance reporting of his investment in a long-short equity hedge fund. The fund's administrator

© 2011 CFA Institute. All rights reserved.

argues "Our procedures call for us to provide clients with both gross- and net-of-fees returns within 30 days of the end of the quarter." He adds "Quarterly reporting is the industry standard."

The administrator complains "This client, Rossi, is overly demanding. He telephoned yesterday and requested an itemization of the fees and other costs charged to him for the past three years. He wants to know the specific management fee, the incentive fee, and the amount of commissions paid. The more time we spend answering his requests, the less time we have to research investments." Campanelli promises to look into the matter for the administrator.

The following week, Campanelli meets with Lee Bruno, manager of the firm's alternative assets fund. Bruno informs Campanelli, "The fund has a three-year lock-up period. We disclosed to all the prospective clients in writing before they invested that this is a long-term investment and that they should not focus on short-term performance results. During the lock-up period, we provide semiannual reporting. After the lock-up, we report quarterly."

Bruno informs Campanelli that whenever possible, the firm uses fair market prices to value client holdings. He adds "Of course, our fund invests in alternative assets—some of which are very difficult to value. They aren't like public equities with independent, third-party market quotations available, so we use an internal model to value client holdings." He continues, "We disclose the use of internal models for valuation purposes on all our reports."

Following her conversation with Bruno, Campanelli researches a complaint from a new client regarding the valuations of his fund's holdings. The client complains that another management firm reported much lower valuations on similar instruments. Campanelli researches the methodologies Bornelli uses for valuing fund holdings. She determines the following:

- All publicly traded US and foreign equities, including large-, mid-, small-, and micro-cap shares are valued at the last available closing price.
- The value of certain securities such as swaps are based on quotes collected from broker-dealers.
- When prices are not available from either of the above sources, valuations are based on internal models.

1 Are the three compliance procedures reviewed by Campanelli consistent with both the required and recommended standards of the CFA Institute Asset Manager Code of Professional Conduct?

A No, the procedures regarding record retention are inconsistent.

B No, the procedures regarding portfolio review are inconsistent.

C No, the procedures regarding investigation of complaints are inconsistent.

2 Is Bornelli's disaster recovery plan consistent with both the required and recommended standards of the Asset Manager Code?

A Yes.

B No, because the plan lacks a backup plan for monitoring, analyzing, and trading investments.

C No, because the plan only provides for contacting and communicating with clients during periods of extended disruption.

3 Are the firm's disclosures regarding management fees consistent with the required and recommended standards of the Asset Manager Code?

A Yes.

B No, because they do not use plain language.

C No, because they do not include the average or expected expenses or fees clients are likely to incur.

4 Are the performance reporting procedures described by the fund's administrator consistent with the required disclosure standards of the Asset Manager Code?

A Yes.

B No, because the AMC requires firms to report performance to all clients on a monthly basis.

C No, because the AMC requires firms to provide performance on a monthly basis when requested by clients.

5 To comply with both the required and recommended standards of the Asset Manager Code, must Bornelli honor Rossi's telephone request regarding an itemization of fees?

A Yes.

B No, because the firm is not required to disclose the amount of incentive fee charged to an individual client.

C No, because unless the firm claims compliance with the Soft Dollar Standards, it is not required to disclose the amount of commissions paid on clients' behalf.

6 Are the policies of the alternative assets fund consistent with the required and recommended standards of the Asset Manager Code?

A Yes.

B No, the frequency of reporting is inconsistent with the AMC.

C No, the use of internal valuation models is inconsistent with the AMC.

The following information relates to Questions 7–12

Henry Schmidt, David Zane, and Andrew Ronoldo founded SZR LLC (SZR), an investment advisory firm managing portfolios for individuals. Although none of the founders holds the CFA charter, SZR has adopted the CFA Institute Asset Manager Code of Professional Conduct.

SZR's client portfolios average $50,000 and are entirely invested in SZR's commingled fund, managed by Ronoldo. Ronoldo implements a quantitative enhanced index process in SZR's fund and has consistently added moderate performance (alpha) over the fund's mid-cap benchmark index. After five years of strong performance, Ronoldo worries that the mid-cap fund will lag broad market indexes, so he decides to broaden the fund's strategy. After doing research, he adds micro-cap, foreign, and convertible preferred stocks to the fund and doubles some holdings so that their weights are much larger than they are in the benchmark index. Since the fund achieves even stronger performance, both against the benchmark mid-cap index and major market indexes, Ronoldo plans to describe the new strategy in the company's next annual newsletter, due to be sent to clients in three months.

As a prominent member of the community, Schmidt has just joined the board of a local company, Trezeguet Baking Company, which recently went public. Trezeguet's shares are in most micro-capitalization (cap) indexes. As a board member, Schmidt receives a small annual stipend of $2,000; however, he is granted several thousand

stock options, which he can exercise after 24 months' board service. Since his stipend is insignificant and he will not exercise his options for at least 24 months, Schmidt does not disclose his Trezeguet board service to SZR clients.

One of SZR's clients is president of Sastre International. Because of SZR's success, this client hires SZR to manage $800 million of Sastre International's corporate cash in a separate account, but asks that its hiring of SZR not be made public. Sastre's board asks Ronoldo to direct all of the Sastre account trades through a local financial advisor, to thank the advisor for selecting SZR. Ronoldo is concerned that this direction may limit SZR's ability to achieve best execution, but after Sastre acknowledges in writing that this is their preference, Ronoldo agrees to follow Sastre's direction.

As head of operations, Zane wishes to simplify trading and implements a new trade policy: first place trades for the Sastre account through the local financial advisor and then submit the commingled fund's trades through national brokerage houses and electronic networks. The local financial advisor is pleased with this arrangement, as he is able to buy securities before other clients; he informs Zane that he'll recommend SZR to additional clients.

Schmidt, SZR's sales director, sends the commingled fund's stellar performance track record to several investment consultants, who serve as "gatekeepers" for large institutional clients, but he is told that SZR is too small to be considered by their clients. After Schmidt reveals that Sastre has recently hired SZR, and offers to negotiate the same special fee discount that has been given to Sastre, one consultant agrees to consider SZR for its clients. The consultant indicates that if SZR agrees to sponsor the consulting firm's annual conference, Schmidt will meet many potential clients. Schmidt considers this conference sponsorship, but decides that it is too costly for SZR's budget, so he declines the offer.

As SZR grows, Zane hires his brother-in-law, John Karna (top salesman for a local auto parts company) as Compliance Officer. Karna is tasked with writing SZR's Code of Ethics and its Investment Policies and Procedures Manual. Karna is also put in charge of the firm's Business Continuity Plan. The plan consists of his taking home, each evening, the computer records of SZR's daily trades.

7 Does Ronoldo violate the CFA Institute Asset Manager Code of Professional Conduct with respect to his broader investment strategy?

A No.

B Yes, with respect to client disclosure only.

C Yes, with respect to reasonable and adequate basis only.

8 Does Schmidt violate the CFA Institute Asset Manager Code of Professional Conduct with respect to his current Trezeguet board service?

A No.

B Yes, with respect to priority of client interests only.

C Yes, with respect to priority of client interests and participation in business relationships.

9 By agreeing to Sastre's direction, does Ronoldo violate the CFA Institute Asset Manager Code of Professional Conduct?

A No.

B Yes, only with respect to best execution.

C Yes, only with respect to fair and equitable trade allocation.

10 Does Zane's revision of SZR's trading process violate the CFA Institute Asset Manager Code of Professional Conduct?

A No.

B Yes, only with respect to best execution.

C Yes, with respect to best execution and fair, equitable trade allocation.

11 Does Schmidt violate the CFA Institute Asset Manager Code of Professional Conduct in his interaction with consultants?

A No.

B Yes, only with respect to confidentiality.

C Yes, only with respect to business relationships that could affect independence.

12 Does Karna's role as Chief Compliance Officer, and the process of SZR's Business Continuity Plan, respectively, conform to the requirements and recommendations of the CFA Institute Asset Manager Code of Professional Conduct?

A Neither Karna's role nor the Business Continuity Plan conforms.

B Karna's role conforms, but the Business Continuity Plan does not conform.

C Karna's role does not conform, but the Business Continuity Plan does conform.

SOLUTIONS

1 C is correct. According to the recommendations of Section D(2) of the Asset Manager Code, where possible, the CCO should be independent from the investment and operations personnel and should report directly to the CEO or the board of directors.

2 B is correct. According to the guidance provided in Section D(6) of the Asset Manager Code, the level and complexity of business-continuity planning depends on the size, nature, and complexity of the organization involved. Bornelli is a large firm with hedge fund investments and it should have alternative plans for monitoring, analyzing, and trading investments if primary systems become unavailable.

3 C is correct. According to the recommendations and guidance of Section F(4d) of the Asset Manager Code, managers must disclose to prospective clients the average or expected expenses or fees clients are likely to incur, and to existing clients the actual fees and other costs charged to them.

4 A is correct. The performance reporting procedures described by the administrator are consistent with the Asset Manager Code (AMC) which requires disclosing the "performance of clients' investments on a regular and timely basis." The AMC recommends that "managers should report to clients at least quarterly, and when possible, such reporting should be provided within 30 days after the end of the quarter." The AMC also states that "at a minimum, Managers should provide clients with gross- and net-of-fees returns." Because quarterly reporting is the recommended minimum, managers may choose to provide more timely performance to clients.

5 A is correct. According to the recommendations of Section F(4d) of the Asset Manager Code, managers should disclose to each client the actual fees and other costs charged to them, together with itemizations of such charges, when requested by clients. The disclosure should include the specific management fee, incentive fee, and the amount of commissions paid on clients' behalf during the period.

6 B is correct. Clients must have regular performance information to evaluate their overall asset allocations and to determine whether rebalancing is necessary. This concept applies even to investment vehicles with lock-up periods. According to the Asset Manager Code, unless otherwise specified by the client, managers should report to clients at least quarterly, and when possible, within 30 days of the end of the period.

7 B is correct. Ronoldo should have disclosed his change in investment strategy to clients, allowing them to move their accounts if not in agreement. Until he disclosed a planned change in strategy, he should have continued to manage in the manner for which clients had hired him.

8 C is correct. Schmidt is on the board of a company whose stock is in microcap indexes. This is a conflict of interest, as Ronoldo's widened investment guidelines allow purchase of Trezeguet stock for the fund. As Schmidt is an insider for the company and received options that can be sold (after 24 months), this relationship should be terminated.

9 A is correct. The Sastre board requests directed trading for its discretionary account and acknowledges, in writing, that trading through the local financial advisor may limit best execution. As this is a discretionary (not pension) account, the client has the right to direct to a less-than-optimal trading venue.

10 C is correct. Zane should have pursued best execution for all clients in the fund (which is not accomplished by placing trades with the local financial advisor first versus with national brokers or electronic networks), and fairly traded for all clients. While Sastre is welcome to direct trades, Zane's change in procedures harms other clients.

11 B is correct. Schmidt violated Code A-2 by revealing Sastre's hiring of SZR and its special fee discount.

12 A is correct. Karna's qualification as compliance officer is inadequate (D-2, D-5), and taking tapes home each night is inadequate business continuity for a firm of $1.5 billion (D-6).

CUSTOMER SERVICE

68

Glossary

Absolute return benchmark A minimum target return that an investment manager is expected to beat.

Absolute return vehicles Investments that have no direct benchmark portfolio.

Accounting defeasance Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

Accounting risk The risk associated with accounting standards that vary from country to country or with any uncertainty about how certain transactions should be recorded.

Accumulated benefit obligation (ABO) The present value of pension benefits, assuming the pension plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date.

Accumulated service Years of service of a pension plan participant as of a specified date.

Active investment strategies An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active-lives The portion of a pension fund's liabilities associated with active workers.

Active management An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active return The portfolio's return in excess of the return on the portfolio's benchmark.

Active risk The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

Active risk budgeting Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

Actual extreme events A type of scenario analysis used in stress testing. It involves evaluating how a portfolio would have performed given movements in interest rates, exchange rates, stock prices, or commodity prices at magnitudes such as occurred during past extreme market events (e.g., the stock market crash of October 1987).

Ad valorem fees Fees that are calculated by multiplying a percentage by the value of assets managed; also called assets under management (AUM) fees.

Adaptive markets hypothesis (AMH) A hypothesis that applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives.

Adverse selection risk The risk associated with information asymmetry; in the context of trading, the risk of trading with a more informed trader.

Algorithmic trading Automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints.

Allocation/selection interaction return A measure of the joint effect of weights assigned to both sectors and individual securities; the difference between the weight of the portfolio in a given sector and the portfolio's benchmark for that sector, times the difference between the portfolio's and the benchmark's returns in that sector, summed across all sectors.

Alpha Excess risk-adjusted return.

Alpha and beta separation An approach to portfolio construction that views investing to earn alpha and investing to establish systematic risk exposures as tasks that can and should be pursued separately.

Alpha research Research related to capturing excess risk-adjusted returns by a particular strategy; a way investment research is organized in some investment management firms.

Alternative investments Groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments.

Anchoring and adjustment An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring and adjustment bias An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring trap The tendency of the mind to give disproportionate weight to the first information it receives on a topic.

Angel investor An accredited individual investing chiefly in seed- and early-stage companies.

Anomalies Apparent deviations from market efficiency.

Ask price The price at which a dealer will sell a specified quantity of a security. Also called *ask*, *offer price*, or *offer*.

Ask size The quantity associated with the ask price.

Aspirational risk bucket In goal-based portfolio planning, that part of wealth allocated to investments that have the potential to increase a client's wealth substantially.

Asset covariance matrix The covariance matrix for the asset classes or markets under consideration.

Asset/liability management The management of financial risks created by the interaction of assets and liabilities.

Asset location The type of account an asset is held within, e.g., taxable or tax deferred.

Asset-only With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

Assurity of completion In the context of trading, confidence that trades will settle without problems under all market conditions.

Assurity of the contract In the context of trading, confidence that the parties to trades will be held to fulfilling their obligations.

Asynchronism A discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

AUM fee A fee based on assets under management; an *ad valorem* fee.

Authorized participants Broker/dealers who enter into an agreement with the distributor of the fund.

Automated trading Any form of trading that is not manual, including trading based on algorithms.

Availability bias An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

Average effective spread A measure of the liquidity of a security's market. The mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study.

Back office Administrative functions at an investment firm such as those pertaining to transaction processing, record keeping, and regulatory compliance.

Backtesting A method for gaining information about a model using past data. As used in reference to VaR, it is the process of comparing the number of violations of VaR thresholds over a time period with the figure implied by the user-selected probability level.

Backwardation With respect to the futures curve in a commodity futures market, the condition of being downward sloping.

Balance of payments An accounting of all cash flows between residents and nonresidents of a country.

Bancassurance The sale of insurance by banks.

Barbell A fixed income portfolio combining securities concentrated in short and long maturities relative to the benchmark.

Base With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in "one unit of a currency."

Base-rate neglect A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

Basis point value (BPV) The change in the bond price for a 1 basis point change in yield. Also called *present value of a basis point* or *price value of a basis point (PVBP)*.

Basis risk The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

Batch auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Bayes' formula A mathematical rule explaining how existing probability beliefs should be changed given new information; it is essentially an application of conditional probabilities.

Bear spread An option strategy that involves selling a put with a lower exercise price and buying a put with a higher exercise price. It can also be executed with calls.

Behavioral finance An approach to finance based on the observation that psychological variables affect and often distort individuals' investment decision making.

Behavioral finance macro A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

Behavioral finance micro A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

Benchmark In an investments context, a standard or point of reference for evaluating the performance of an investment portfolio.

Benchmark spread The yield on a credit security over the yield on a security with little or no credit risk (benchmark bond) and with a similar duration.

Best efforts order A type of order that gives the trader's agent discretion to execute the order only when the agent judges market conditions to be favorable.

Beta A measure of the sensitivity of a given investment or portfolio to movements in the overall market.

Beta research Research related to systematic (market) risk and return; a way investment research is organized in some investment management firms.

Bid The price at which a dealer will buy a specified quantity of a security. Also called *bid price*.

Bid–ask spread The difference between the current bid price and the current ask price of a security.

Bid price In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

Bid size The quantity associated with the bid price.

Block order An order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets.

Bond-yield-plus-risk-premium method An approach to estimating the required return on equity which specifies that required return as a bond yield plus a risk premium.

Bottom-up Focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development.

Bottom-up approach A credit strategy approach that involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features.

Bounded rationality The notion that people have informational and cognitive limitations when making decisions and do not necessarily optimize when arriving at their decisions.

Box spread An option strategy that combines a bull spread and a bear spread having two different exercise prices, which produces a risk-free payoff of the difference in the exercise prices.

Broad market indexes An index that is intended to measure the performance of an entire asset class. For example, the S&P 500 Index, Wilshire 5000, and Russell 3000 indexes for US common stocks.

Broker An agent of a trader in executing trades.

Brokered markets Markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.

Bubbles Episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value.

Buffering With respect to style index construction, rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style.

Build-up approach Synonym for the risk premium approach.

Bull spread An option strategy that involves buying a call with a lower exercise price and selling a call with a higher exercise price. It can also be executed with puts.

Bullet A fixed income portfolio made up of securities targeting a single segment of the curve.

Business cycle Fluctuations in GDP in relation to long-term trend growth, usually lasting 9–11 years.

Business risk The equity risk that comes from the nature of the firm's operating activities.

Butterfly spread An option strategy that combines two bull or bear spreads and has three exercise prices, or, a measure of yield curve curvature.

Buy side Investment management companies and other investors that use the services of brokerages.

Buy-side traders Professional traders that are employed by investment managers and institutional investors.

Calendar-and-percentage-of-portfolio rebalancing Monitoring a portfolio at regular frequencies, such as quarterly. Rebalancing decisions are then made based upon percentage-of-portfolio principles.

Calendar rebalancing Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

Calmar ratio The compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period.

Cap A combination of interest rate call options designed to hedge a borrower against rate increases on a floating-rate loan.

Cap weighting See *capitalization weighting*.

Capital adequacy ratio A measure of the adequacy of capital in relation to assets.

Capital flows forecasting approach An exchange rate forecasting approach that focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment.

Capital market expectations (CME) Expectations concerning the risk and return prospects of asset classes.

Capitalization weighting The most common security weighting scheme in which constituents are held in proportion to their market capitalizations, calculated as price times available shares. Also known as *market value*, *market cap*, or *cap weighting*.

Caplet Each component call option in a cap.

Carried interest A private equity fund manager's incentive fee; the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital.

Carry trade A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

Cash balance plan A defined-benefit plan whose benefits are displayed in individual recordkeeping accounts.

Cash flow at risk A variation of VaR that measures the risk to a company's cash flow, instead of its market value; the minimum cash flow loss expected to be exceeded with a given probability over a specified time period.

Cash flow matching Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps.

Cell approach See *stratified sampling*.

Certainty equivalent The maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in an opportunity.

Chain-linking A process for combining periodic returns to produce an overall time-weighted rate of return.

Cheapest-to-deliver A bond in which the amount received for delivering the bond is largest compared with the amount paid in the market for the bond.

Civil law A legal system derived from Roman law, in which judges apply general, abstract rules or concepts to particular cases. In civil systems, law is developed primarily through legislative statutes or executive action.

Clawback provision With respect to the compensation of private equity fund managers, a provision that specifies that money paid to the fund manager be returned to the investors if, at the end of a fund's life, the investors have not received back their capital contributions and contractual share of profits.

Closed-book markets Markets in which a trader does not have real-time access to all quotes in a security.

Closeout netting In a bankruptcy, a process by which multiple obligations between two counterparties are consolidated into a single overall value owed by one of the counterparties to the other.

Cobb-Douglas model A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cobb-Douglas production function A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cognitive dissonance The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

Cognitive errors Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

Collar An option strategy involving the purchase of a put and sale of a call in which the holder of an asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. Collars also can be used to provide protection against rising interest rates on a floating-rate loan by giving up gains from lower interest rates.

Commingled real estate funds (CREFs) Professionally managed vehicles for substantial commingled (i.e., pooled) investment in real estate properties.

Commitment period The period of time over which committed funds are advanced to a private equity fund.

Commodities Articles of commerce such as agricultural goods, metals, and petroleum; tangible assets that are typically relatively homogeneous in nature.

Commodity trading advisers (CTAs) Registered advisers who manage futures funds.

Common law A legal system which draws abstract rules from specific cases. In common law systems, law is developed primarily through decisions of the courts.

Community property regime A marital property regime under which each spouse has an indivisible one-half interest in property received during marriage.

Company-specific risk The non-systematic or idiosyncratic risk specific to a particular company's operations, reputation, and business environment.

Completeness fund A portfolio that, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.

Confidence band With reference to a quality control chart for performance evaluation, a range in which the manager's value-added returns are anticipated to fall a specified percentage of the time.

Confirmation bias A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

Confirming evidence trap The bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it.

Conjunction fallacy An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

Conservatism bias A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

Consistent growth A growth investment substyle that focuses on companies with consistent growth having a long history of unit-sales growth, superior profitability, and predictable earnings.

Constant returns to scale A characteristic of a production function such that a given percentage increase in capital stock and labor input results in an equal percentage increase in output.

Contingent immunization Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

Continuous auction markets Auction markets where orders can be executed at any time during the trading day.

Contrarian A value investment substyle focusing on stocks that have been beset by problems.

Controlled foreign corporation A company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law.

Convexity A measure of how interest rate sensitivity changes with a change in interest rates.

Core capital The amount of capital required to fund spending to maintain a given lifestyle, fund goals, and provide adequate reserves for unexpected commitments.

Core–satellite A way of thinking about allocating money that seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles.

Core-satellite portfolio A portfolio in which certain investments (often indexed or semi-active) are viewed as the core and the balance are viewed as satellite investments fulfilling specific roles.

Corporate governance The system of internal controls and procedures used to define and protect the rights and responsibilities of various stakeholders.

Corporate venturing Investments by companies in promising young companies in the same or a related industry.

Covered call An option strategy involving the holding of an asset and sale of a call on the asset.

Creation units Large blocks of ETF shares often traded against a basket of underlying securities.

Credit default swap A swap used to transfer credit risk to another party. A protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event.

Credit derivative A contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

Credit method When the residence country reduces its taxpayers' domestic tax liability by the amount of taxes paid to a foreign country that exercises source jurisdiction.

Credit risk The risk of loss caused by a counterparty's or debtor's failure to make a timely payment or by the change in value of a financial instrument based on changes in default risk. Also called *default risk*.

Credit spread forward A forward contract used to transfer credit risk to another party; a forward contract on a yield spread.

Credit spread option An option based on the yield spread between two securities that is used to transfer credit risk.

Credit VaR A variation of VaR related to credit risk; it reflects the minimum loss due to credit exposure with a given probability during a period of time.

Credited rates Rates of interest credited to a policyholder's reserve account.

Cross-default provision A provision stipulating that if a borrower defaults on any outstanding credit obligations, the borrower is considered to be in default on all obligations.

Cross hedge A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

Currency overlay programs A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

Current credit risk The risk of credit-related events happening in the immediate future; it relates to the risk that a payment currently due will not be paid. Also called *jump-to-default risk*.

Custom security-based benchmark Benchmarks that are custom built to accurately reflect the investment discipline of a particular investment manager. Also called *strategy benchmarks* because they reflect a manager's particular strategy.

Cyclical stocks The shares of companies whose earnings have above-average sensitivity to the business cycle.

Cyclically Adjusted P/E Ratio (CAPE) A price-to-earnings ratio in which the numerator (in a US context) is defined as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings on the S&P 500.

Day traders Traders that rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are prepared to hold a position. Day traders hold a position open somewhat longer than a scalper but closing all positions at the end of the day.

Dealer A business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order. Also called *market maker*.

Decision price The prevailing price when the decision to trade is made. Also called *arrival price* or *strike price*.

Decision-reversal risk The risk of reversing a chosen course of action at the point of maximum loss.

Decision risk The risk of changing strategies at the point of maximum loss.

Deduction method When the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income.

Deemed dispositions Tax treatment that assumes property is sold. It is sometimes seen as an alternative to estate or inheritance tax.

Deemed distribution When shareholders of a controlled foreign corporation are taxed as if the earnings were distributed to shareholders, even though no distribution has been made.

Default risk The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.

Default risk premium Compensation for the possibility that the issue of a debt instrument will fail to make a promised payment at the contracted time and in the contracted amount.

Defaultable debt Debt with some meaningful amount of credit risk.

Deferred annuity An annuity that enables an individual to purchase an income stream that will begin at a later date.

Defined-benefit plan A pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants.

Defined-contribution plan A pension plan that specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants.

Deflation A decrease in the general level of prices; an increase in the purchasing power of a unit of currency.

Delay costs Implicit trading costs that arise from the inability to complete desired trades immediately due to order size or market liquidity. Also called *slippage*.

Delta The relationship between the option price and the underlying price, which reflects the sensitivity of the price of the option to changes in the price of the underlying.

Delta hedge An option strategy in which a position in an asset is converted to a risk-free position with a position in a specific number of options. The number of options per unit of the underlying changes through time, and the position must be revised to maintain the hedge.

Delta hedging Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

Delta-normal method A measure of VaR equivalent to the analytical method but that refers to the use of delta to estimate the option's price sensitivity.

Demand deposit A deposit that can be drawn upon without prior notice, such as a checking account.

Demutualizing The process of converting an insurance company from mutual form to stock.

Descriptive statistics Methods for effectively summarizing data to describe important aspects of a dataset.

Differential returns Returns that deviate from a manager's benchmark.

Diffusion index An index that measures how many indicators are pointing up and how many are pointing down.

Direct commodity investment Commodity investment that involves the cash market purchase of physical commodities or exposure to changes in spot market values via derivatives, such as futures.

Direct market access Platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker.

Disability income insurance A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

Discounted cash flow models (DCF models) Valuation models that express the idea that an asset's value is the present value of its (expected) cash flows.

Discretionary trust A trust structure in which the trustee determines whether and how much to distribute in the sole discretion of the trustee.

Disintermediation To withdraw funds from financial intermediaries for placement with other financial intermediaries offering a higher return or yield. Or, to withdraw funds from a financial intermediary for the purposes of direct investment, such as withdrawing from a mutual fund to make direct stock investments.

Dispersion The weighted *variance* of the times to receipt of cash flow; it measures the extent to which the payments are spread out around the duration.

Disposition effect As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

Distressed debt arbitrage A distressed securities investment discipline that involves purchasing the traded bonds of bankrupt companies and selling the common equity short.

Distressed securities Securities of companies that are in financial distress or near bankruptcy; the name given to various investment disciplines employing the securities of companies in distress.

Diversification effect In reference to VaR across several portfolios (for example, across an entire firm), this effect equals the difference between the sum of the individual VaRs and total VaR.

Dividend recapitalization A method by which a buyout fund can realize the value of a holding; involves the issuance of debt by the holding to finance a special dividend to owners.

Domestic asset An asset that trades in the investor's domestic currency (or home currency).

Domestic currency The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

Domestic-currency return A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

Donor-advised fund A fund administered by a tax-exempt entity in which the donor advises on where to grant the money that he or she has donated.

Double inflection utility function A utility function that changes based on levels of wealth.

Downside deviation A measure of volatility using only rate of return data points below the investor's minimum acceptable return.

Due diligence Investigation and analysis in support of an investment action or recommendation, such as the scrutiny of operations and management and the verification of material facts.

Duration A measure of the approximate sensitivity of a security to a change in interest rates (i.e., a measure of interest rate risk).

Duration matching Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

Dynamic asset allocation A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

Dynamic hedge A hedge requiring adjustment as the price of the hedged asset changes.

Earnings at risk (EAR) A variation of VaR that reflects the risk of a company's earnings instead of its market value.

Earnings momentum A growth investment substyle that focuses on companies with earnings momentum (high quarterly year-over-year earnings growth).

Earnings risk The risk associated with the earning potential of an individual.

Econometrics The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

Economic balance sheet A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet.*

Economic exposure The risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.

Economic indicators Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

Effective convexity A second-order effect that describes how a bond's interest rate sensitivity changes with changes in yield. Effective convexity is used when the bond has cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities).

Effective duration Duration adjusted to account for embedded options.

Effective spread Two times the distance between the actual execution price and the midpoint of the market quote at the time an order is entered; a measure of execution costs that captures the effects of price improvement and market impact.

Electronic communications networks (ECNs) Computer-based auctions that operate continuously within the day using a specified set of rules to execute orders.

Emerging market debt The sovereign debt of nondeveloped countries.

Emotional biases Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Empirical duration A measure of interest rate sensitivity that is determined from market data.

Endogenous variable A variable whose values are determined within the system.

Endowment bias An emotional bias in which people value an asset more when they hold rights to it than when they do not.

Endowments Long-term funds generally owned by operating nonprofit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Enhanced derivatives products companies A type of subsidiary separate from an entity's other activities and not liable for the parent's debts. They are often used by derivatives dealers to control exposure to ratings downgrades. Also called *special purpose vehicles.*

Enhanced indexing strategy Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

Enterprise risk management An overall assessment of a company's risk position. A centralized approach to risk management sometimes called firmwide risk management.

Environmental, social, and corporate governance (ESG) Also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.

Equal probability rebalancing Rebalancing in which the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor.

Equal weighted In an equal-weighted index, each stock in the index is weighted equally.

Equal weighting Security weighting scheme in which all constituents are held at equal weights at specified rebalancing times.

Equitized Given equity market systematic risk exposure.

Equity forward sale contract A private contract for the forward sale of an equity position.

Equity monetization The realization of cash for an equity position through a manner other than an outright sale.

Equity *q* The ratio of a company's equity market capitalization divided by net worth measured at replacement cost.

Equity risk premium Compensation for the additional risk of equity compared with debt.

ESG risk The risk to a company's market valuation resulting from environmental, social, and governance factors.

Estate All of the property a person owns or controls; may consist of financial assets, tangible personal assets, immovable property, or intellectual property.

Estate planning The process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime.

Estate tax freeze A plan usually involving a corporation, partnership, or limited liability company with the goal to transfer *future* appreciation to the next generation at little or no gift or estate tax cost.

Eurozone The region of countries using the euro as a currency.

Evaluated pricing See *matrix pricing.*

***Ex post* alpha** (or Jensen's alpha) The average return achieved in a portfolio in excess of what would have been predicted by CAPM given the portfolio's risk level; an after-the-fact measure of excess risk-adjusted return.

Excess capital An investor's capital over and above that which is necessary to fund their lifestyle and reserves.

Excess return The difference between the benchmark return and the portfolio return, which may be either positive or negative.

Exchange A regulated venue for the trading of investment instruments.

Exchange fund A fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself.

Exchange-traded funds Exchange-traded Funds or ETFs are hybrid investment products with many features of mutual funds combined with the trading features of common stocks or bonds. Essentially, ETFs are typically portfolios of stocks or bonds or commodities that trade throughout the day like common stocks.

Execution uncertainty Uncertainty pertaining to the timing of execution, or if execution will even occur at all.

Exemption method When the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, in effect having only one jurisdiction impose tax.

Exogenous shocks Events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example.

Exogenous variable A variable whose values are determined outside the system.

Extended portfolio assets and liabilities Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

Externality Those consequences of a transaction (or process) that do not fall on the parties to the transaction (or process).

Factor covariance matrix The covariance matrix of factors.

Factor-model-based benchmark Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

Factor push A simple stress test that involves pushing prices and risk factors of an underlying model in the most disadvantageous way to estimate the impact of factor extremes on the portfolio's value.

Factor sensitivities In a multifactor model, the responsiveness of the dependent variable to factor movements. Also called *factor betas* or *factor loadings*.

Fallen angels Debt that has crossed the threshold from investment grade to high yield.

Fed model An equity valuation model that relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds.

Federal funds rate The interest rate on overnight loans of reserves (deposits) between US Federal Reserve System member banks.

Fee cap A limit on the total fee paid regardless of performance.

Fiduciary A person or entity standing in a special relation of trust and responsibility with respect to other parties.

Financial buyers Buyers who lack a strategic motive.

Financial capital The tangible and intangible assets (excluding human capital) owned by an individual or household.

Financial equilibrium models Models describing relationships between expected return and risk in which supply and demand are in balance.

Financial risk Risks derived from events in the external financial markets, such as changes in equity prices, interest rates, or currency exchange rates.

Fiscal policy Government activity concerning taxation and governmental spending.

Fixed trust A trust structure in which distributions to beneficiaries are prescribed in the trust document to occur at certain times or in certain amounts.

Flexible-premium variable life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *variable universal life*.

Floating supply of shares The number of shares outstanding that are actually available to investors. Also called *free float*.

Floor A combination of interest rate options designed to provide protection against interest rate decreases.

Floor broker An agent of the broker who, for certain exchanges, physically represents the trade on the exchange floor.

Floorlet Each component put option in a floor.

Forced heirship rules Legal ownership principles whereby children have the right to a fixed share of a parent's estate.

Foreign assets Assets denominated in currencies other than the investor's home currency.

Foreign currency Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

Foreign-currency return The return of the foreign asset measured in foreign-currency terms.

Formal tools Established research methods amenable to precise definition and independent replication of results.

Forward conversion with options The construction of a synthetic short forward position against the asset held long.

Forward rate bias Persistent violation of uncovered interest rate parity that is exploited by the carry trade.

Foundations Typically, grant-making institutions funded by gifts and investment assets.

Fourth market A term occasionally used for direct trading of securities between institutional investors; the fourth market would include trading on electronic crossing networks.

Framing An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Framing bias An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Front office The revenue generating functions at an investment firm such as those pertaining to trading and sales.

Front-run To trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions.

Full replication When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Full replication approach When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Fully funded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is 100 percent or greater.

Fund manager The professional manager of separate accounts or pooled assets structured in a variety of ways.

Fund of funds A fund that invests in a number of underlying funds.

Fundamental law of active management The relation that the information ratio of a portfolio manager is approximately equal to the information coefficient multiplied by the square root of the investment discipline's breadth (the number of independent, active investment decisions made each year).

Fundamental weighting Patented by Research Affiliates LLC, this scheme uses company characteristics such as sales, cash flow, book value, and dividends to weight securities.

Funded status The relationship between the value of a plan's assets and the present value of its liabilities.

Funding currencies The low-yield currencies in which borrowing occurs in a carry trade.

Funding risk The risk that liabilities funding long asset positions cannot be rolled over at reasonable cost.

G-spread The yield on a credit security over the yield of an actual or interpolated government bond.

Gain-to-loss ratio The ratio of positive returns to negative returns over a specified period of time.

Gamblers' fallacy A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

Gamma A numerical measure of the sensitivity of delta to a change in the underlying's value.

Global custodian An entity that effects trade settlement, safekeeping of assets, and the allocation of trades to individual custody accounts.

Global investable market A practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.

Goals-based With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

Goals-based investing An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

Gordon (constant) growth model A version of the dividend discount model for common share value that assumes a constant growth rate in dividends.

Government structural policies Government policies that affect the limits of economic growth and incentives within the private sector.

Grinold–Kroner model An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

Growth in total factor productivity A component of trend growth in GDP that results from increased efficiency in using capital inputs; also known as technical progress.

H-model A variant of the two-stage dividend discount model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate that holds in perpetuity.

Hague Conference on Private International Law An intergovernmental organization working toward the convergence of private international law. Its 69 members consist of countries and regional economic integration organizations.

Halo effect An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

Health insurance A type of insurance used to cover health care and medical costs.

Health risk The risk associated with illness or injury.

Hedge funds A historically loosely regulated, pooled investment vehicle that may implement various investment strategies.

Hedge ratio The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

Hedging A general strategy usually thought of as reducing, if not eliminating, risk.

Herding When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

High-water mark A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

High yield A value investment substyle that focuses on stocks offering high dividend yield with prospects of maintaining or increasing the dividend.

High-yield investing A distressed securities investment discipline that involves investment in high-yield bonds perceived to be undervalued.

Hindsight bias A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

Historical simulation method The application of historical price changes to the current portfolio.

Holdings-based style analysis An approach to style analysis that categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time.

Holistic balance sheet See *economic balance sheet.*

Home bias A preference for securities listed on the exchanges of one's home country.

Home-country bias The favoring of domestic over non-domestic investments relative to global market value weights.

Home currency See *domestic currency.*

Horizon matching Hybrid approach that combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short-and long-term liabilities.

Human capital An implied asset; the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital.*

Hybrid markets Combinations of market types, which offer elements of batch auction markets and continuous auction markets, as well as quote-driven markets.

Hypothetical events A type of scenario analysis used in stress testing that involves the evaluation of performance given events that have never happened in the markets or market outcomes to which we attach a small probability.

I-spread The yield on a credit security over the swap rate (denominated in the same currency as the credit security). Also known as interpolated spread.

Illiquidity premium Compensation for the risk of loss relative to an investment's fair value if an investment needs to be converted to cash quickly.

Illusion of control A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Illusion of control bias A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Immediate annuity An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

Immunization An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

Implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return.

Implementation shortfall strategy A strategy that attempts to minimize trading costs as measured by the implementation shortfall method. Also called *arrival price strategy*.

Implied yield A measure of the yield on the underlying bond of a futures contract implied by pricing it as though the underlying will be delivered at the futures expiration.

Incremental VaR A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.

Indexing A common passive approach to investing that involves holding a portfolio of securities designed to replicate the returns on a specified index of securities.

Indifference curve analysis A decision-making approach whereby curves of consumption bundles, among which the decision-maker is indifferent, are constructed to identify and choose the curve within budget constraints that generates the highest utility.

Indirect commodity investment Commodity investment that involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production.

Inferential statistics Methods for making estimates or forecasts about a larger group from a smaller group actually observed.

Inflation An increase in the general level of prices; a decrease in the purchasing power of a unit of currency.

Inflation hedge An asset whose returns are sufficient on average to preserve purchasing power during periods of inflation.

Inflation premium Compensation for expected inflation.

Information coefficient The correlation between forecast and actual returns.

Information-motivated traders Traders that seek to trade on information that has limited value if not quickly acted upon.

Information ratio The mean excess return of the account over the benchmark (i.e., mean active return) relative to the variability of that excess return (i.e., tracking risk); a measure of risk-adjusted performance.

Infrastructure funds Funds that make private investment in public infrastructure projects in return for rights to specified revenue streams over a contracted period.

Initial public offering The initial issuance of common stock registered for public trading by a formerly private corporation.

Input uncertainty Uncertainty concerning whether the inputs are correct.

Inside ask The lowest available ask price. Also called *market ask*.

Inside bid The highest available bid price. Also called *market bid*.

Inside bid–ask spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *market spread*.

Inside quote Combination of the highest available bid price with the lowest available ask price. Also called *market quote*.

Inside spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside bid–ask spread*, or *market spread*.

Institutional investors Corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets.

Interest rate management effect With respect to fixed-income attribution analysis, a return component reflecting how well a manager predicts interest rate changes.

Interest spread With respect to banks, the average yield on earning assets minus the average percent cost of interest-bearing liabilities.

Internal rate of return The growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows; money-weighted rate of return is a synonym.

Intestate Having made no valid will; a decedent without a valid will or with a will that does not dispose of their property is considered to have died intestate.

Intrinsic value The difference between the spot exchange rate and the strike price of a currency option.

Inventory cycle A cycle measured in terms of fluctuations in inventories, typically lasting 2–4 years.

Inverse floater A floating-rate note or bond in which the coupon is adjusted to move opposite to a benchmark interest rate.

Investment currencies The high-yielding currencies in a carry trade.

Investment skill The ability to outperform an appropriate benchmark consistently over time.

Investment style A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

Investment style indexes Indexes that represent specific portions of an asset category. For example, subgroups within the US common stock asset category such as large-capitalization growth stocks.

Investment universe The set of assets that may be considered for investment.

Investor's benchmark The benchmark an investor uses to evaluate performance of a given portfolio or asset class.

Irrevocable trust A trust arrangement wherein the settlor has no ability to revoke the trust relationship.

J factor risk The risk associated with a judge's track record in adjudicating bankruptcies and restructurings.

Joint ownership with right of survivorship Jointly owned; assets held in joint ownership with right of survivorship automatically transfer to the surviving joint owner or owners outside the probate process.

Justified P/E The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.

Key rate duration A method of measuring the interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

Knock-in/knock-out Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

Lagging economic indicators A set of economic variables whose values correlate with recent past economic activity.

Leading economic indicators A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

Legal/contract risk The possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake; for example, if a contract is voided through litigation.

Leverage-adjusted duration gap A leverage-adjusted measure of the difference between the durations of assets and liabilities which measures a bank's overall interest rate exposure.

Leveraged floating-rate note (leveraged floater) A floating-rate note or bond in which the coupon is adjusted at a multiple of a benchmark interest rate.

Leveraged recapitalization A leveraging of a company's balance sheet, usually accomplished by working with a private equity firm.

Liability-based benchmark A benchmark structured to accurately reflect the return required to meet the future obligations of an investor and to mimic the volatility of the liabilities.

Liability-driven investing An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

Liability glide path A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

Liability insurance A type of insurance used to manage liability risk.

Liability-relative With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

Liability risk The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

Life-cycle finance A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

Life insurance A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

Lifetime gratuitous transfer A lifetime gift made during the lifetime of the donor; also known as *inter vivos* transfers.

Limit order An instruction to execute an order when the best price available is at least as good as the limit price specified in the order.

Liquidity The ability to trade without delay at relatively low cost and in relatively large quantities.

Liquidity-motivated traders Traders that are motivated to trade based upon reasons other than an information advantage. For example, to release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs.

Liquidity risk Any risk of economic loss because of the need to sell relatively less liquid assets to meet liquidity requirements; the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.

Lock-up period A minimum initial holding period for investments during which no part of the investment can be withdrawn.

Locked up Said of investments that cannot be traded at all for some time.

Logical participation strategies Protocols for breaking up an order for execution over time. Typically used by institutional traders to participate in overall market volumes without being unduly visible.

Longevity risk The risk associated with living to an advanced age in retirement, including the uncertainty surrounding how long retirement will last; the risk of outliving one's financial resources.

Loss-aversion bias A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

Loss given default See *loss severity*.

Loss severity The amount of loss if a default occurs. Also called *loss given default*.

Low P/E A value investment substyle that focuses on shares selling at low prices relative to current or normal earnings.

M^2 A measure of what a portfolio would have returned if it had taken on the same total risk as the market index.

Macaulay duration The percentage change in price for a percentage change in yield. The term, named for one of the economists who first derived it, is used to distinguish the calculation from modified duration. (See also *modified duration*).

Macro attribution Performance attribution analysis conducted on the fund sponsor level.

Macro expectations Expectations concerning classes of assets.

Managed futures Pooled investment vehicles, frequently structured as limited partnerships, that invest in futures and options on futures and other instruments.

Managed futures funds Pools of private capital managed by commodity trading advisers.

Manager continuation policies Policies adopted to guide the manager evaluations conducted by fund sponsors. The goal of manager continuation policies is to reduce the costs of manager turnover while systematically acting on indications of future poor performance.

Manager monitoring A formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations; used to identify warning signs of adverse changes in existing managers' organizations.

Manager peer group See *manager universe*.

Manager review A detailed examination of a manager that currently exists within a plan sponsor's program. The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired.

Manager universe A broad group of managers with similar investment disciplines. Also called *manager peer group*.

Market-adjusted implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return, adjusted using beta to remove the effect of the return on the market.

Market ask The lowest available ask price.

Market bid The best available bid; highest price any buyer is currently willing to pay.

Market bid–ask spread Market ask price minus market bid price. Also called *inside bid–ask spread*, *inside spread*, or *market spread*.

Market cap weighting See *capitalization weighting*.

Market fragmentation A condition whereby a market contains no dominant group of sellers (or buyers) that are large enough to unduly influence the market.

Market impact The effect of the trade on transaction prices. Also called *price impact*.

Market index Represents the performance of a specified security market, market segment, or asset class.

Market integration The degree to which there are no impediments or barriers to capital mobility across markets.

Market microstructure The market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Market model A regression equation that specifies a linear relationship between the return on a security (or portfolio) and the return on a broad market index.

Market-not-held order A variation of the market order designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the floor broker is not required to trade at any specific price or in any specific time interval.

Market on close order A market order to be executed at the closing of the market.

Market on open order A market order to be executed at the opening of the market.

Market order An instruction to execute an order as soon as possible in the public markets at the best price available.

Market oriented With reference to equity investing, an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth.

Market quote Combination of the highest available bid price with the lowest available ask price. Also called *inside quote*.

Market risk The risk associated with interest rates, exchange rates, and equity prices.

Market risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to maintain the client's current standard of living.

Market segmentation The degree to which there are some meaningful impediments to capital movement across markets.

Market spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *inside bid–ask spread*.

Market value weighting See *capitalization weighting*.

Marking to market A procedure used primarily in futures markets in which the parties to a contract settle the amount owed daily. Also known as the *daily settlement*.

Mass affluent An industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services.

Matrix prices Prices determined by comparisons to other securities of similar credit risk and maturity; the result of matrix pricing.

Matrix pricing An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

Maturity premium Compensation for the increased sensitivity of the market value of debt to a change in market interest rates as maturity is extended.

Maximum loss optimization A stress test in which we would try to optimize mathematically the risk variable that would produce the maximum loss.

Mega-cap buyout funds A class of buyout funds that take public companies private.

Mental accounting bias An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

Micro attribution Performance attribution analysis carried out on the investment manager level.

Micro expectations Expectations concerning individual assets.

Middle-market buyout funds A class of buyout funds that purchase private companies whose revenues and profits are too small for them to access capital from the public equity markets.

Midquote The halfway point between the market bid and ask prices.

Minimum-variance hedge ratio A mathematical approach to determining the optimal cross hedging ratio.

Mismatch in character The potential tax inefficiency that can result if the instrument being hedged, and the tool that is being used to hedge it, produce income and loss of a different character.

Missed trade opportunity costs Unrealized profit/loss arising from the failure to execute a trade in a timely manner.

Model risk The risk that a model is incorrect or misapplied; in investments, it often refers to valuation models.

Model uncertainty Uncertainty concerning whether a selected model is correct.

Modified duration An adjustment of the duration for the level of the yield. Contrast with *Macaulay duration*.

Monetary policy Government activity concerning interest rates and the money supply.

Monetize To access an item's cash value without transferring ownership of it.

Money duration A measure of the price change in units of the currency in which the bond is denominated given a change in its yield-to-maturity.

Money markets Markets for fixed-income securities with maturities of one year or less.

Money-weighted rate of return Same as the internal rate of return; the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows.

Multifactor model A model that explains a variable in terms of the values of a set of factors.

Multiperiod Sharpe ratio A Sharpe ratio based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment.

Mutual funds A professionally managed investment pool in which investors in the fund typically each have a pro-rata claim on the income and value of the fund.

Mutuals With respect to insurance companies, companies that are owned by their policyholders, who share in the company's surplus earnings.

Natural liquidity An extensive pool of investors who are aware of and have a potential interest in buying and/or selling a security.

Net asset value Value established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.

Net employment capital See *human capital*.

Net interest margin With respect to banks, net interest income (interest income minus interest expense) divided by average earning assets.

Net interest spread With respect to the operations of insurers, the difference between interest earned and interest credited to policyholders.

Net wealth The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

Net worth tax or net wealth tax A tax based on a person's assets, less liabilities.

Nominal default-free bonds Conventional bonds that have no (or minimal) default risk.

Nominal gross domestic product A money measure of the goods and services produced within a country's borders. Also called *nominal GDP*.

Nominal risk-free interest rate The sum of the real risk-free interest rate and the inflation premium.

Non-deliverable forwards Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

Nonfinancial risk Risks that arise from sources other than the external financial markets, such as changes in accounting rules, legal environment, or tax rates.

Nonparametric Involving minimal probability-distribution assumptions.

Nonstationarity A property of a data series that reflects more than one set of underlying statistical properties.

Normal portfolio A portfolio with exposure to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Objective function A quantitative expression of the objective or goal of a process.

Offer price The price at which a counterparty is willing to sell one unit of the base currency.

Open market operations The purchase or sale by a central bank of government securities, which are settled using reserves, to influence interest rates and the supply of credit by banks.

Open outcry auction market Public auction where representatives of buyers and sellers meet at a specified location and place verbal bids and offers.

Operational risk The risk of loss from failures in a company's systems and procedures (for example, due to computer failures or human failures) or events completely outside of the control of organizations (which would include "acts of God" and terrorist actions).

Opportunistic participation strategies Passive trading combined with the opportunistic seizing of liquidity.

Optimization With respect to portfolio construction, a procedure for determining the best portfolios according to some criterion.

Option-adjusted spread The constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price.

Order-driven markets Markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices.

Ordinary life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *whole life insurance*.

Orphan equities investing A distressed securities investment discipline that involves investment in orphan equities that are perceived to be undervalued.

Orphan equity The newly issued equity of a company emerging from reorganization.

Output gap The difference between the value of GDP estimated as if the economy were on its trend growth path (potential output) and the actual value of GDP.

Overall trade balance The sum of the current account (reflecting exports and imports) and the financial account (consisting of portfolio flows).

Overbought When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

Overconfidence bias A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

Overconfidence trap The tendency of individuals to overestimate the accuracy of their forecasts.

Oversold The opposite of overbought; see *overbought*.

Pairs trade A basic long–short trade in which an investor is long and short equal currency amounts of two common stocks in a single industry. Also called *pairs arbitrage*.

Panel method A method of capital market expectations setting that involves using the viewpoints of a panel of experts.

Partial correlation In multivariate problems, the correlation between two variables after controlling for the effects of the other variables in the system.

Partial fill Execution of a purchase or sale for fewer shares than was stipulated in the order.

Participate (do not initiate) order A variant of the market-not-held order. The broker is deliberately low-key and waits for and responds to the initiatives of more active traders.

Passive investment Investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

Passive investment strategies A buy-and-hold strategy to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive management A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive traders Traders that seek liquidity in their rebalancing transactions, but are much more concerned with the cost of trading.

Payment netting A means of settling payments in which the amount owed by the first party to the second is netted with the amount owed by the second party to the first; only the net difference is paid.

Pension funds Funds consisting of assets set aside to support a promise of retirement income.

Pension surplus Pension assets at market value minus the present value of pension liabilities.

Percent-range rebalancing An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

Percentage-of-portfolio rebalancing Rebalancing is triggered based on set thresholds stated as a percentage of the portfolio's value.

Percentage-of-volume strategy A logical participation strategy in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Perfect markets Markets without any frictional costs.

Performance appraisal The evaluation of portfolio performance; a quantitative assessment of a manager's investment skill.

Performance attribution A comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns.

Performance-based fee Fees specified by a combination of a base fee plus an incentive fee for performance in excess of a benchmark's.

Performance evaluation The measurement and assessment of the outcomes of investment management decisions.

Performance measurement A component of performance evaluation; the relatively simple procedure of calculating an asset's or portfolio's rate of return.

Performance netting risk For entities that fund more than one strategy and have asymmetric incentive fee arrangements with the portfolio managers, the potential for loss in cases where the net performance of the group of managers generates insufficient fee revenue to fully cover contractual payout obligations to all portfolio managers with positive performance.

Periodic auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Permanent income hypothesis The hypothesis that consumers' spending behavior is largely determined by their long-run income expectations.

Permanent life insurance A type of life insurance that provides lifetime coverage.

Personal risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to protect the client from a drastic decrease in lifestyle.

Plan sponsor The trustee, company, or employer responsible for a public or private institutional investment plan.

Pledging requirement With respect to banks, a required collateral use of assets.

Point estimate A single-valued estimate of a quantity, as opposed to an estimate in terms of a range of values.

Policyholder reserves With respect to an insurance company, an amount representing the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Political risk The risk of war, government collapse, political instability, expropriation, confiscation, or adverse changes in taxation. Also called *geopolitical risk*.

Portable Moveable. With reference to a pension plan, one in which a plan participant can move his or her share of plan assets to a new plan, subject to certain rules, vesting schedules, and possible tax penalties and payments.

Portable alpha A strategy involving the combining of multiple positions (e.g., long and short positions) so as to separate the alpha (unsystematic risk) from beta (systematic risk) in an investment.

Portfolio trade A trade in which a number of securities are traded as a single unit. Also called *program trade* or *basket trade*.

Position a trade To take the other side of a trade, acting as a principal with capital at risk.

Post-trade transparency Degree to which completed trades are quickly and accurately reported to the public.

Potential output The value of GDP if the economy were on its trend growth path.

Preferred return With respect to the compensation of private equity fund managers, a hurdle rate.

Premature death risk The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

Premium Regarding life insurance, the asset paid by the policy holder to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy.

Prepackaged bankruptcy A bankruptcy in which the debtor seeks agreement from creditors on the terms of a reorganization before the reorganization filing.

Prepaid variable forward A collar and loan combined within a single instrument.

Present value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Present value of distribution of cash flows methodology Method used to address a portfolio's sensitivity to rate changes along the yield curve, this approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

Pretrade transparency Ability of individuals to quickly, easily, and inexpensively obtain accurate information about quotes and trades.

Price discovery Adjustment of transaction prices to balance supply and demand.

Price improvement Execution at a price that is better than the price quoted at the time of order placement.

Price uncertainty Uncertainty about the price at which an order will execute.

Price value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Price weighted With respect to index construction, an index in which each security in the index is weighted according to its absolute share price.

Price weighting Security weighting scheme in which constituents are weighted in proportion to their prices.

Priced risk Risk for which investors demand compensation.

Primary capital Assets held outside a concentrated position that are at least sufficient to provide for the owner's lifetime spending needs.

Prime brokerage A suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

Principal trade A trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell.

Private equity Ownership interests in non-publicly traded companies.

Private equity funds Pooled investment vehicles that generally invest in highly illiquid assets; include venture capital funds and buyout funds.

Private exchange A method for handling undiversified positions with built-in capital gains in which shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.

Private placement memorandum A document used to raise venture capital financing when funds are raised through an agent.

Probate The legal process to confirm the validity of a will so that executors, heirs, and other interested parties can rely on its authenticity.

Profit-sharing plans A defined-contribution plan in which contributions are based, at least in part, on the plan sponsor's profits.

Projected benefit obligation (PBO) A measure of a pension plan's liability that reflects accumulated service in the same manner as the ABO but also projects future variables, such as compensation increases.

Property insurance A type of insurance used by individuals to manage property risk.

Property risk The possibility that a person's property may be damaged, destroyed, stolen, or lost.

Prospect theory An alternative to expected utility theory, it assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses.

Protective put An option strategy in which a long position in an asset is combined with a long position in a put.

Proxy hedge See *cross hedge*.

Prudence trap The tendency to temper forecasts so that they do not appear extreme; the tendency to be overly cautious in forecasting.

Public good A good that is not divisible and not excludable (a consumer cannot be denied it).

Purchasing power parity The theory that movements in an exchange rate should offset any difference in the inflation rates between two countries.

Pure indexing Method investors use to match an underlying market index in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk.

Pure sector allocation return A component of attribution analysis that relates relative returns to the manager's sector-weighting decisions. Calculated as the difference between the allocation (weight) of the portfolio to a given sector and the portfolio's benchmark weight for that sector, multiplied by the difference between the sector benchmark's return and the overall portfolio's benchmark return, summed across all sectors.

Put spread A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

Quality control charts A graphical means of presenting performance appraisal data; charts illustrating the performance of an actively managed account versus a selected benchmark.

Quantitative easing A policy measure in which a central bank buys financial assets to inject a predetermined quantity of money in the financial system.

Quote-driven markets Markets that rely on dealers to establish firm prices at which securities can be bought and sold. Also called *dealer markets*.

Quoted depth The number of shares available for purchase or sale at the quoted bid and ask prices.

Ratio spread An option strategy in which a long position in a certain number of options is offset by a short position in a certain number of other options on the same underlying, resulting in a risk-free position.

Rational economic man A self-interested, risk-averse individual who has the ability to make judgments using all available information in order to maximize his/her expected utility.

Re-base With reference to index construction, to change the time period used as the base of the index.

Real estate Interests in land or structures attached to land.

Real estate investment trusts (REITs) Publicly traded equities representing pools of money invested in real estate properties and/or real estate debt.

Real option An option involving decisions related to tangible assets or processes.

Real risk-free interest rate The single-period interest rate for a completely risk-free security if no inflation were expected.

Rebalancing In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

Rebalancing range A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

Rebate rate The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

Recallability trap The tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory.

Recession A broad-based economic downturn, conventionally defined as two successive quarterly declines in GDP.

Regime A distinct governing set of relationships.

Regret The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

Regret-aversion bias An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

Regulatory risk The risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change.

Reinvestment risk The risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate.

Relative economic strength forecasting approach An exchange rate forecasting approach that suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate.

Relative strength indicators A price momentum indicator that involves comparing a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.

Remaindermen Beneficiaries of a trust; having a claim on the residue.

Repo rate The interest rate on a repurchase agreement.

Representativeness bias A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

Repurchase agreements (repos) In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount, while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

Repurchase yield The negative of the expected percent change in number of shares outstanding, in the Grinold–Kroner model.

Residence jurisdiction A framework used by a country to determine the basis for taxing income, based on residency.

Residence–residence conflict When two countries claim residence of the same individual, subjecting the individual's income to taxation by both countries.

Residence–source conflict When tax jurisdiction is claimed by an individual's country of residence and the country where some of their assets are sourced; the most common source of double taxation.

Residue With respect to trusts, the funds remaining in a trust when the last income beneficiary dies.

Resistance levels Price points on dealers' order boards where one would expect to see a clustering of offers.

Retired-lives The portion of a pension fund's liabilities associated with retired workers.

Returns-based benchmarks Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

Returns-based style analysis An approach to style analysis that focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns.

Reverse repos Repurchase agreement from the standpoint of the lender.

Revocable trust A trust arrangement wherein the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets.

Risk budgeting The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

Risk exposure A source of risk. Also, the state of being exposed or vulnerable to a risk.

Risk premium approach An approach to forecasting the return of a risky asset that views its expected return as the sum of the risk-free rate of interest and one or more risk premiums.

Risk reversal With respect to foreign exchange option strategies, one involving a long position in a call option and a short position in a put option.

Risk tolerance The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

Rolling return The moving average of the holding-period returns for a specified period (e.g., a calendar year) that matches the investor's time horizon.

Sale and leaseback A transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rate and term acceptable to the new owner and on financial terms consistent with the marketplace.

Sample estimator A formula for assigning a unique value (a point estimate) to a population parameter.

Sample-size neglect A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or "real" data).

Sandwich spread An option strategy that is equivalent to a short butterfly spread.

Satisfice A combination of "satisfy" and "suffice" describing decisions, actions, and outcomes that may not be optimal, but are adequate.

Savings–investment imbalances forecasting approach An exchange rate forecasting approach that explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate.

Scenario analysis A risk assessment technique involving the examination of the performance of a portfolio under specified situations.

Seagull spread An extension of the risk reversal foreign exchange option strategy that limits downside risk.

Secondary offering An offering after the initial public offering of securities.

Sector/quality effect In a fixed-income attribution analysis, a measure of a manager's ability to select the "right" issuing sector and quality group.

Security selection effect In a fixed-income attribution analysis, the residual of the security's total return after other effects are accounted for; a measure of the return due to ability in security selection.

Segmentation With respect to the management of insurance company portfolios, the notional subdivision of the overall portfolio into sub-portfolios each of which is associated with a specified group of insurance contracts.

Self-attribution bias A bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control.

Self-control bias A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

Sell side Broker/dealers that sell securities and make recommendations for various customers, such as investment managers and institutional investors.

Semi-active management A variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark with tightly controlled risk relative to the benchmark. Also called *enhanced indexing* or *risk-controlled active management.*

Separate property regime A marital property regime under which each spouse is able to own and control property as an individual.

Settlement netting risk The risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.

Settlement risk When settling a contract, the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.

Settlor (or grantor) An entity that transfers assets to a trustee, to be held and managed for the benefit of the trust beneficiaries.

Shari'a The law of Islam. In addition to the law of the land, some follow guidance provided by Shari'a or Islamic law.

Sharpe ratio A measure of risk-adjusted performance that compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. Also called *reward-to-variability*.

Short sale against the box Shorting a security that is held long.

Shortfall probability The probability of failing to meet a specific liability or goal.

Shortfall risk The risk that portfolio value will fall below some minimum acceptable level during a stated time horizon; the risk of not achieving a specified return target.

Shrinkage estimation Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

Shrinkage estimator The formula used in shrinkage estimation of a parameter.

Smart beta Involves the use of simple, transparent, rules-based strategies as a basis for investment decisions.

Smart routing The use of algorithms to intelligently route an order to the most liquid venue.

Smoothing rule With respect to spending rates, a rule that averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

Social proof A bias in which individuals tend to follow the beliefs of a group.

Socially responsible investing An approach to investing that integrates ethical values and societal concerns with investment decisions. Also called *ethical investing*.

Soft dollars The use of commissions to buy services other than execution services. Also called *soft dollar arrangements* or *soft commissions*.

Sole ownership Owned by one person; assets held in sole ownership are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will through the probate process.

Solow residual A measure of the growth in total factor productivity that is based on an economic growth model developed by economist Robert M. Solow.

Sortino ratio A performance appraisal ratio that divides the difference between a portfolio's return and a minimum acceptable return by downside deviation.

Source jurisdiction A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Source–source conflict When two countries claim source jurisdiction of the same asset; both countries may claim that the income is derived from their jurisdiction.

Sovereign risk A form of credit risk in which the borrower is the government of a sovereign nation.

Spread curve The fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Spread duration A measure used in determining a portfolio's sensitivity to changes in credit spreads.

Stale price bias Bias that arises from using prices that are stale because of infrequent trading.

Static hedge A hedge that is not sensitive to changes in the price of the asset hedged.

Stationary A series of data for which the parameters that describe a return-generating process are stable.

Status quo bias An emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change.

Status quo trap The tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past.

Sterling ratio The compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%.

Stock companies With respect to insurance companies, companies that have issued common equity shares.

Stock index futures Futures contracts on a specified stock index.

Stops Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

Straddle An option strategy involving the purchase of a put and a call on the same underlying with the same exercise price and expiration date. If the put and call are held long, it is a long straddle; if they are held short, it is a short straddle.

Straight-through processing Systems that simplify transaction processing through the minimization of manual and/or duplicative intervention in the process from trade placement to settlement.

Strangle A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

Strap An option strategy involving the purchase of two calls and one put.

Strategic asset allocation 1) The process of allocating money to IPS-permissible asset classes that integrates the investor's return objectives, risk tolerance, and investment constraints with long-run capital market expectations. 2) The result of the above process, also known as the policy portfolio.

Strategic buyers Buyers who have a strategic motive (e.g., realization of synergies) for seeking to buy a company.

Strategy benchmarks See custom security-based benchmarks.

Stratified sampling A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

Strip An option strategy involving the purchase of two puts and one call.

Structural level of unemployment The level of unemployment resulting from scarcity of a factor of production.

Structural risk Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

Structured note A variation of a floating-rate note that has some type of unusual characteristic such as a leverage factor or in which the rate moves opposite to interest rates.

Style drift Inconsistency in style.

Style index A securities index intended to reflect the average returns to a given style.

Stylized scenario A type of analysis often used in stress testing. It involves simulating the movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio.

Sunshine trades Public display of a transaction (usually high-volume) in advance of the actual order.

Support levels Price points on dealers' order boards where one would expect to see a clustering of bids.

Surplus The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

Surplus capital Capital that is in excess of primary capital.

Survey method A method of capital market expectations setting that involves surveying experts.

Survival probability The probability an individual survives in a given year; used to determine expected cash flow required in retirement.

Survivorship bias Bias that arises in a data series when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain; when a data series as of a given date reflects only entities that have survived to that date.

Swap rate The interest rate applicable to the pay-fixed-rate side of an interest rate swap.

Tactical asset allocation Asset allocation that involves making short-term adjustments to asset class weights based on short-term predictions of relative performance among asset classes.

Tactical rebalancing A variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals.

Tail risk The risk that there are more actual events in the tail of a probability distribution than would be predicted by probability models.

Tail value at risk (or conditional tail expectation) The VaR plus the expected loss in excess of VaR, when such excess loss occurs.

Target covariance matrix A component of shrinkage estimation; allows the analyst to model factors that are believed to influence the data over periods longer than observed in the historical sample.

Tax avoidance Developing strategies that minimize tax, while conforming to both the spirit and the letter of the tax codes of jurisdictions with taxing authority.

Tax efficiency The proportion of the expected pretax total return that will be retained after taxes.

Tax evasion The practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

Tax premium Compensation for the effect of taxes on the after-tax return of an asset.

Tax risk The uncertainty associated with tax laws.

Taylor rule A rule linking a central bank's target short-term interest rate to the rate of growth of the economy and inflation.

Temporary life insurance A type of life insurance that covers a certain period of time, specified at purchase. Commonly referred to as "term" life insurance.

Term life insurance A type of life insurance policy that provides coverage for a specified length of time and accumulates little or no cash values.

Territorial tax system A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Testamentary gratuitous transfer The bequeathing or transfer of assets upon one's death. From a recipient's perspective, it is called an inheritance.

Testator A person who makes a will.

Theta The change in price of an option associated with a one-day reduction in its time to expiration; the rate at which an option's time value decays.

Tick The smallest possible price movement of a security.

Time deposit A deposit requiring advance notice prior to a withdrawal.

Time-series estimators Estimators that are based on lagged values of the variable being forecast; often consist of lagged values of other selected variables.

Time to expiration The time remaining in the life of a derivative, typically expressed in years.

Time value The difference between the market price of an option and its intrinsic value, determined by the uncertainty of the underlying over the remaining life of the option.

Time-weighted average price (TWAP) strategy A logical participation strategy that assumes a flat volume profile and trades in proportion to time.

Time-weighted rate of return The compound rate of growth over a stated evaluation period of one unit of money initially invested in the account.

Tobin's *q* An asset-based valuation measure that is equal to the ratio of the market value of debt and equity to the replacement cost of total assets.

Top-down Proceeding from the macroeconomy, to the economic sector level, to the industry level, to the firm level.

Top-down approach A credit strategy approach that involves formulating a view on major macroeconomic trends and then selecting the bonds that the investor expects to perform best in the expected environment.

Total factor productivity (TFP) A variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

Total future liability With respect to defined-benefit pension plans, the present value of accumulated and projected future service benefits, including the effects of projected future compensation increases.

Total rate of return A measure of the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized).

Total return equity swap A swap contract that involves a series of exchanges of the total return on a specified asset or equity index in return for specified fixed or floating rate payments.

Total return payer Party responsible for paying the reference obligation cash flows and return to the receiver, but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Total return receiver Party receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread.

Total return swap A swap in which one party agrees to pay the total return on a security. Often used as a credit derivative, in which the underlying is a bond.

Tracking error The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking risk*.

Tracking risk The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking error*.

Trade blotter A device for entering and tracking trade executions and orders to trade.

Trade settlement Completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller.

Trading activity In fixed-income attribution analysis, the effect of sales and purchases of bonds over a given period; the total portfolio return minus the other components determining the management effect in an attribution analysis.

Transaction exposure The risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale.

Translation exposure The risk associated with the conversion of foreign financial statements into domestic currency.

Transparency Availability of timely and accurate market and trade information.

Trigger points In the context of portfolio rebalancing, the endpoints of a rebalancing range (corridor).

Twist With respect to the yield curve, a movement in contrary directions of interest rates at two maturities; a nonparallel movement in the yield curve.

Type I error With respect to manager selection, keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct).

Type II error With respect to manager selection, firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect).

Underfunded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is less than 100 percent.

Underwriting (profitability) cycle A cycle affecting the profitability of insurance companies' underwriting operations.

Unit-linked life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *variable life insurance*.

Universal life insurance A type of life insurance policy that provides for premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element.

Unrelated business income With respect to the US tax code, income that is not substantially related to a foundation's charitable purposes.

Unstructured modeling Modeling without a theory on the underlying structure.

Uptick rules Trading rules that specify that a short sale must not be on a downtick relative to the last trade at a different price.

Urgency of the trade The importance of certainty of execution.

Utility The level of relative satisfaction received from the consumption of goods and services.

Utility theory Theory whereby people maximize the present value of utility subject to a present value budget constraint.

Valuation reserve With respect to insurance companies, an allowance, created by a charge against earnings, to provide for losses in the value of the assets.

Value The amount for which one can sell something, or the amount one must pay to acquire something.

Value at risk (VaR) A probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy over a specified period of time.

Value-motivated traders Traders that act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range.

Value weighted With respect to index construction, an index in which each security in the index is weighted according to its market capitalization. Also called *market-capitalization weighted*.

Variable life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *unit-linked life insurance*.

Variable prepaid forward A monetization strategy that involves the combination of a collar with a loan against the value of the underlying shares. When the loan comes due, shares are sold to pay off the loan and part of any appreciation is shared with the lender.

Variable universal life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *flexible-premium variable life*.

Vega A measure of the sensitivity of an option's price to changes in the underlying's volatility.

Venture capital The equity financing of new or growing private companies.

Venture capital firms Firms representing dedicated pools of capital for providing equity or equity-linked financing to privately held companies.

Venture capital fund A pooled investment vehicle for venture capital investing.

Venture capital trust An exchange-traded, closed-end vehicle for venture capital investing.

Venture capitalists Specialists who seek to identify companies that have good business opportunities but need financial, managerial, and strategic support.

Vested With respect to pension benefits or assets, said of an unconditional ownership interest.

Vintage year With reference to a private equity fund, the year it closed.

Vintage year effects The effects on returns shared by private equity funds closed in the same year.

Volatility Represented by the Greek letter sigma (σ), the standard deviation of price outcomes associated with an underlying asset.

Volatility clustering The tendency for large (small) swings in prices to be followed by large (small) swings of random direction.

Volume-weighted average price (VWAP) The average price at which a security is traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade.

Volume-weighted average price (VWAP) strategy A logical participation strategy that involves breaking up an order over time according to a prespecified volume profile.

Wealth relative The ending value of one unit of money invested at specified rates of return.

Whole life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *ordinary life insurance*.

Will A document associated with estate planning that outlines the rights others will have over one's property after death. Also called *testament*.

Within-sector selection return In attribution analysis, a measure of the impact of a manager's security selection decisions relative to the holdings of the sector benchmark.

Worst-case scenario analysis A stress test in which we examine the worst case that we actually expect to occur.

Yardeni model An equity valuation model, more complex than the Fed model, that incorporates the expected growth rate in earnings.

Yield beta A measure of the sensitivity of a bond's yield to a general measure of bond yields in the market that is used to refine the hedge ratio.

Yield curve The relationship between yield and time to maturity.

Yield to worst The yield on a callable bond that assumes a bond is called at the earliest opportunity.

Z-spread The yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. Also known as zero-volatility spread.

Zero-cost collar A transaction in which a position in the underlying is protected by buying a put and selling a call with the premium from the sale of the call offsetting the premium from the purchase of the put. It can also be used to protect a floating-rate borrower against interest rate increases with the premium on a long cap offsetting the premium on a short floor.

Zero-premium collar A hedging strategy involving the simultaneous purchase of puts and sale of call options on a stock. The puts are struck below and the calls are struck above the underlying's market price.

CUSTOMER SERVICE

68

Index

A
academic designations, 176
account information, regular statements of, 77
account reviews
  disclosure of, 257–258
  firm policies on, 77
  regular, 94
  systematic, 86
accounts
  audits of, 257–258
  with beneficial ownership, 158
  errors in, 208
  family, 80, 158, 160–161
  in performance calculations, 100
actions
  investment (*see also* Investment Analysis, Recommendations, and Actions [Standard of Professional Conduct V])
    in AMC, 242, 245–248
    fair dealing in, 83–84
    firm policies on, 77
    impact of, 12–13
    unethical, 29
  personal, 55
Additional Compensation Arrangements [Standard IV(B)], 116–117
  application of the standard, 116–117
  compliance procedures, 116
  guidance, 116
  text of, 17, 116
adequate compliance procedures, 119–121
advisers, selecting, 129
agent options, 154
allocations
  minimum lot, 88–89
  trade allocation procedures, 85, 257
  transaction, 87–88
AMC. *see* Asset Manager Code of Professional Conduct
applicable law
  and Code/Standards, 22–23
  on confidentiality, 102
  in firm policy, 77
  global, 23–25
  and investment products, 23–25
  providing information on, 27
approval, for outside compensation, 117
Asset Manager Code of Professional Conduct (AMC), 129, 239–265
  Code of Ethics and Standards of Professional Conduct vs., 10
  compliance of firms with Standard I(A), 27
  Disclosures (Part F), 243–244, 255–258
  introduction, 239–241
  Investment Processes and Actions (Part B), 242, 245–248
  Loyalty to Clients (Part A), 242, 244–245
  Performance and Valuation (Part E), 243, 254–255
  practice problems, 259–263
  principles of conduct, 241
  recommendations and guidance, 244–258
  Risk Management, Compliance, and Support (Part D), 243, 250–254
  solutions to problems, 264–265
  text of, 242–244
  Trading (Part C), 242–243, 248–250
asset weighing, 99
audits, of accounts, 257–258

B
beneficial ownership, 158
best execution (term), 76, 78, 250
Best Practice Guidelines Governing Analyst/Corporate Issuer Relations (CFA Institute), 33
blackout periods, 159
blind trusts, 200
bonus compensation, 116–117
brokerage arrangements, 76, 79
broker recruiting, 107
bundled commissions, 257
business-continuity planning, 252–253
business relationships
  in AMC, 245
  and conflicts of interest, 152, 156
buy-side clients, 31
Bylaws and Rules of Procedure for Proceedings Related to Professional Conduct, 9

C
candidacy in CFA program, referring to, 171–172
Candidate Pledge, 167
candidates, CFA
  knowledge of the law [Standard I(A)], 26
  responsibilities of (*see* Responsibilities of CFA Members and Candidates [Standard of Professional Conduct VII])
capital markets. *see also* Integrity of Capital Markets [Standard of Professional Conduct II]
  and benefit of ethics to society, 12
  sustainability of, 12–13
care. *see also* Loyalty, Prudence, and Care [Standard III(A)]
  and independent professional judgment, 210
  and prudent judgment, 245–246
case studies (violations of ethical standards), 197–237
  consultants, 198–202
  framework for ethical decision-making, 197–198
  Pearl Investment Management, 202–213
  practice problems, 214–230
  solutions to problems, 231–237
CDOs. *see* collateralized debt obligations
Certificate in Investment Performance Measurement (CIPM), 9
CFA charterholders, 171
CFA designation, 171. *see also* Reference to CFA Institute, Designation and Program [Standard VII(B)]
  guidance on using, 171
  right to use, 175
  stating facts about, 176
CFA examinations, 5
  bringing written material into exam room, 167
  confidential information in, 165–166
  expressing opinions about, 166
  grading guidelines and results for, 169
  passing, in consecutive years, 174–175
  sharing content of, 168–169
  sharing questions from, 167
  writing after exam period, 168
CFA Institute. *see also specific committees and programs*
  acknowledgment of AMC compliance by, 241
  compromising integrity of, 169
  ethical commitment of, 14–15
  mission of, 7
  referring to, 171 (*see also* Reference to CFA Institute, Designation and Program [Standard VII(B)])
  values of, 15
  website, 15, 129
CFA logo, 172–173, 175–176
CFA marks, use of, 172–174
CFA members and candidates
  knowledge of the law [Standard I(A)], 26
  responsibilities of (*see* Responsibilities of CFA Members and Candidates [Standard of Professional Conduct VII])
CFA Program. *see also* Reference to CFA Institute, Designation and Program [Standard VII(B)]
  conduct restrictions for candidates and members, 166
  confidential information about, 165–166
  stating facts about, 176
  testing policies for, 167
changes
  fund mandate, 142
  to investment process, 142–144
  organizational, 258
  personnel, 258
Chartered Financial Analyst. *see entries beginning with* CFA
CIPM. *see* Certificate in Investment Performance Measurement

client commission practices, 78–80
client–plan participants, identifying, 78
clients
approval from, 77
buy-side, 31
communication with (*see* Communication with Clients and Prospective Clients [Standard V(B)])
disclosure of conflicts to, 150–151
duties to (*see* Duties to Clients [Standard of Professional Conduct III])
fair dealing with, 90
gifts and entertainment from, 39
identifying, 75, 80–81, 93
informing, of investment process, 138–139
interests of, 78, 244–245
loyalty to, 81 (*see also* Loyalty to Clients [AMC Part A])
maintaining lists of, 85
priority of personal trading vs. trading for, 157
risk profile of, 91
select, additional services for, 88
soliciting former, 109–114
status of, 102
client updates, 131–132
Code of Ethics (CFA Institute), 5–16
adoption of, 10
and applicable law, 22–23
evolution of, 6–7
and importance of ethics, 11–15
notification of, 114
and Professional Conduct Program, 9–10
and Standards of Practice Council, 10–11
in *Standards of Practice Handbook,* 3, 5–7
text of, 15–16
and values of CFA Institute, 15
codes of ethics (in general)
adopting, 120
commitment to, 14
developing, 26–27, 54
collateralized debt obligations (CDOs), 114
commission practices
and AMC, 249–250
client, 78–80
disclosure of, 257
communication(s)
in AMC, 255
in case study, 201
different forms of, 139
to employees of material nonpublic information, 63
interdepartmental, 61
Communication with Clients and Prospective Clients [Standard V(B)]
application of the standard, 141–146
case study, 212
compliance procedures, 140–141
eleventh edition revision, 8
guidance, 138–140
different forms of communication, 139
facts vs. opinions in reports, 140
identifying risks and limitations of analysis, 139–140
informing clients of investment process, 138–139
report presentation, 140
text of, 18, 137–138
company promotion, 69
compensation. *see also* Additional Compensation Arrangements [Standard IV(B)]
bonus, 116–117
and conflict of interest, 153–154
disclosure of, 77
externally compensated assignments, 113
notification of, 116–117
outside, 117
and research independence, 40
competence, 54
competition policies, 109, 112
compliance, claiming (with AMC), 241
compliance officers, 36, 251
compliance procedures
adequate, 119–121
adoption of, 120
for AMC, 250–251
in case studies, 202
inadequate, 124
as responsibility of supervisors, 120–121
composite construction, 52
Conduct as Participants in CFA Institute Programs [Standard VII(A)], 19, 165–169
application of the standard, 167–169
eleventh edition revision, 8
guidance, 165–167
additional CFA restrictions, 166
confidential program information, 165–166
expressing opinions, 166
text of, 19, 165
confidential information
about firms, 115
in AMC, 245
conveying, 205
disclosing, 103–105
possessing, 103
confidentiality. *see also* Preservation of Confidentiality [Standard III(E)]
of CFA program information, 165–166
maintaining, 78
confirmations of transactions, duplicate, 160
conflicts of interest
in AMC, 255–256
avoidance of, 200
and business relationships, 152, 156
and business stock ownership, 152
in case studies, 199–201
and compensation arrangement, 153–154
and directorship, 154–155
disclosure of (*see also* Disclosure of Conflicts [Standard VI(A)])
in AMC, 255–256
firm policies, 77
and personal stock ownership, 153
and personal trading, 155
potential, in ethical decision-making framework, 200
and priority of transactions, 157
and requested favors, 155
Conflicts of Interest [Standard of Professional Conduct VI], 149–164
Disclosure of Conflicts [Standard VI(A)], 149–156
application of the standard, 152–156
compliance procedures, 152
guidance, 149–152
text of, 18, 149
Priority of Transactions [Standard VI(B)], 157–162
application of the standard, 160–162
case study, 204
compliance procedures, 158–160
guidance, 157–158
text of, 18, 157
Referral Fees [Standard VI(C)], 162–164
application of the standard, 162–164
compliance procedures, 162
guidance, 162
text of, 18, 162
constraints, investor, 93
consultants (case study), 198–202
consulting contract, 199
evaluation of, 199–202
copies, maintaining, 47
correction, of unintentional errors, 48
cost arrangements, restricting, 36
credit rating agency opinions, 33–34
cross-departmental conflicts, 151
custodial relationships, 32
custody of client assets, 74

D
deceit, 55
decision making
basis for, 246–247
ethical framework for, 13–14, 197–198
group, 129
decisions, time frame for dissemination and, 84–85
departments, physical separation of, 61
descriptions of securities, 141–142
diligence, 127
Diligence and Reasonable Basis [Standard V(A)], 126–137
application of the standard, 130–137
case study, 210–212
compliance procedures, 130
guidance, 126–129
diligence and reasonable basis defined, 127
group research and decision making, 129
quantitatively oriented research, 128
quantitatively oriented techniques, 129
secondary or third-party research, 127–128
selecting external advisers and subadvisers, 129
text of, 18, 126
directed brokerage, 76
directors, conflicts of interest for, 151–152, 154–155
disciplinary action, disclosure of, 256
Disciplinary Review Committee (DRC), 9
disclosure
of compensation, 77
of confidential information, 103–105

conflicts of interest
in case studies, 200–201
firm policies on, 77
interdepartmental referral arrangements, 163
investment system, 141, 143
issuer-paid research, 48
level of service, 86
material information, 60–61, 64
of performance calculation methodology, 100–101
personal investing policies, 160
personal trading, 161
possible illegal activity, 104
referral arrangements, 162–164
selective, 64, 86, 88
on social media, 89
trade allocation procedures, 86
Disclosure of Conflicts [Standard VI(A)], 149–156
application of the standard, 152–156
compliance procedures, 152
guidance, 149–152
conflicts as a director, 151–152
cross-departmental conflicts, 151
disclosure to clients, 150–151
disclosure to employers, 150
stock ownership conflicts, 151
text of, 18, 149
Disclosures (AMC Part F), 243–244, 255–258
dissemination of information
pre-dissemination behavior, 85
simultaneous, 85
time frame between decision and, 84–85
trading prior to, 161–162
dissociation, 26–28
distribution area laws, 26
diversification
as firm policy, 77
need for, 92
documentation, of trade allocation procedures, 85
documents, former employers', 110
DRC. *see* Disciplinary Review Committee
due diligence
and failed investments, 135
in financial research and analysis, 33
in submanager selection, 132–133
sufficient, 130, 133–134
Duties to Clients [Standard of Professional Conduct III], 73–105
Fair Dealing [Standard III(B)], 82–90
application of the standard, 86–90
case study, 207
compliance procedures, 84–86
guidance, 82–84
text of, 17, 82
Loyalty, Prudence, and Care [Standard III(A)], 73–81
application of the standard, 78–81
case study, 205, 207
compliance procedures, 77–81
guidance, 73–77
text of, 17, 73
Performance Presentation [Standard III(D)], 97–101
application of the standard, 98–101
case study, 213
compliance procedures, 98
guidance, 97–98
text of, 17, 97
Preservation of Confidentiality [Standard III(E)], 101–105
application of the standard, 103–105
compliance procedures, 103
guidance, 101–102
text of, 17, 101
Suitability [Standard III(C)], 90–97
application of the standard, 94–97
compliance procedures, 93–94
guidance, 90–93
text of, 17, 90
text of, 16–17
Duties to Employers [Standard of Professional Conduct IV], 105–126
additional compensation arrangements [Standard IV(B)], 116–117
application of the standard, 116–117
compliance procedures, 116
guidance, 116
text of, 17, 116
Loyalty [Standard IV(A)], 105–115
application of the standard, 109–115
case study, 205
compliance procedures, 109
guidance, 105–109
text of, 17, 105
Responsibilities of Supervisors [Standard IV(C)], 118–126
application of the standard, 122–126
case study, 204
compliance procedures, 120–122
eleventh edition revision, 7–8
guidance, 118–120
text of, 18, 118

E

education, 121, 201
electronic information, confidentiality of, 102
employee classifications, 109
employee references, checking, 54
employees, independent contractors vs., 108–109
employer(s)
competing with current, 112
disclosure of conflicts to, 150, 156
duties to (*see* Duties to Employers [Standard of Professional Conduct IV])
leaving, 106–107, 115
misrepresentation of work for, 46
responsibilities of, 106
employment, nature of, 108–109
entertainment
and gifts from clients, 39
and gifts from related parties, 38–39
equity IPOs, 158–159
errors
in accounts, 208
known, 48
notification of, 144
unintentional, 48
ethical culture, 202
ethical decision-making framework, 13–14, 197–198
ethical principles, applicable, 200
ethics. *see also* Code of Ethics; Standards of Professional Conduct
case studies, 197–237
consultants, 198–202
Pearl Investment Management, 202–213
practice problems, 214–230
solutions to problems, 231–237
firms commitment to, 14
importance, 11–15
and investment industry, 11–15
and regulations, 13
societal benefit of, 12
excessive trading, 80, 89
execution, best, 76, 78, 250
execution-only responsibilities, 81
expert networks, 67
experts, 59–60
external advisers, selecting, 129
externally compensated assignments, 113
external manager, travel expenses from, 39–40

F

facts
opinions in reports vs., 141, 212
providing opinions as, 141
factual presentations, misrepresentation and, 46–47
failed investments, due diligence and, 135
fair dealing
in AMC, 246
with clients, 90
between funds, 86–87
and IPO distribution, 87
and transaction allocation, 87–88
Fair Dealing [Standard III(B)], 82–90
application of the standard, 86–90
case study, 207
compliance procedures, 84–86
developing firm policies, 84–86
disclosure of level of service, 86
disclosure of trade allocation procedures, 86
systematic account reviews, 86
guidance, 82–84
investment action, 83–84
investment recommendations, 82–83
text of, 17, 82
family accounts, 80, 158, 160–161
favors, requested, 155
FCMs. *see* futures commission merchants
fees. *see also* Referral Fees [Standard VI(C)]
and conflicts of interest, 151
management, 256
service, 40
fictitious name, 173, 174, 176
files
current, maintaining, 26
of former employers, 110
financial modeling, 9
financial risk, errors in client accounts and, 208
firewalls, 32, 61

firm policies
in case studies, 204, 205, 208, 210–213
for fair dealing, 84–86
on loyalty, prudence, and care, 77–78
firm results, overemphasis of, 53
firms
commitment to ethics by, 14
compliance with Code of Standards, 10
confidential information about, 115
informing, of referral arrangements, 163
knowledge of the law, 26–27
records as property of, 147
starting new, 112
flash reports, 85
former clients, soliciting, 109–114
former employer
documents and files of, 110
in performance presentation, 99
fraud, 55
front-running, 159
funding, travel, 35
fund manager relationships, 32, 42
fund mandate, change in, 142
funds, fair dealing between, 86–87
futures commission merchants (FCMs), 123

G
gifts
in AMC, 245
from clients, 39
limiting, 36
from related parties, 38–39
Global Investment Performance Standards (GIPS), 129
performance presentation with, 98
performance presentation without, 98
governing laws, regulations and, 203–204
group decision making, 129
group research, 129, 132

H
highest requirement, following, 28
hot issue securities, 84
human resources, in AMC, 252

I
illegal activity, disclosure of, 104
inadequate compliance procedures, 124
inadequate supervision, 124–125
incentive structures, establishing, 122
incident-reporting procedures, 109
independence, in AMC, 245
Independence and Objectivity [Standard I(B)], 30–42
application of the standard, 36–42
compliance procedures, 35–36
guidance, 30–35
buy-side clients, 31
credit rating agency opinions, 33–34
fund manager and custodial relationships, 32
influence in manager selection/procurement process, 34
investment banking relationships, 32–33
issuer-paid research, 34–35
performance measurement and attribution, 33
public companies, 33
travel funding, 35
text of, 16, 30
independence policies, 36
independent analysis, 69
independent contractors, employees vs., 108–109
independent practice, 106
independent professional judgment, 210
indexes, managing to, 93
industry experts, 59–60
information
account, 77
on applicable laws, 27
confidential
about CFA program, 165–166
about firms, 115
conveying, 205
disclosing, 103–105
possessing, 103
considering, before taking action, 77
dissemination
simultaneous, 85
time frame between decision and, 84–85
trading prior to, 161–162
insider, 210–211
material, 57
in AMC, 255
analyst recommendations as, 65–66
selective disclosure of, 64
material nonpublic (*see* material nonpublic information)
misrepresentation of (*see* misrepresentation)
nonpublic, 58, 63–66, 158
acting on, 63
analyst recommendations as, 65–66
controlling, 64
defined, 58
standards for priority of transactions with, 158
out-of-date, 52–53
third-party confirmation of, 251–252
verification of outside, 47
information-based manipulation, 68, 72–73
initial public offerings (IPOs), 87, 158–159
inputs, model, 72
insider information, 210–211
integrity, 55, 169
Integrity of Capital Markets [Standard of Professional Conduct II], 56–73
eleventh edition revision, 7
Market Manipulation [Standard II(B)], 16, 68–73
application of the standard, 69–73
guidance, 68–69
text of, 16, 68
Material Nonpublic Information [Standard II(A)], 16, 56–67
application of the standard, 63–67
case study, 210
compliance procedures, 60–63
guidance, 56–60
text of, 16, 56
text of, 16
interdepartmental communications, 61
interdepartmental referral arrangements, disclosure of, 163
interests, client, 78, 244–245
intrafirm pressure, 37, 42
investment actions. *see also* Investment Analysis, Recommendations, and Actions [Standard of Professional Conduct V]
in AMC, 242, 245–248
fair dealing in, 83–84
firm policies on, 77
impact of, 12–13
unethical, 29
investment analysis
due diligence in, 33
independent, 69
risks and limitations of, 139–140, 145–146
Investment Analysis, Recommendations, and Actions [Standard of Professional Conduct V], 126–148
Communication with Clients and Prospective Clients [Standard V(B)]
application of the standard, 141–146
case study, 212
compliance procedures, 140–141
eleventh edition revision, 8
guidance, 138–140
text of, 18, 137–138
Diligence and Reasonable Basis [Standard V(A)], 126–137
application of the standard, 130–137
case study, 210–212
compliance procedures, 130
guidance, 126–129
text of, 18, 126
Record Retention [Standard V(C)], 146–148
application of the standard, 148
compliance procedures, 147
guidance, 146–147
text of, 18, 146
investment banking relationships, 32–33
investment industry, ethics in, 11–15
investment objectives
establishing, 77
in IPSs, 93, 148
investment personnel. *see* personnel
investment policy statement (IPS)
and AMC, 247–248
in compliance procedures, 93
developing, 91
record retention of objectives/recommendations in, 148
requirements and limitations of, 95–96
reviews of, 96
updating, 92, 95
investment practice, impact of misrepresentation on, 44
investment process
changes to, 142–144
disclosure of, 256
informing clients of, 138–139
Investment Processes and Actions (AMC Part B), 242, 245–248
investment products, applicable laws for, 23–25

investments
failed, 135
restricting, 36
investment strategies, managing to, 247
investment styles, managing to, 247
investment system, disclosure of, 141, 143
investor constraints, 93
IPOs. *see* initial public offerings
IPS. *see* investment policy statement
issuer-paid research, 34–35, 48
issuer relationship pressure, 37–38

K
knowingly (term), 43
knowledge of the law, failure to maintain, 29
Knowledge of the Law [Standard I(A)], 21–29
application of the standard, 27–29
case study, 203–204
compliance procedures, 26–27
CFA members and candidates, 26
dissociation, 26
distribution area laws, 26
firms, 26–27
legal counsel, 26
guidance, 21–25
Code/Standards and applicable law, 22–23
investment products and applicable law, 23–25
violations by others, participation or association with, 23
text of, 16, 21
known errors, noncorrection of, 48

L
law(s). *see also* applicable law
knowledge of, 29 (*see also* Knowledge of the Law [Standard I(A)])
more strict law, 22
regulations and governing, 203–204
religious tenets as basis for, 28–29
leadership, 202
leaving an employer, 106–107, 115
legal counsel, 26
less strict (LS) countries, 24–25
level of service, disclosure of, 86
limits, on private placements, 159
local requirements, for record retention, 147
lot allocations, minimum, 88–89
Loyalty, Prudence, and Care [Standard III(A)], 73–81
application of the standard, 78–81
case study, 205, 207
compliance procedures, 77–81
client approval, 77
firm policies, 77–78
regular account information, 77
guidance, 73–77
client's portfolio, developing, 75–76
identifying the client, 75
proxy voting policies, 76–77
soft commission policies, 76
understanding application of standard, 74–75
text of, 17, 73
understanding application of standard, 74–75
Loyalty [Standard IV(A)], 105–115
application of the standard, 109–115
case study, 205
compliance procedures, 109
competition policy, 109
employee classification, 109
incident-reporting procedures, 109
termination policy, 109
guidance, 105–109
employer responsibilities, 106
independent practice, 106
leaving employers, 106–107
nature of employment, 108–109
social media, 108
whistleblowing, 108
text of, 17, 105
loyalty to clients, 81
Loyalty to Clients (AMC Part A), 242, 244–245
LS countries. *see* less strict countries

M
management fees, disclosure of, 256
manager selection process
diligence in, 136
influencing, 34, 41–42
mandates
following, 95
managing to, 93, 247
notification of change in, 142
market making, 63
Market Manipulation [Standard II(B)], 16, 68–73
application of the standard, 69–73
guidance, 68–69
information-based manipulation, 68
transaction-based manipulation, 69
text of, 16, 68
material information
in AMC, 248–249, 255
defined, 57
selective disclosure of, 64
materiality, determining, 64, 67
material nonpublic information
adopting compliance procedures for, 60
in AMC, 248–249
analyst recommendations as, 65–66
Material Nonpublic Information [Standard II(A)]
application of the standard, 63–67
case study, 210
compliance procedures
achieving public dissemination, 60
adopting, 60
adopting disclosure procedures, 60–61
appropriate interdepartmental communications, 61
communication to employees, 63
firewall elements, 61
issuing press releases, 61
personal trading limitations, 62
physical separation of departments, 61
preventing personnel overlap, 62
proprietary trading procedures, 63
record maintenance, 62
reporting systems, 62
guidance, 56–60
industry experts, 59–60
investment research reports, 60
material information defined, 57
mosaic theory, 58–59
nonpublic information defined, 58
social media, 59
text of, 16, 56
members, CFA. *see* Responsibilities of CFA Members and Candidates [Standard of Professional Conduct VII]
membership status, CFA Institute, 171, 175
minimum lot allocations, 88–89
Misconduct [Standard I(D)], 53–56
application of the standard, 54–56
compliance procedures, 54
guidance, 53–54
text of, 16, 53
misrepresentation
in AMC, 254
avoiding, 52
potential, 49
Misrepresentation [Standard I(C)], 43–53
application of the standard, 48–53
case study, 211–213
compliance procedures, 46–47
factual presentations, 46–47
maintaining webpages, 47
plagiarism policy, 47
qualification summary, 47
verifying outside information, 47
guidance, 43–46
impact on investment practice, 44
omissions, 45
performance reporting, 44–45
plagiarism, 45–46
social media, 45
work completed for employer, 46
text of, 16, 43
Model Request for Proposal, 129
models
manipulating inputs for, 72
in quantitatively oriented research, 128
more strict (MS) countries, 24–25
more strict law, 22
mosaic theory
and AMC, 249
applying, 65, 66
in case studies, 210
and material nonpublic information, 58–59
MS countries. *see* more strict countries

N
names, fictitious, 173, 174, 176
nature of employment, 108–109
networks, expert, 67
new firms, starting, 112
new media, information retention on, 147
noncompete agreements, 107
noncorrection of known errors, 48

nonpublic information
acting on, 63, 66
analyst recommendations as, 65–66
controlling, 64
defined, 58
material (*see* Material Nonpublic Information [Standard II(A)])
standards for priority of transactions with, 158
no securities laws (NS) countries, 24–25
notification
changes to investment process, 142–144
client bonus compensation, 116–117
Code and Standards, 114
fund mandate change, 142
known violations, 27
outside compensation, 117
NS countries. *see* no securities laws countries

O
objectives (investment)
establishing, 77
in IPSs, 93, 148
objectivity, 245. *see also* Independence and Objectivity [Standard I(B)]
omissions, 45
opinions
about CFA Program or Institute, 166
of credit rating agency, 33–34
facts in reports vs., 141, 212
group research, 132
integrity of, 35
providing, as facts, 141
reasonable basis for, 211–212
options, 154
organizational changes, disclosure of, 258
others to whom duty is owed (ethical decision-making framework), 200
out-of-date information, 52–53
outside compensation
notification of, 117
prior approval for, 117
outside information, verifying, 47
outside parties, referral arrangements and, 162–164
ownership
beneficial, 158
of completed prior work, 111
of firm's records, 147, 148

P
partial fills, 85
part-time status, 116
passing exams in consecutive years, 174–175
pay-to-play scandals, 34
PCP. *see* Professional Conduct Program
Pearl Investment Management, 202–213
Code of Ethics and Standards of Professional Conduct violations
of new employees, 202–205
in ordinary business practices, 208–213
with rush projects, 206–208
Performance and Valuation (AMC Part E), 243, 254–255
performance attribution, 33, 100
performance calculations
and asset weighting, 99
and length of time, 98
methodology for, 100–101
on selected accounts, 100
performance measurement
benchmarks for, 93
and independence/objectivity, 33
performance presentation
and misrepresentation, 212–213
and prior fund/employer, 99
and simulated results, 99–100
Performance Presentation [Standard III(D)], 97–101
application of the standard, 98–101
case study, 213
compliance procedures, 98
with GIPS standards, 98
without GIPS standards, 98
guidance, 97–98
text of, 17, 97
performance reporting, 44–45
personal actions, 55
personal trading, 69–70
and conflict of interest, 155
disclosure of, 161
disclosure of policies for, 160
limitations on, 62
priority of transactions for, 157, 204–205
personnel
changes in, 258
preventing overlap of, 62
privy to recommendation, 84
reporting requirements for, 159–160
plagiarism, 49–51
and misrepresentation, 45–46
policies on, 47
pooled funds, managing, 247
portfolio(s)
developing, 75–76
managing to mandates, 247
suitability of investment for, 94–95
portfolio managers, independence of, 32
practice, defined, 106
preclearance procedures, 160
pre-dissemination behavior, guidelines for, 85
Preservation of Confidentiality [Standard III(E)], 17, 101–105
application of the standard, 103–105
compliance procedures, 103
communicating with clients, 103
guidance, 101–102
compliance with laws, 102
electronic information and security, 102
professional conduct investigations by CFA Institute, 102
status of client, 102
text of, 17, 101
press releases, issuing, 61
price
artificial price volatility, 70–72
distortion of, 246
and personal trading practices, 69–70
prior coverage, 38
prior employer
documents and files of, 110
in performance presentation, 99
prior fund, in performance presentation, 99
priority of transactions (AMC), 249
Priority of Transactions [Standard VI(B)], 157–162
application of the standard, 160–162
case study, 204
compliance procedures, 158–160
guidance
accounts with beneficial ownership, 158
avoiding potential conflicts, 157
nonpublic information standards, 158
personal trading secondary to trading for clients, 157
text of, 18, 157
prior work, ownership of, 111
private placements, limits on, 159
procurement process, 34
professional conduct. *see also* Standards of Professional Conduct
Asset Manager Code of Professional Conduct, 239–265
introduction, 239–241
practice problems, 259–263
principles of conduct, 241
recommendations and guidance, 244–258
solutions to problems, 264–265
text of, 242–244
CFA Professional Conduct Program, 9–10
professional conduct investigations, 102
Professional Conduct Program (PCP), 9–10, 23
confidentiality of investigations, 102
misuse of, 54
professional designations, 176
professionalism, 54
Professionalism [Standard of Professional Conduct I], 21–56
Independence and Objectivity [Standard I(B)], 30–42
application of the standard, 36–42
compliance procedures, 35–36
guidance, 30–35
text of, 16, 30
Knowledge of the Law [Standard I(A)], 21–29
application of the standard, 27–29
case study, 203–204
compliance procedures, 26–27
guidance, 21–25
text of, 16, 21
Misconduct [Standard I(D)], 16, 53–56
application of the standard, 54–56
compliance procedures, 54
guidance, 53–54
text of, 16, 53
Misrepresentation [Standard I(C)], 16, 43–53
application of the standard, 48–53
case study, 211–213
compliance procedures, 46–47
guidance, 43–46
text of, 16, 43
text of, 16
promotion, company, 69
proprietary trading procedures, 63
prospective clients. *see* Communication with Clients and Prospective Clients [Standard V(B)]
"Protocol for Broker Recruiting," 107

proxy voting policies, 76–78
prudence. *see* Loyalty, Prudence, and Care [Standard III(A)]
prudent judgment, 245–246
public companies, independence and objectivity of, 33
public dissemination, achieving, 60
pump and dump strategy, 72
pump-priming strategy, 71

Q
qualification summary, 47
quantitatively oriented models, 134–135
quantitatively oriented research, 128
quantitatively oriented techniques, 129
quotations, attributing, 47

R
reasonable basis. *see also* Diligence and Reasonable Basis [Standard V(A)]
  defined, 127
  developing, 131
reasonable care, 245–246
recommendation objectivity, 40–41
recommendations. *see also* Investment Analysis, Recommendations, and Actions [Standard of Professional Conduct V]
  fair dealing in, 82–83
  in investment policy statements, 148
  as material nonpublic information, 65–66
  number of people privy to, 84
  reasonable basis for, 127
record keeping
  in AMC, 252
  supervision of, 123
record retention
  and IPS objectives and recommendations, 148
  and research process, 148
Record Retention [Standard V(C)], 146–148
  application of the standard, 148
  compliance procedures, 147
  guidance, 146–147
    local requirements, 147
    new media records, 147
    records as property of firm, 147
  text of, 18, 146
records
  maintenance of, 62
  as property of firm, 147, 148
references, employee, 54
Reference to CFA Institute, Designation and Program [Standard VII(B)], 19, 170–176
  application of the standard, 174–176
  compliance procedures, 174
  guidance, 170–174
    CFA designation, 171
    CFA Institute membership, 171
    referring to candidacy in CFA program, 171–172
    use of CFA marks, 172–174
  text of, 19
referral arrangements
  disclosure of, 162–164
  informing firms of, 163
  interdepartmental, 163
Referral fees [Standard VI(C)], 162–164
  application of the standard, 162–164
  compliance procedures, 162
  guidance, 162
  text of, 18, 162
regulations
  and ethics, 13
  and governing laws, 203–204
related parties, gifts and entertainment from, 38–39
relationships
  in AMC, 245
  and conflicts of interest, 152, 156
  custodial, 32
  fund manager, 32, 42
  independent contractor, 108–109
  investment banking, 32–33
religious tenets, laws and regulations based on, 28–29
reporting
  of material nonpublic information, 62
  performance, 44–45
  of potential unethical actions, 29
  requirements for investment personnel, 159–160
reports
  facts vs. opinions in, 141
  material nonpublic information in, 60
  presentation of, 140
requested favors, 155
request for proposal (RFP), 112
research
  diligence, 129
  facts vs. opinions in reports, 212
  group, 129, 132
  issuer-paid, 34–35, 48
  of others, using, 211
  and plagiarism, 45–46
  quantitatively oriented, 128
  reasonable basis for, 131, 211–212
  and record retention, 148
  secondary, 127–128
  supervision of, 122–123, 125–126
  third-party, 127–128, 132
research independence, 37–38, 40
research reports, material nonpublic information in, 60
Responsibilities of CFA Members and Candidates [Standard of Professional Conduct VII]
  case study, 206
  Conduct as Participants in CFA Institute Programs [Standard VII(A)], 19, 165–169
    application of the standard, 167–169
    eleventh edition revision, 8
    guidance, 165–167
    text of, 19, 165
  Reference to CFA Institute, Designation and Program [Standard VII(B)], 19, 170–176
    application of the standard, 174–176
    compliance procedures, 174
    guidance, 170–174
    text of, 19, 170
Responsibilities of Supervisors [Standard IV(C)], 118–126
  application of the standard, 122–126
  case study, 204
  compliance procedures, 120–122
    adequate, 120–121
    code of ethics or compliance procedures, 120
    establishing incentive structures, 122
    implementation of compliance education and training, 121
  eleventh edition revision, 7–8
  guidance, 118–120
    detection in supervision, 119–120
    system for supervision, 119
  text of, 18, 118
responsibility(-ies)
  accepting, 124
  of employers, 106
restricted lists, creating, 36
restricted periods, 159
results
  overemphasis of, 53
  simulated, 99–100
retired CFA Institute membership status, 175
reviews. *see also* account reviews
  of compliance procedures, 26
  for independence/objectivity, 36
RFP. *see* request for proposal
risk(s)
  financial, 208
  of investment analysis, 139–140, 145–146
risk-arbitrage trading, 63
risk management, 253–254
Risk Management, Compliance, and Support (AMC Part D), 243, 250–254
risk management process, disclosure of, 258
risk profile
  investment suitability for, 94, 96
  understanding, 91
Rules of Procedure. *see* Bylaws and Rules of Procedure for Proceedings Related to Professional Conduct
rumors, addressing, 110–111

S
sales pressure, 38
sanctions, 9–10, 15
scenario testing, 131
secondary research, 127–128
securities, description of, 141–142
security (of electronic information), 102
selective disclosure, 64, 86, 88
self-dealing, 107
service(s)
  additional, for select clients, 88
  level of, 86
  misrepresentation of, 212–213
service fees, 40
service providers, selecting, 135–136
shareholder voting policies, 257
sidecar arrangements, 246
side-letter arrangements, 246
simulated results, 99–100
simultaneous dissemination, 85
social media, 9
  limited disclosures on, 89
  and loyalty to employers, 108
  material nonpublic information on, 59
  misrepresentation on, 45

society, benefit of ethics to, 12
soft commissions, 250
  disclosure of, 257
  policies for, 76
soft dollars, 76, 250
Soft Dollar Standards, 250
solicitation, of former clients, 109–114
Standards of Practice Council (SPC), 10–11, 15
Standards of Practice Handbook, 3, 5–9, 11, 14
  eleventh edition, 7–9
  revisions to, 6–7
Standards of Professional Conduct, 5–19, 21–194. *see also* Asset Manager Code of Professional Conduct (AMC)
  adoption of, 10
  and applicable law, 22–23
  conflicts of interest [Standard VI], 149–164
    disclosure of conflicts [Standard VI(A)], 18, 149–156
    priority of transactions [Standard VI(B)], 18, 157–162, 204
    referral fees [Standard VI(C)], 18, 162–164
    text of, 18
  duties to clients [Standard III], 73–105
    fair dealing [Standard III(B)], 17, 82–90, 207
    loyalty, prudence, and care [Standard III(A)], 17, 73–81, 205, 207
    performance presentation [Standard III(D)], 17, 97–101, 213
    preservation of confidentiality [Standard III(E)], 17, 101–105
    suitability [Standard III(C)], 17, 90–97
    text of, 16–17
  duties to employers [Standard IV], 105–126
    additional compensation arrangements [Standard IV(B)], 17, 116–117
    loyalty [Standard IV(A)], 17, 105–115, 205
    responsibilities of supervisors [Standard IV(C)], 7–8, 18, 118–126, 204
    text of, 17–18
  evolution of, 6–7
  and importance of ethics, 11–15
  integrity of capital markets [Standard II], 56–73
    market manipulation [Standard II(B)], 16, 68–73
    material nonpublic information [Standard II(A)], 16, 56–67, 210
    text of, 16
  investment analysis, recommendations, and actions [Standard V], 126–148
    communication with clients and prospective clients [Standard V(B)], 8, 18, 137–146, 212
    diligence and reasonable basis [Standard V(A)], 18, 126–137, 210–212
    record retention [Standard V(C)], 18, 146–148
    text of, 18
  notification of, 114
  practice problems, 177–186
  and Professional Conduct Program, 9–10
  professionalism [Standard I], 21–56
    independence and objectivity [Standard I(B)], 16, 30–42
    knowledge of the law [Standard I(A)], 16, 21–29, 203–204
    misconduct [Standard I(D)], 16, 53–56
    misrepresentation [Standard I(C)], 16, 43–53, 211–213
    text of, 16
  responsibilities of CFA members and candidates [Standard VII], 165–176
    case study, 206
    conduct as participants in CFA Institute programs [Standard VII(A)], 8, 19, 165–169
    reference to CFA Institute, designation and Program [Standard VII(B)], 19, 170–176
    text of, 18–19
  solutions to problems, 187–194
  and Standards of Practice Council, 10–11
  in *Standards of Practice Handbook,* 3, 5–9
  text of, 16–19
  and values of CFA Institute, 15
statements of account information, 77
status, client, 102
stock ownership, 151, 152
subadvisers, selecting, 129, 136
submanagers
  and IPS reviews, 96
  selection of, 132–133
suitability, 97
  in AMC, 248
  for entire portfolio, 94–95
  for investor risk profile, 94, 96
Suitability [Standard III(C)], 90–97
  application of the standard, 94–97
  compliance procedures, 93–94
    investment policy statements, 93
    regular updates, 94
    suitability test policies, 94
  guidance, 90–93
    developing investment policies, 91
    managing to indexes or mandates, 93
    need for diversification, 92
    understanding client's risk profile, 91
    unsolicited trading requests, 92–93
    updating investment policies, 92
  text of, 17, 90
suitability test policies, 94
summaries, attributing, 47
supervision
  detection as part of, 119–120
  inadequate, 124–125
  of research activities, 122–123, 125–126
  system for, 119
  of trading activities, 123
supervisors. *see* Responsibilities of Supervisors [Standard IV(C)]
sustainability of capital markets, 12–13
systematic account reviews, 86

T
tag-along arrangements, 246
technical model requirements, 136–137
termination policies, 109
third-party confirmation of information, 251–252
third-party custodians, 32
third-party research, 127–128, 132
time frame
  of decision and dissemination, 84–85
  and performance calculation, 98
trade allocation procedures
  developing and documenting, 85
  disclosure of, 86, 257
  fair and equitable, 250
trading
  excessive, 80, 89
  for family member accounts, 160
  priority of transactions for, 157
  prior to dissemination, 161–162
  proprietary trading procedures, 63
  supervising trading activities, 123
Trading (AMC Part C), 242–243, 248–250
trading requests, unsolicited, 92–93
training, compliance, 121
transaction allocation, 87–88
transaction-based manipulation, 69
transactions, priority of. *see* priority of transactions
travel expenses, 36–37, 39–40
travel funding, 35

U
unethical actions, reporting, 29
unintentional errors, correction of, 48
unsolicited trading requests, 92–93
updates, 94, 131–132

V
valuation
  disclosure of methods, 257
  Performance and Valuation (AMC Part E), 243, 254–255
values, CFA Institute, 15
Vernley, Mark (case study), 198–202
violations of ethical standards
  case studies, 197–237
    consultants, 198–202
    Pearl Investment Management, 202–213
    practice problems, 214–230
    solutions to problems, 231–237
  dissociating from, 27–28
  and legal violations, 204
  lists of, 54
  notification of known, 27
  by others, participation or association with, 23
  sanctions, 15
  supervisor's response to, 121
volume, trading, 70, 246
volunteers, compromising of CFA Institute integrity, 169
voting
  proxy voting policies, 76–78
  shareholder voting policies, 257

W
webpages, maintaining, 47
whistleblowing, 108, 113
writing, after exam period, 168
written material, brought into exam room, 167

CFA Institute®
CFA Program

BEHAVIORAL FINANCE, INDIVIDUAL INVESTORS, AND INSTITUTIONAL INVESTORS

CFA® Program Curriculum
2018 • LEVEL III • VOLUME 2

WILEY

CONTENTS

How to Use the CFA Program Curriculum vii
Curriculum Development Process vii
Organization of the Curriculum viii
Features of the Curriculum viii
Designing Your Personal Study Program x
Feedback xi

Portfolio Management

Study Session 3 **Behavioral Finance** 3

Reading 5 **The Behavioral Finance Perspective** 5
Introduction 5
Behavioral versus Traditional Perspectives 7
Traditional Finance Perspectives on Individual Behavior 8
Behavioral Finance Perspectives on Individual Behavior 14
Neuro-economics 19
Decision Making 20
Decision Theory 20
Bounded Rationality 22
Prospect Theory 24
Perspectives on Market Behavior and Portfolio Construction 28
Traditional Perspectives on Market Behavior 28
Traditional Perspectives on Portfolio Construction 36
Alternative Models of Market Behavior and Portfolio Construction 36
Summary 42
Practice Problems 45
Solutions 47

Reading 6 **The Behavioral Biases of Individuals** 49
Introduction 49
Categorizations of Behavioral Biases 50
Differences between Cognitive Errors and Emotional Biases 51
Cognitive Errors 52
Belief Perseverance Biases 52
Information-Processing Biases 63
Cognitive Errors: Conclusion 69
Emotional Biases 70
Loss-Aversion Bias 70
Overconfidence Bias 73
Self-Control Bias 76
Status Quo Bias 77
Endowment Bias 78
Regret-Aversion Bias 79
Emotional Biases: Conclusion 80

◘ indicates an optional segment

	Investment Policy and Asset Allocation	**81**
	Behaviorally Modified Asset Allocation	**82**
	Case Studies	**86**
	Summary	**96**
	Practice Problems	**99**
	Solutions	**102**
Reading 7	**Behavioral Finance and Investment Processes**	**107**
	Introduction	**107**
	The Uses and Limitations of Classifying Investors into Types	**108**
	General Discussion of Investor Types	**108**
	Limitations of Classifying Investors into Various Types	**116**
	How Behavioral Factors Affect Adviser–Client Relations	**117**
	Formulating Financial Goals	**118**
	Maintaining a Consistent Approach	**118**
	Investing as the Client Expects	**118**
	Ensuring Mutual Benefits	**119**
	Limitations of Traditional Risk Tolerance Questionnaires	**119**
	How Behavioral Factors Affect Portfolio Construction	**120**
	Inertia and Default	**120**
	Naïve Diversification	**122**
	Company Stock: Investing in the Familiar	**122**
	Excessive Trading	**123**
	Home Bias	**124**
	Behavioral Portfolio Theory	**124**
	Behavioral Finance and Analyst Forecasts	**125**
	Overconfidence in Forecasting Skills	**126**
	Influence of Company's Management on Analysis	**131**
	Analyst Biases in Conducting Research	**133**
	How Behavioral Factors Affect Committee Decision Making	**136**
	Investment Committee Dynamics	**137**
	Techniques for Structuring and Operating Committees to Address Behavioral Factors	**137**
	How Behavioral Finance Influences Market Behavior	**138**
	Defining Market Anomalies	**138**
	Momentum	**140**
	Bubbles and Crashes	**141**
	Value and Growth	**144**
	Summary	**145**
	Practice Problems	**148**
	Solutions	**153**
Study Session 4	**Private Wealth Management (1)**	**155**
Reading 8	**Managing Individual Investor Portfolios**	**157**
	Introduction	**158**
	Case Study	**158**
	The Inger Family	**159**

	Investor Characteristics	162
	Situational Profiling	162
	Psychological Profiling	165
	Investment Policy Statement	171
	Setting Return and Risk Objectives	172
	Constraints	176
	An Introduction to Asset Allocation	188
	Asset Allocation Concepts	188
	Monte Carlo Simulation in Personal Retirement Planning	196
	Summary	200
	Practice Problems	202
	Solutions	212
Reading 9	**Taxes and Private Wealth Management in a Global Context**	225
	Introduction	225
	Overview of Global Income Tax Structures	226
	International Comparisons of Income Taxation	227
	Common Elements	227
	General Income Tax Regimes	229
	Other Considerations	232
	After-Tax Accumulations and Returns for Taxable Accounts	232
	Simple Tax Environments	232
	Blended Taxing Environments	239
	Accrual Equivalent Returns and Tax Rates	243
	Types of Investment Accounts	245
	Tax-Deferred Accounts	246
	Tax-Exempt Accounts	246
	After-Tax Asset Allocation	247
	Choosing Among Account Types	248
	Taxes and Investment Risk	250
	Implications for Wealth Management	251
	Asset Location	251
	Trading Behavior	254
	Tax Loss Harvesting	255
	Holding Period Management	258
	After-Tax Mean–Variance Optimization	260
	Summary	260
	Practice Problems	262
	Solutions	267
Reading 10	**Estate Planning in a Global Context**	271
	Introduction	272
	Domestic Estate Planning: Some Basic Concepts	273
	Estates, Wills, and Probate	273
	Legal Systems, Forced Heirship, and Marital Property Regimes	274
	Income, Wealth, and Wealth Transfer Taxes	276
	Core Capital and Excess Capital	278
	Estimating Core Capital with Mortality Tables	280
	Estimating Core Capital with Monte Carlo Analysis	285

	Transferring Excess Capital	**288**
	Lifetime Gifts and Testamentary Bequests	**288**
	Generation Skipping	**296**
	Spousal Exemptions	**297**
	Valuation Discounts	**297**
	Deemed Dispositions	**298**
	Charitable Gratuitous Transfers	**298**
	Estate Planning Tools	**299**
	Trusts	**299**
	Foundations	**302**
	Life Insurance	**302**
	Companies and Controlled Foreign Corporations	**303**
	Cross-Border Estate Planning	**303**
	The Hague Conference	**304**
	Tax System	**305**
	Double Taxation	**307**
	Transparency and Offshore Banking	**310**
	Summary	**311**
	Practice Problems	**313**
	Solutions	**315**
Study Session 5	**Private Wealth Management (2)**	**319**
Reading 11	**Concentrated Single-Asset Positions**	**321**
	Introduction	**322**
	Concentrated Single-Asset Positions: Overview	**323**
	Investment Risks of Concentrated Positions	**324**
	General Principles of Managing Concentrated Single-Asset Positions	**327**
	Objectives in Dealing with Concentrated Positions	**327**
	Considerations Affecting All Concentrated Positions	**328**
	Institutional and Capital Market Constraints	**329**
	Psychological Considerations	**331**
	Goal-Based Planning in the Concentrated-Position Decision-Making Process	**334**
	Asset Location and Wealth Transfers	**337**
	Concentrated Wealth Decision Making: A Five-Step Process	**340**
	Managing the Risk of Concentrated Single-Stock Positions	**340**
	Introduction to Key Tax Considerations	**341**
	Introduction to Key Non-Tax Considerations	**342**
	Strategies	**343**
	Managing the Risk of Private Business Equity	**356**
	Profile of a Typical Business Owned by a Private Client	**357**
	Profile of a Typical Business Owner	**358**
	Monetization Strategies for Business Owners	**358**
	Considerations in Evaluating Different Strategies	**362**
	Managing the Risk of Investment Real Estate	**366**
	Monetization Strategies for Real Estate Owners	**367**

	Summary	**370**
	Practice Problems	**372**
	Solutions	**376**
Reading 12	**Risk Management for Individuals**	**381**
	Introduction	**382**
	Human Capital and Financial Capital	**382**
	Human Capital	**383**
	Financial Capital	**386**
	Net Wealth	**390**
	A Framework for Individual Risk Management	**391**
	The Risk Management Strategy for Individuals	**391**
	Financial Stages of Life	**392**
	The Individual Balance Sheet	**394**
	Individual Risk Exposures	**400**
	Insurance and Annuities	**405**
	Life Insurance	**405**
	Disability Income Insurance	**417**
	Property Insurance	**418**
	Health/Medical Insurance	**420**
	Liability Insurance	**421**
	Other Types of Insurance	**422**
	Annuities	**422**
	Implementation of Risk Management for Individuals	**431**
	Determining the Optimal Risk Management Strategy	**431**
	Analyzing an Insurance Program	**433**
	The Effect of Human Capital on Asset Allocation Policy	**440**
	Asset Allocation and Risk Reduction	**443**
	Summary	**446**
	Practice Problems	**449**
	Solutions	**455**
Study Session 6	**Portfolio Management for Institutional Investors**	**459**
Reading 13	**Managing Institutional Investor Portfolios**	**461**
	Introduction	**462**
	Pension Funds	**463**
	Defined-Benefit Plans: Background and Investment Setting	**464**
	Defined-Contribution Plans: Background and Investment Setting	**477**
	Hybrid and Other Plans	**483**
	Foundations and Endowments	**484**
	Foundations: Background and Investment Setting	**484**
	Endowments: Background and Investment Setting	**489**
	The Insurance Industry	**499**
	Life Insurance Companies: Background and Investment Setting	**499**
	Non-Life Insurance Companies: Background and Investment Setting	**511**
	Banks and Other Institutional Investors	**519**
	Banks: Background and Investment Setting	**519**
	Other Institutional Investors: Investment Intermediaries	**526**

Summary **527**
Practice Problems **530**
Solutions **537**

Glossary **G-1**
Index **I-1**

How to Use the CFA Program Curriculum

Congratulations on reaching Level III of the Chartered Financial Analyst® (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities it develops. Your commitment to the CFA Program should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. The CFA Program represents the first step toward a career-long commitment to professional education.

The CFA examination measures your mastery of the core skills required to succeed as an investment professional. These core skills are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major topic areas covered in the CFA Program (www.cfainstitute.org/cbok);
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/level_III);
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- The CFA Program curriculum, which contains the readings and end-of-reading questions, that candidates receive upon exam registration.

Therefore, the key to your success on the CFA examinations is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, and tips for developing an effective study program.

CURRICULUM DEVELOPMENT PROCESS

The CFA Program is grounded in the practice of the investment profession. Beginning with the Global Body of Investment Knowledge (GBIK), CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the knowledge, skills, and abilities (competencies) that are relevant to the profession. Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback from the GBIK collaborative website. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

© 2017 CFA Institute. All rights reserved.

The Education Advisory Committee, consisting of practicing charterholders, in conjunction with CFA Institute staff, designs the CFA Program curriculum in order to deliver the CBOK to candidates. The examinations, also written by charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit www.cfainstitute.org.

ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into 10 topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected.

Each topic area is then divided into one or more study sessions. These study sessions—18 sessions in the Level III curriculum—should form the basic structure of your reading and preparation.

Each study session includes a statement of its structure and objective and is further divided into specific reading assignments. An outline illustrating the organization of these 18 study sessions can be found at the front of each volume of the curriculum.

The readings and end-of-reading questions are the basis for all examination questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK. These readings are drawn from content commissioned by CFA Institute, textbook chapters, professional journal articles, research analyst reports, and cases. All readings include problems and solutions to help you understand and master the topic areas.

Reading-specific Learning Outcome Statements (LOS) are listed at the beginning of each reading. These LOS indicate what you should be able to accomplish after studying the reading. The LOS, the reading, and the end-of-reading questions are dependent on each other, with the reading and questions providing context for understanding the scope of the LOS.

You should use the LOS to guide and focus your study because each examination question is based on the assigned readings and one or more LOS. The readings provide context for the LOS and enable you to apply a principle or concept in a variety of scenarios. The candidate is responsible for the entirety of the required material in a study session, which includes the assigned readings as well as the end-of-reading questions and problems.

We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfaprogram/courseofstudy/Pages/study_sessions.aspx), including the descriptions of LOS "command words" (www.cfainstitute.org/programs/Documents/cfa_and_cipm_los_command_words.pdf).

FEATURES OF THE CURRICULUM

OPTIONAL SEGMENT

Required vs. Optional Segments You should read all of an assigned reading. In some cases, though, we have reprinted an entire chapter or article and marked certain parts of the reading as "optional." The CFA examination is based only on the required segments, and the optional segments are included only when it is determined that they might help you to better understand the required segments (by seeing the required material in its full context). When an optional segment begins, you will see an icon and a dashed

vertical bar in the outside margin that will continue until the optional segment ends, accompanied by another icon. *Unless the material is specifically marked as optional, you should assume it is required.* You should rely on the required segments and the reading-specific LOS in preparing for the examination.

END OPTIONAL SEGMENT

End-of-Reading Problems/Solutions *All problems in the readings as well as their solutions (which are provided directly following the problems) are part of the curriculum and are required material for the exam.* When appropriate, we have included problems within and after the readings to demonstrate practical application and reinforce your understanding of the concepts presented. The problems are designed to help you learn these concepts and may serve as a basis for exam questions. Many of these questions are adapted from past CFA examinations.

Glossary and Index For your convenience, we have printed a comprehensive glossary in each volume. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the glossary. The curriculum eBook is searchable, but we also publish an index that can be found on the CFA Institute website with the Level III study sessions.

LOS Self-Check We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

Source Material The authorship, publisher, and copyright owners are given for each reading for your reference. We recommend that you use the CFA Institute curriculum rather than the original source materials because the curriculum may include only selected pages from outside readings, updated sections within the readings, and problems and solutions tailored to the CFA Program. Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*®, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and 11 Nobel laureates have contributed a total of 45 articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this practice-oriented publication. Candidates have full online access to the *Financial Analysts Journal* and associated resources. All you need is to log in on www.cfapubs.org using your candidate credentials.

DESIGNING YOUR PERSONAL STUDY PROGRAM

Create a Schedule An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all reading assignments and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skill, or ability described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

As you prepare for your exam, we will e-mail you important exam updates, testing policies, and study tips. Be sure to read these carefully. Curriculum errata are periodically updated and posted on the study session page at www.cfainstitute.org.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience. For each level of the curriculum, there are 18 study sessions. So, a good plan is to devote 15–20 hours per week for 18 weeks to studying the material. Use the final four to six weeks before the exam to review what you have learned and practice with topic tests and mock exams. This recommendation, however, may underestimate the hours needed for appropriate examination preparation depending on your individual circumstances, relevant experience, and academic background. You will undoubtedly adjust your study time to conform to your own strengths and weaknesses and to your educational and professional background.

You will probably spend more time on some study sessions than on others, but on average you should plan on devoting 15–20 hours per study session. You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

An interactive study planner is available in the candidate resources area of our website to help you plan your study time. The interactive study planner recommends completion dates for each topic of the curriculum. Dates are determined based on study time available, exam topic weights, and curriculum weights. As you progress through the curriculum, the interactive study planner dynamically adjusts your study plan when you are running off schedule to help you stay on track for completion prior to the examination.

CFA Institute Topic Tests The CFA Institute topic tests are intended to assess your mastery of individual topic areas as you progress through your studies. After each test, you will receive immediate feedback noting the correct responses and indicating the relevant assigned reading so you can identify areas of weakness for further study. For more information on the topic tests, please visit www.cfainstitute.org.

CFA Institute Mock Exams The three-hour mock exams simulate the morning and afternoon sessions of the actual CFA examination, and are intended to be taken after you complete your study of the full curriculum so you can test your understanding of the curriculum and your readiness for the exam. You will receive feedback at the end of the mock exam, noting the correct responses and indicating the relevant assigned readings so you can assess areas of weakness for further study during your review period. We recommend that you take mock exams during the final stages of your preparation for the actual CFA examination. For more information on the mock examinations, please visit www.cfainstitute.org.

Preparatory Providers After you enroll in the CFA Program, you may receive numerous solicitations for preparatory courses and review materials. When considering a prep course, make sure the provider is in compliance with the CFA Institute Approved

Prep Provider Program (www.cfainstitute.org/utility/examprep/Pages/index.aspx). Just remember, there are no shortcuts to success on the CFA examinations; reading and studying the CFA curriculum is the key to success on the examination. The CFA examinations reference only the CFA Institute assigned curriculum—no preparatory course or review course materials are consulted or referenced.

SUMMARY

Every question on the CFA examination is based on the content contained in the required readings and on one or more LOS. Frequently, an examination question is based on a specific example highlighted within a reading or on a specific end-of-reading question and/or problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the examination except for occasional sections marked as optional. You may read optional pages as background, but you will not be tested on them.
2. All questions, problems, and their solutions—found at the end of readings—are part of the curriculum and are required study material for the examination.
3. You should make appropriate use of the topic tests and mock examinations and other resources available at www.cfainstitute.org.
4. Use the interactive study planner to create a schedule and commit sufficient study time to cover the 18 study sessions, review the materials, and take topic tests and mock examinations.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and member feedback as we work to incorporate content, design, and packaging improvements. You can be assured that we will continue to listen to your suggestions. Please send any comments or feedback to info@cfainstitute.org. Ongoing improvements in the curriculum will help you prepare for success on the upcoming examinations and for a lifetime of learning as a serious investment professional.

CUSTOMER SERVICE

68

Portfolio Management

STUDY SESSIONS

Study Session 3	Behavioral Finance
Study Session 4	Private Wealth Management (1)
Study Session 5	Private Wealth Management (2)
Study Session 6	Portfolio Management for Institutional Investors
Study Session 7	Applications of Economic Analysis to Portfolio Management
Study Session 8	Asset Allocation and Related Decisions in Portfolio Management (1)
Study Session 9	Asset Allocation and Related Decisions in Portfolio Management (2)
Study Session 10	Fixed-Income Portfolio Management (1)
Study Session 11	Fixed-Income Portfolio Management (2)
Study Session 12	Equity Portfolio Management
Study Session 13	Alternative Investments for Portfolio Management
Study Session 14	Risk Management
Study Session 15	Risk Management Applications of Derivatives
Study Session 16	Trading, Monitoring, and Rebalancing
Study Session 17	Performance Evaluation
Study Session 18	Global Investment Performance Standards

This volume includes Study Sessions 3–6.

© 2017 CFA Institute. All rights reserved.

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; evaluate portfolio performance; and analyze a presentation of investment returns for consistency with Global Investment Performance Standards (GIPS®).

PORTFOLIO MANAGEMENT
STUDY SESSION

3

Behavioral Finance

Behavioral finance is introduced in the first study session on portfolio management because all market participants, regardless of expertise or experience, may be subject to behavioral biases. Behavioral finance provides insight into how emotional biases and cognitive errors may influence individuals' perceptions and investment decisions. As a consequence, knowledge of behavioral biases may help in understanding client goals, in constructing investment portfolios, and in identifying inconsistencies in investment decision making. Behavioral finance also provides insights into issues such as market anomalies. The readings propose that integration of behavioral and traditional finance may lead to a better outcome than either approach used in isolation.

READING ASSIGNMENTS

Reading 5	The Behavioral Finance Perspective by Michael M. Pompian, CFA
Reading 6	The Behavioral Biases of Individuals by Michael M. Pompian, CFA
Reading 7	Behavioral Finance and Investment Processes by Michael M. Pompian, CFA, Colin McLean, FSIP, and Alistair Byrne, PhD, CFA

Note: The readings in this study session use widely recognized terminology. Nevertheless, readers should be aware that writers on behavioral finance vary in their choice of terminology.

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

5

The Behavioral Finance Perspective

by Michael M. Pompian, CFA

Michael M. Pompian, CFA (USA)

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** contrast traditional and behavioral finance perspectives on investor decision making;
☐	**b.** contrast expected utility and prospect theories of investment decision making;
☐	**c.** discuss the effect that cognitive limitations and bounded rationality may have on investment decision making;
☐	**d.** compare traditional and behavioral finance perspectives on portfolio construction and the behavior of capital markets.

INTRODUCTION

1

Behavioral finance attempts to understand and explain observed investor and market behaviors. This differs from traditional (standard) finance, which is based on hypotheses about how investors and markets should behave. In other words, behavioral finance differs from traditional finance in that it focuses on how investors and markets behave in practice rather than in theory. By focusing on actual behavior, behavioral researchers have observed that individuals make investment decisions in ways and with outcomes that differ from the approaches and outcomes of traditional finance. As Meir Statman so succinctly puts it, "Standard finance people are modeled as "rational," whereas behavioral finance people are modeled as "normal."[1] Normal people behave in a manner and with outcomes that may appear irrational or suboptimal from a traditional finance perspective. As a result of identified divergence between observed and theoretically optimal decision making, the global investment community has begun to realize that it cannot rely entirely on scientific, mathematical, or economic models to explain individual investor and market behavior.

1 Statman (1999).

© 2011 CFA Institute. All rights reserved.

As behavioral finance gains acceptance, efforts to understand what drives individual investor and market behavior will increase. Complete understanding will never be possible, however, because human behavior cannot be predicted with scientific precision or fully explained by a simple "unifying theory." In fact, trying to predict economic behavior, and by extension market behavior, has been likened to trying to predict the weather.

> Like weather forecasters, economic forecasters must deal with a system that is extraordinarily complex, that is subject to random shocks, and about which our data and understanding will always be imperfect. In some ways, predicting the economy is even more difficult than forecasting the weather, because the economy is not made up of molecules whose behavior is subject to the laws of physics, but rather of human beings who are themselves thinking about the future and whose behavior may be influenced by the forecasts that they or others make. To be sure, historical relationships and regularities can help economists, as well as weather forecasters, gain some insight into the future, but these must be used with considerable caution and healthy skepticism.
>
> US Federal Reserve Chairman Ben Bernanke[2]

At its core, behavioral finance is about understanding how people make decisions, both individually and collectively. By understanding how investors and markets behave, it may be possible to modify or adapt to their behaviors in order to improve economic outcomes. In many instances, this may entail identifying a behavior and then modifying the behavior so it more closely matches that assumed under the traditional finance models. In other instances, it may be necessary to adapt to an identified behavior and to make decisions that adjust for the behavior. The integration of behavioral and traditional finance has the potential to produce a superior economic outcome; the resulting financial decision may produce an economic outcome closer to the optimal outcome of traditional finance, while being easier for an investor to adhere to in practice.

To provide a framework for understanding the implications of the decision-making process for financial market practitioners, throughout this reading we will use an approach developed by decision theorist, Howard Raiffa. Raiffa (1997) discusses three approaches to the analysis of decisions that provide a more accurate view of a "real" person's thought process. He uses the terms normative analysis, descriptive analysis, and prescriptive analysis. Normative analysis is concerned with the rational solution to the problem at hand. It defines an ideal that actual decisions should strive to approximate. Descriptive analysis is concerned with the manner in which real people actually make decisions. Prescriptive analysis is concerned with practical advice and tools that might help people achieve results more closely approximating those of normative analysis. We can think of the traditional finance assumptions about behavior as normative, behavioral finance explanations of behaviors as descriptive, and efforts to use behavioral finance in practice as prescriptive.

In order to use behavioral finance in practice, it is important to understand how behavioral finance differs from traditional finance and some of the theoretical perspectives that are relevant to the understanding of the differences. Section 2 compares and contrasts behavioral and traditional perspectives of investor behaviors. Section 3 discusses theories that relax the assumptions about investor behavior that are inherent

2 Bernanke (2009).

in traditional finance. Section 4 compares and contrasts traditional and behavioral finance perspectives of market behaviors and portfolio construction. A summary and practice problems conclude the reading.

2 BEHAVIORAL VERSUS TRADITIONAL PERSPECTIVES

Traditional finance is grounded in neoclassical economics. Within traditional finance, individuals are assumed to be risk-averse, self-interested utility maximizers. Investors who behave in a manner consistent with these assumptions are referred to as rational. Traditional finance further hypothesizes that, at the market level, prices incorporate and reflect all available and relevant information. Markets that behave in a manner consistent with this hypothesis are described as efficient.

Behavioral finance is largely grounded in psychology. The term behavioral finance—generally defined as the application of psychology to finance—appears regularly in books, magazine articles, and investment papers; however, a common understanding of what is meant by behavioral finance is lacking. This may be because of a proliferation of topics resembling behavioral finance that examine investor behavior: These include behavioral economics, investor psychology, behavioral science, experimental economics, and cognitive psychology. Such emerging subjects as neuro-economics and adaptive finance (also known as evolutionary finance) are making their way into the conversation and provide another perspective on investor behavior. The variety of approaches taken to examine investor behavior adds to the confusion about what is meant by behavioral finance.

Behavioral finance attempts to understand and explain observed investor and market behaviors and bases its assumptions on observed financial behavior rather than on idealized financial behavior. Behavioral finance neither assumes that people act rationally and consider all available information in decision making nor that markets are efficient. To make behavioral finance easier to understand—and to differentiate the study of individual investor behavior from collective market behavior—behavioral finance in this reading is classified as either behavioral finance micro (BFMI) or behavioral finance macro (BFMA). Behavioral finance micro examines behaviors or biases that distinguish individual investors from the rational actors envisioned in neoclassical economic theory. Behavioral finance macro considers market anomalies that distinguish markets from the efficient markets of traditional finance. Whether BFMI or BFMA is of greater interest to practitioners depends on many factors, including the job held. For example, the primary focus of wealth managers and investment advisers to individual clients is BFMI (i.e., the behavior of individuals), while the primary focus of fund managers and economists is BFMA (i.e., the behavior of markets).

Regardless of whether BFMI or BFMA is of primary interest, it is critical to understand that much of traditional financial theory is based on the assumptions that individuals act rationally and consider all available information in the decision-making process and that markets are efficient. Behavioral finance challenges these assumptions. BFMI questions the perfect rationality and decision-making process of individual investors, and BFMA questions the efficiency of markets.

BFMI suggests that behavioral biases impact the financial decisions of individual investors. Behavioral biases can be categorized as cognitive errors or emotional biases. Cognitive errors stem from basic statistical, information-processing, or memory errors; cognitive errors may be considered to result from reasoning based on faulty thinking. Emotional biases stem from impulse or intuition; emotional biases may be considered to result from reasoning influenced by feelings. Behavioral biases, cognitive

or emotional, may cause decisions to deviate from the rational decisions of traditional finance. BFMA suggests that markets are subject to behavioral effects. These behavioral effects may cause markets to deviate from the efficient markets of traditional finance.

Meir Statman, a prolific contributor to behavioral finance research, states comprehensively, "Standard finance is the body of knowledge built on the pillars of the arbitrage principles of Miller and Modigliani, the portfolio principles of Markowitz, the capital asset pricing theory of Sharpe, Lintner, and Black, and the option pricing theory of Black, Scholes, and Merton."[3] Statman's point is that traditional (standard) finance theory is designed to provide mathematically elegant explanations for financial questions that, when posed in real life, are often complicated by imprecise conditions. The traditional finance approach relies on assumptions that tend to oversimplify reality and are challenged by behavioral finance.

Sections 2.1, 2.2, and 2.3 focus on assumptions about investor behavior (BFMI). Section 2.1 provides an overview of the traditional finance perspective of individual behavior; section 2.2 discusses the behavioral finance challenges to the traditional finance perspective of individual behavior; and section 2.3 briefly introduces neuroeconomics and its potential role in explaining individual investor behavior. Following section 2 and its discussions of traditional finance and behavioral finance perspectives, section 3 primarily addresses theories developed in response to apparent deviations from the assumptions of traditional finance regarding decision making.

2.1 Traditional Finance Perspectives on Individual Behavior

Traditional finance concepts may be thought of as normative, indicating how people and markets should behave. Investors are assumed to be rational; investors make decisions consistent with utility theory and revise expectations (update beliefs) consistent with Bayes' formula. They are further assumed to be self-interested and risk-averse, to have access to perfect information, and to process all available information in an unbiased way. Each of these underlying assumptions will be discussed further in the following subsections.

2.1.1 *Utility Theory and Bayes' Formula*

In **utility theory**, people maximize the present value of utility subject to a present value budget constraint.[4] **Utility** may be thought of as the level of relative satisfaction received from the consumption of goods and services. Decision makers choose between risky or uncertain prospects by comparing their expected utility values. They maximize their expected utility—the weighted sum of the utility values of outcomes multiplied by their respective probabilities—subject to their budget constraints. It is important to note that the determination of the value of an item is not based on its price, but rather on the utility it yields. The price of an item is dependent only on the characteristics of the item and is equal for everyone; the utility, however, is dependent on the particular circumstances and preferences of the person making the estimate of utility.

For our purposes, it is not important to understand fully the mathematical aspects of the expected utility model, which assumes that it is possible to quantify exactly how much utility an individual will derive based on the uncertain outcome of an economic decision and that the individual can and will choose between various options to arrive at an optimal decision that maximizes the individual's expected utility. Normatively, this is how people *should* make economic decisions; it is important to understand expected utility theory conceptually.

3 Statman (1999).
4 See, for example, Samuelson (1937).

There are some basic axioms of utility theory.[5] It is assumed that a rational decision maker follows rules of preference consistent with the axioms and that the utility function of a rational decision maker reflects the axioms. From any set of alternatives, a *rational* decision maker makes decisions consistent with the axioms of utility theory and chooses the combination of decisions that maximizes expected utility. The basic axioms of utility theory are completeness, transitivity, independence, and continuity.

- *Completeness* assumes that an individual has well-defined preferences and can decide between any two alternatives.

  Axiom (Completeness): Given choices A and B, the individual either prefers A to B, prefers B to A, or is indifferent between A and B.

- *Transitivity* assumes that, as an individual decides according to the completeness axiom, an individual decides consistently.

  Axiom (Transitivity): Transitivity is illustrated by the following examples. Given choices A, B, and C, if an individual prefers A to B and prefers B to C, then the individual prefers A to C; if an individual prefers A to B and is indifferent between B and C, then the individual prefers A to C; or, if an individual is indifferent between A and B and prefers A to C, then the individual prefers B to C.

- *Independence* also pertains to well-defined preferences and assumes that the preference order of two choices combined in the same proportion with a third choice maintains the same preference order as the original preference order of the two choices.

  Axiom (Independence): Let A and B be two mutually exclusive choices, and let C be a third choice that can be combined with A or B. If A is preferred to B and some amount, x, of C is added to A and B, then A plus xC is preferred to B plus xC. This assumption allows for additive utilities. If the utility of A is dependent on how much of C is available, the utilities are not additive.

- *Continuity* assumes there are continuous (unbroken) indifference curves such that an individual is indifferent between all points, representing combinations of choices, on a single indifference curve.

  Axiom (Continuity): When there are three lotteries (A, B, and C) and the individual prefers A to B and B to C, then there should be a possible combination of A and C such that the individual is indifferent between this combination and the lottery B. The end result is continuous indifference curves.

If the individual's decision making satisfies the four axioms, the individual is said to be rational. Put another way, if an individual is to maximize utility, he or she will choose one alternative over another if and only if the expected utility of one alternative exceeds the expected utility of the other alternative. The utility of any choice may be expressed as a function of the utility of the possible outcomes of the choice and their respective probabilities. If an individual believes a choice has possible outcomes, x_i, each with a utility of $u(x_i)$ and a subjective probability of $P(x_i)$, then the individual's subjective expected utility is $\Sigma u(x_i)P(x_i)$.[6] The completely rational individual makes decisions based on the axioms of utility theory in order to maximize expected utility.

The rational decision maker, given new information, is assumed to update beliefs about probabilities according to Bayes' formula. **Bayes' formula** is a mathematical rule explaining how existing probability beliefs should be changed given new information. In other words, Bayes' formula expects people to update old beliefs in a certain manner when given new information. Bayes' formula is essentially an application of conditional

5 See von Neumann and Morgenstern (1944).
6 See Savage (1954).

probabilities. This formula is valid in all common probability interpretations. In order to develop the calculation, all possible events must be mutually exclusive and exhaustive events with known probabilities.

Bayes' formula shows how one conditional probability is inversely related to the probability of another mutually exclusive outcome. The formula is:

$$P(A|B) = [P(B|A)/P(B)]\ P(A)$$

where:

P(A|B) = conditional probability of event A given B. It is the updated probability of A given the new information B.

P(B|A) = conditional probability of B given A. It is the probability of the new information B given event A.

P(B) = prior (unconditional) probability of information B.

P(A) = prior probability of event A, without new information B. This is the base rate or base probability of event A.

EXAMPLE 1

Example of Bayes' Formula

You have two identical urns, U1 and U2. U1 has 2 red balls (R) and 3 white balls (W). U2 has 4 red balls and 1 white ball. You randomly choose one of the urns to pick out a ball. A red ball is pulled out first. What is the probability that you picked U1, based on the fact that a red ball was pulled out first, P(U1|R)?

Solution:

P(R|U1) is the conditional probability of a red ball being pulled out, given U1 is picked:

2 red balls/5 balls = 40%

P(U1) is the probability of picking U1:

1 urn/2 urns = 50%

P(R) is the probability of a red ball being picked regardless of which urn is picked:

2 red balls in U1 + 4 red balls in U2 = 6 red balls

6 red balls/10 balls = 60%

P(U1|R) is the objective of the exercise. Based on the above formula, we calculate:

$$P(U1|R) = [P(R|U1)/P(R)]\ P(U1) = [40\%/60\%]50\% = 33.3\%$$

This solution can also be shown using a probability tree. In Exhibit 1, we can see that the probability of U1 being picked and a red ball being chosen is P(U1) × P(R|U1) = (0.5 × 0.4) = 0.20. The probability of picking a red ball if either urn is picked is P(R) = (0.20 + 0.40) = 0.60. Therefore, because we know that a red ball was picked, we can find the probability of having chosen U1 by dividing the probability of choosing both U1 and a red ball by the probability of choosing a red ball. This gives us 0.333 or 33.3% [= 0.20/0.60].

Exhibit 1 Probability Tree

Different people may make different decisions because they may have different utility functions or different beliefs about the probabilities of different outcomes.

In a perfect world, when people make decisions under uncertainty, they are assumed to do the following:

1. Adhere to the axioms of utility theory.
2. Behave in such a way as to assign a probability measure to possible events.
3. Incorporate new information by conditioning probability measures according to Bayes' formula.
4. Choose an action that maximizes the utility function subject to budget constraints (consistently across different decision problems) with respect to this conditional probability measure.

Is it reasonable, however, to think that ordinary people perform Bayesian updating on a consistent basis or make decisions as if they perform Bayesian updating? Bayesian updating requires the ability to perform complicated statistical calculations. People have cognitive limitations not accounted for in expected utility theory. Behavioral finance proponents argue that it seems highly unlikely that people actually take each of these steps as a matter of procedure every time they make a decision or that the decisions of people are consistent with those that would be made on the basis of Bayesian updating.

2.1.2 *Rational Economic Man*

Traditional finance assumes that after gathering information and analyzing it according to Bayes' formula, individuals will make decisions consistent with the decisions of homo economicus or **rational economic man** (REM). REM will try to obtain the highest possible economic well-being or utility given budget constraints and the available information about opportunities, and he will base his choices only on the consideration of his own personal utility, not considering the well-being of others except to the extent this impacts REM's utility. Using indifference curve analysis, rational economic man will determine the choices that will combine to give him the highest utility. REM will construct curves of consumption bundles amongst which

he is indifferent because each bundle gives the same utility. The curve that is within budget constraints and furthest from the origin gives the highest utility. Choices made by REM will fall on that curve.

The notion of rational economic man was developed in the late 19th century as a simple model of human economic behavior. The model assumes that humans make perfectly rational economic decisions at all times. REM is a rational, self-interested, labor-averse individual who has the ability to make judgments about his subjectively defined ends. REM also strives to maximize economic well-being by selecting strategies contingent on predetermined, utility-optimizing goals on the information that he possesses as well as on any other postulated constraints. REM tries to achieve discretely specified goals to the most comprehensive, consistent extent possible while minimizing economic costs.

The amount of utility that REM associates with any given outcome is represented by the output of his algebraic utility function. Predicting how REM will negotiate complex trade-offs, such as the pursuit of wages versus leisure, entails the use of mathematical models using calculus. REM ignores social values unless adhering to them will give him pleasure (i.e., provide utility) or failing to adhere to them will cause him pain (i.e., create disutility). Principles of perfect rationality, perfect self-interest, and perfect information govern REM's economic decisions.

2.1.3 *Perfect Rationality, Self-Interest, and Information*

REM is assumed to maximize utility and make complex deductions toward that end. He is capable of thinking through all possible outcomes and choosing the course of action that will result in the best possible outcome. Perfect rationality assumes that REM is a perfectly rational thinker and has the ability to reason and make beneficial judgments at all times. In reality, however, rationality is not the sole driver of human behavior. At times, it is observed that the human intellect is subservient to such human emotions as fear, love, hate, pleasure, and pain. Moreover, people often use their intellects to achieve or avoid these emotional outcomes.

Perfect self-interest is the idea that humans are perfectly selfish. For every economic decision, REM ensures that he is getting the highest possible utility and will never concede anything to his opponent in a transaction. Many studies have shown that people are not perfectly self-interested. If they were, philanthropy would not exist. Religions prizing selflessness, sacrifice, and kindness to strangers would also be unlikely to thrive as they have over millennia. Perfect self-interest would preclude people from performing unselfish deeds, such as volunteering, helping the needy, or serving in the military. If behaving in an apparently altruistic manner generates utility for the giver, however, then such behavior is consistent with self- interest and may be viewed as rational.

Some people may possess perfect or near-perfect information on certain subjects. A doctor or dentist, for example, should be impeccably versed in her field. It is impossible, however, for every person to enjoy perfect knowledge of every subject. In the world of investing, there is nearly an infinite amount to learn and know, and even the most successful investors don't master all disciplines. In microeconomics, a state of perfect information is assumed in some models of perfect competition. That is, assuming all agents are rational and have perfect information, they will choose the best products; the market will then reward those who make the best products with higher sales accordingly. Perfect information would mean that all consumers know all things about all products at all times; therefore, they would always make the best decision regarding purchases. In competitive markets, unlike in game-theory models, perfect competition does not require that agents have complete knowledge about the actions of others. Rather, in competitive markets, it is assumed that all relevant information is reflected in prices.

2.1.4 *Risk Aversion*

Expected utility theory generally assumes that individuals are risk-averse. This means that an individual may refuse a fair wager (a wager with an expected value of zero), and also implies that his utility functions are concave and show diminishing marginal utility of wealth. Given two choices—investing to receive an expected value with certainty or investing in an uncertain alternative that generates the same expected value—someone who prefers to invest to receive an expected value with certainty rather than invest in the uncertain alternative that generates the same expected value is called risk-averse. Someone who is indifferent between the two investments is called risk-neutral. Someone who prefers to invest in the uncertain alternative is called risk-seeking. In traditional finance, individuals are assumed to be risk-averse.

Following is an example that demonstrates risk neutrality, risk aversion, and risk-seeking. Let's assume a person is given the choice between two scenarios. In the guaranteed scenario, the person receives $100. In the uncertain scenario, a coin is flipped to decide whether the person receives $200 or nothing. The expected payoff for both scenarios is $100. A person who is insensitive to risk or risk-neutral will be indifferent between the guaranteed payment and the coin flip. A person is risk-averse if he or she would accept a payoff of less than $100 with certainty rather than take the coin flip. A person is risk-seeking (or risk-loving) if the guaranteed payment has to be more than $100 to induce him to take the guaranteed option rather than the coin flip, where he could possibly win $200.

An alternative example to demonstrate risk aversion, risk neutrality, and risk-seeking involves determining how much a person is willing to pay to participate in the uncertain scenario. If the person is willing to pay $100 (the expected payoff), the person is risk-neutral. If the person is willing to pay less than $100, the person is risk-averse. If the person is willing to pay more than $100, the person is risk-seeking.

Given an opportunity to participate or to forgo to participate in an event for which the outcome, and therefore his or her receipt of a reward, is uncertain, the **certainty equivalent** is the maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in the opportunity. The difference between the certainty equivalent and the expected value is called the risk premium. Certainty equivalents are used in evaluating attitudes toward risk.

Risk attitudes toward wealth are reflected in the curvature of the individual's utility function of wealth. As shown in Exhibit 2, risk-neutral individuals have linear utility functions; risk-averse individuals have concave utility functions; and risk-seeking individuals have convex utility functions. A linear utility function means that utility increases at a constant rate with increases in wealth; the risk-neutral individual has a constant marginal utility of wealth. A concave utility function means that utility increases at a decreasing rate with increases in wealth; the risk-averse individual has a diminishing marginal utility of wealth. A convex utility function means that utility increases at an increasing rate with increases in wealth; the risk-seeking individual has an increasing marginal utility of wealth. The degree of risk aversion can be measured by the curvature of the utility function.

Exhibit 2 Utility Function of Wealth

As stated previously, expected utility theory generally assumes that individuals are risk-averse. This implies that utility functions are concave and exhibit diminishing marginal utility. A commonly cited example to demonstrate diminishing marginal utility is a favorite food or beverage. The first taste may give great pleasure (high utility), but each subsequent taste may generate less pleasure; in fact, excessive consumption may lead to discomfort (disutility). Although there may be no discomfort associated with increasing wealth, one can imagine a situation in which an incremental increase to wealth generates less increased utility than a previous increase to incremental wealth. For example, sufficient wealth to pay for housing has a very positive utility, but the extra wealth to pay for a third or fourth home may have a much smaller positive impact on utility. Thus, assuming that individuals are risk-averse and that utility curves are concave and exhibit diminishing marginal utility seems reasonable.

2.2 Behavioral Finance Perspectives on Individual Behavior

Behavioral finance challenges the assumptions of traditional finance based on observed behaviors. The assumptions of traditional finance with respect to the behaviors of individuals are not universally observed to hold true. Investors do not necessarily make decisions consistent with utility theory and revise expectations (update beliefs) consistent with Bayes' formula. They may exhibit behavior that is not self-interested or risk-averse. They do not have access to perfect information and may not process all available information.

In contrast to ideas of perfect rationality or utility maximization, behavioral finance attempts to identify and learn from human psychological phenomena at work within individual market participants. The impact of psychological phenomena on individual market participants may then, in turn, impact financial markets. Behavioral finance, like traditional finance, is guided by basic precepts and assumptions. However, behavioral finance grounds its assumptions in observed financial behavior rather than in idealized financial behavior. For example, behavioral finance examines mental processes, such as the fear of loss or the human tendency to overestimate low-probability events. Some of the behavioral challenges to the assumptions of traditional finance are discussed in the following sections.

2.2.1 *Challenges to Rational Economic Man*

The validity of rational economic man (REM) has been the subject of much debate since the model's introduction. Those who challenge REM do so by attacking the basic assumptions of perfect information, perfect rationality, and perfect self-interest. Keynes (1936) contends that no human can be fully informed of "all circumstances and maximize his expected utility by determining his complete, reflexive, transitive, and continuous preferences over alternative bundles of consumption goods at all times." Keynes acknowledges the inherent limitations of people in making decisions.

Bounded rationality (discussed further in section 3.2) is proposed as an alternative to the assumptions of perfect information and perfect rationality. It relaxes the assumptions of expected utility theory and perfect information to more realistically represent human economic decision making. Bounded rationality assumes that individuals' choices are rational but are subject to limitations of knowledge and cognitive capacity. Bounded rationality is concerned with ways in which final decisions are shaped by the decision-making process itself.

A shortcoming of the theory of rational economic man is that it disregards the inner conflicts that real people face. For instance, rational economic man does not account for the fact that people can have difficulty prioritizing short-term versus long-term goals (e.g., spending versus saving) and do not behave with perfect self-interest. People instead seem to try to reconcile short-term and long-term goals with individual goals and societal values. This may result in inner conflicts, and these conflicts may lead to behavior that is not rational as defined in traditional finance.

Perhaps the strongest criticisms of REM challenge the underlying assumption of perfect information. It is intuitively obvious that many economic decisions are made in the absence of perfect information. For example, some economic theories assume that people adjust their buying habits based on the monetary policy of central banks. Although some people may know how to find the central bank data, interpret it, and apply it, many do not even know the roles of central banks. This one example demonstrates the implausibility of the idea that all participants in financial markets possess or act as if they possess perfect information.

The concept of rational economic man is appealing to financial theorists for two primary reasons. First, assuming decision making by REM simplifies economic models and analysis, because it is easier to model human behavior given this assumption. Second, this allows economists to quantify their findings, making their work easier to understand. If humans are perfectly rational and self-interested and possess perfect information, then quantifying their behavior may be feasible. However, human rationality covers a spectrum from that which appears perfectly rational to that which appears irrational. Individuals are neither perfectly rational nor perfectly irrational; instead, they possess diverse combinations of rational and irrational characteristics and benefit from different degrees of knowledge. The extent to which any one individual appears to be behaving rationally can vary between decisions depending on a variety of factors, including the type of decision, the extent of the individual's knowledge, and the particular circumstances. Even if individuals do not behave rationally, the idea of REM is useful because it is normative and helps define an optimal outcome.

2.2.2 *Utility Maximization and Counterpoint*

A useful way to assess the validity of rational economic theory is to use indifference curves. The aim of indifference curve analysis is to demonstrate, mathematically and graphically, the basis on which a rational consumer substitutes certain quantities of one good for another. For example, it is possible to model the effects of a wage adjustment on a worker's allocation of hours to work versus leisure. **Indifference curve analysis** may incorporate budget lines or constraints, which represent restrictions on consumption that stem from resource scarcity. In the work-versus-leisure model, for

example, workers may not allocate any sum exceeding 24 hours per day. The number of hours available for work and leisure may be lower than 24 hours depending on other demands on their time.

An indifference curve, as shown in Exhibit 3, depicts all of the possible combinations of two goods amongst which an individual is indifferent.[7] This individual appears to have a constraint of 10 hours available for work and leisure. Consuming any bundle on the curve shown yields the same level of utility for the individual. In Exhibit 3, the individual would achieve equal satisfaction with four hours of work and six hours of leisure or with seven hours of work and three hours of leisure. The indifference curve shows the marginal rate of substitution, or the rate at which a person is willing to give up one good for another, at any point. If the two items are perfect substitutes, then the individual is willing to trade one for the other in a fixed ratio; then, the indifference curve is a line with a constant slope reflecting the marginal rate of substitution. If the two items are perfect complements, then the curve would be L-shaped. An additional amount of either good adds no extra utility because the goods are only used in combination.

Exhibit 3 Trade-Off between Work and Leisure

Utility theory should also consider such other factors as risk aversion, probability, size of the payout, and the different utility yielded from the payout based on the individual's circumstances. For example, in a period of high unemployment, an individual may be competing with many others for a job. Under these circumstances, the individual may be willing to work 10 hours a day with no leisure. The trade-off between work and leisure hours is impacted by exogenous factors.

Although indifference curve analysis is theoretically sound, is an individual likely to calculate and perform mathematical equations to determine the trade-off between work and leisure on an ongoing basis? Some might, but many would not. The failure to consider exogenous factors in rational utility analysis is also problematic. Furthermore,

7 Note that the intercept of the axes as shown (the origin) is not (0, 0).

risk needs to be accounted for. What is this individual's risk of job loss if he or she does not work eight hours a day? Risk plays an important part in making utility-maximizing decisions. Risk aversion is an assumption underlying actions taken by REM.

2.2.3 *Attitudes Toward Risk*

Assuming that individuals are risk-averse and that utility curves are concave and exhibit diminishing marginal utility seems reasonable, but observed behaviors are not always consistent with the assumption of an individual who is constantly risk-averse. For example, anyone who has ever purchased a lottery ticket has displayed risk-seeking behavior that is inconsistent with the rational risk-averse behavior assumed in traditional finance. Friedman and Savage (1948) discuss behaviors that seem to contradict the traditional finance beliefs that individuals always seek to maximize the utility of their money and are risk-averse. They cite examples, such as buying lottery tickets and buying insurance, in which expected utility is low but people (even with low incomes) participate in the purchase. The authors find that generally people must be paid a premium to be induced to take moderate risks. However, if an investment offers a few extremely large prizes, its attractiveness is increased far beyond the aggregate value of the prizes. They also find a difference between individuals at different income levels. Those with less income prefer either certainty or a risk that offers a small chance of a large gain to a risk that is moderate. Middle-income people are more likely to be attracted by small, fair gambles.

Perhaps the most important concept we can learn here is that risk evaluation is reference-dependent, meaning risk evaluation depends in part on the wealth level and circumstances of the decision maker. Friedman and Savage indicate that it is not necessarily true that an individual's utility function has the same curvature consistently: There may be levels of wealth, for instance, at which an investor is a risk-seeker and levels of wealth where the investor is risk-neutral. Also, circumstances may vary. As shown in Exhibit 4, the Friedman–Savage **double inflection utility function**, $u(z)$, is concave up to inflection point B, then becomes convex until inflection point C, after which it becomes concave again. Thus, at low income levels (between the origin and z_B), agents exhibit risk-averse behavior; they are also risk-averse at high income levels (above z_C). However, between the inflection points B and C, agents are risk-loving.

Double Inflection Utility Function—A utility function that changes based on levels of wealth.

Exhibit 4 Friedman–Savage Double-Inflection Utility Function

Friedman and Savage try to explain why people may take low-probability, high-payoff risks (e.g., lottery tickets), while at the same time insuring against low risks with low payoffs (e.g., flight insurance). To see this, presume one is at inflection point *B* between risk-averse and risk-seeking. Suppose one faces two lotteries, one yielding *A* or *B*, another yielding *B* or *C*. These lotteries are captured by the solid line segments between the respective payoffs *AB* and *BC*. Expected utility of the first gamble is notated as $E(u)$ and is depicted in Exhibit 4 at point *D*—where, obviously, $E(u)$ is less than the utility of the expected outcome of the first gamble, $u[E(z)]$, depicted at point *F*. Consequently, a risk-averse agent would pay a premium to avoid it. The second gamble yields expected utility $E(u')$ at point D' on the *BC* segment, which is greater than the utility of the expected outcome $u[E(z')]$, depicted at point *G*. A risk-seeking agent would *pay* a premium to undertake this gamble. Thus, we can view risk-averse behavior with regard to *AB* as a case of insurance against small losses and the risk-seeking behavior with regard to *BC* as a case of purchasing lottery tickets.

Prospect theory (discussed further in section 3.3) has been proposed as an alternative to expected utility theory.[8] Prospect theory assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses. The value function is defined by deviations from a reference point and is normally concave for gains (implying risk aversion), convex for losses (risk-seeking), and steeper for losses than for gains (loss aversion). Decision weights are generally lower than the corresponding probabilities, except in the range of low probabilities.

8 See Kahneman and Tversky (1979).

It appears that the assumptions of traditional finance with respect to the behaviors of individuals are not universally observed to hold true. Investors do not necessarily make decisions consistent with utility theory and revise expectations (update beliefs) consistent with Bayes' formula. They may exhibit behavior that is not self-interested or risk-averse. They may not have access to perfect information and may not process all available information.

2.3 Neuro-economics

Behavioral finance, drawing on psychology, observes behaviors in an attempt to understand and explain how investors and markets behave. Neuro-economics combines neuroscience, psychology, and economics in attempting to explain how humans make economic decisions. Neuro-economics is an emerging field of study relevant to understanding how people make economic decisions under uncertainty. Neuro-economics attempts to explain investor behavior based on the functioning of the brain.

Neuro-economics uses imaging of brain activity and other techniques in combination with experimental economics to study the neural basis of economic decision making. By comparing the blood flow to and activity in different parts of the brain before, during, and after a task, it is possible to associate certain regions of the brain with performance of the task. In addition, chemical levels in the brain are studied to gain insights into responses to events and activities. Neuro-economics attempts to bridge the gap between research on decision behavior and economic theory by understanding the brain activity of judgment and making choices.

Glimcher (2003) described the goal of his research as follows: "The long-term goal of my research is to describe the neural events that underlie behavioral decision making. Our approach to this problem consolidates mathematical economic approaches to decision making with traditional neurobiological tools. By using these tools in our physiological analyses of the brainstem, cortex, and the basal ganglia, we hope to develop a coherent view of how the brain makes decisions."[9]

By observing brain activity, neuro-economics attempts to answer such questions as, "How do emotions affect judgment and decision making? How do people perceive uncertainty? How does risk affect human decision making?" Traditional finance attempts to answer similar questions by making simplifying assumptions. Behavioral finance attempts to answer similar questions by observing behaviors and inferring the basis for the behavior. These approaches each potentially provide insights into financial decision making and should not be viewed as mutually exclusive.

Critics of neuro-economics claim that, although the results of neuro-economics may be interesting, there have been few insights from neurobiological studies that constrain economic theory. Gul and Pesendorfer (2008) argue that neurobiological measurements, per se, are entirely outside the scope of economics. Economic theory makes predictions about behavior, and the actual functioning of the brain during decision making is irrelevant. In short, they argue that insights into biological mechanisms, such as brain activity or chemical levels in the brain, are unlikely to have an impact on economic theory.

Perhaps some of the more interesting insights result from examining chemical levels in the brain. Dopamine and serotonin are chemicals naturally produced in the body. Dopamine functions as a neurotransmitter and is commonly associated with the pleasure system, providing feelings of enjoyment and reinforcement to motivate people to do or continue certain activities. A reduction in serotonin in the body is often linked to such emotional and behavioral problems as anxiety, depression, impulsiveness, and irritability.

9 Glimcher (2003).

Dopamine is released in response to both a reward and the expectation of a reward. The release of dopamine after an expected or unexpected reward and the desire for dopamine release may explain risk-taking behavior. The prospect of a euphoric effect may inhibit people from focusing on the more logical thought of how small the odds of a reward (positive outcome) actually are. In this context, it is not difficult to imagine that dopamine may explain such behavioral biases as overconfidence and may also play a role in market overreaction to short-term results.

If an expected reward fails to arrive, dopamine is not released and dopamine levels decline, which may result in a depressed state. Further, unfulfilled expectations depress brain serotonin levels. The resulting emotional state may impact investors in a variety of ways: It may prevent the investors from taking further actions that involve assuming risk or it may cause investors to become impulsive and attempt to recoup losses by employing high-risk investing strategies (usually resulting in excessive trading).

Research focusing on the roles played by areas of the brain also provides insights into human behavior. For example, the amygdala plays a key role in emotions, such as fear and pleasure. It is the amygdala that creates a "fight or flight" response during a sudden event or trauma. For investors, the amygdala may be responsible for a panicked response rather than an analytical response to a dropping market. Although neuroeconomics research is interesting and may provide further insights into individual economic decision making, its effect on economic theory remains to be seen.

3 DECISION MAKING

This section examines behavioral theories developed in response to the relaxing of particular assumptions about individual behavior with respect to decision making. Prospect theory relaxes the assumptions of expected utility theory and risk aversion. Bounded rationality relaxes the assumption that all available information is used to arrive at a wealth-maximizing decision. Before discussing prospect theory and bounded rationality, which are based on observations of how people actually do seem to make decisions, we will discuss theories of how people should make decisions. Prospect theory and bounded rationality are descriptive, describing how people *do* behave and make decisions. Expected utility and decision theories are normative, describing how people *should* behave and make decisions.

3.1 Decision Theory

Decision theory is concerned with identifying values, probabilities, and other uncertainties relevant to a given decision and using that information to arrive at a theoretically optimal decision. Decision theory is normative, meaning that it is concerned with identifying the ideal decision. As such, it assumes that the decision maker is fully informed, is able to make quantitative calculations with accuracy, and is perfectly rational. The practical application of decision theory is prescriptive. It analyzes decisions and attempts to provide tools and methods to help people make better decisions.

From a historical perspective, the initial focus of decision theory was on expected value. The first person to record explorations of expected value was Blaise Pascal, a French mathematician and philosopher in the 1600s who is also known for his wager

on the existence of God.[10] In 1670, Pascal discussed expected value and choice in this way: "When faced with a number of actions, each of which could give rise to more than one possible outcome with different probabilities, the rational procedure is to identify all possible outcomes, determine their values (positive or negative) and the probabilities that will result from each course of action, and multiply the two to give an expected value. The action to be chosen should be the one that gives rise to the highest total expected value."[11]

Bernoulli (1954) describes the difference between expected utility and expected value.[12] Expected value of an item is based on its price, which is the same for everyone because the price depends only on the item itself. Expected utility of an item is based on the worth assigned to it by the person making the estimate; as a result, it may vary from person to person because it depends on each person's circumstances. Bernoulli's theory of expected utility, which includes the premise that utility increases at a decreasing rate with increases in wealth, is one of the theories that supports traditional finance perspectives.

Frank Knight (1921) makes important distinctions between risk and uncertainty. He defines risk as randomness with knowable probabilities and uncertainty as randomness with unknowable probabilities. Knight argues that situations with risk, such as decision making with unknown outcomes but known ex-ante probability distributions, differ from situations with uncertainty, such as decision making with unknown outcomes and probabilities. He contends that situations in which decision-making rules, such as maximizing expected utility, can be applied differ in a substantial way from those in which they cannot, such as when the probability distribution of a random outcome is unknown. Risk is measurable, but uncertainty is not.

von Neumann and Morgenstern (1944) posit that a rational decision maker makes decisions consistent with the axioms of utility theory and chooses the combination of decisions that maximize expected utility. Savage (1954) introduces subjective expected utility (SEU). The theories of von Neumann and Morgenstern and Savage extend the scope of expected utility theory to situations in which only subjective probabilities are available. SEU theory extends the conditions of perfect utility-maximizing rationality to a world in which the probability distributions of all relevant variables can be provided by the decision makers.

In order to take SEU theory and apply it to actual decision making, prescriptive theories of choice should consider the empirical evidence as to how people actually make decisions. Prescriptive approaches based on SEU theory consider empirical evidence as to the limits on human rationality. These limitations are imposed by the complexity of the world we live in, the incompleteness and inadequacy of human knowledge, the computational inadequacy of people, the inconsistencies of individual preference and beliefs, and the conflicts of value among individuals and groups.

Descriptive analysis of problem solving and decision making are centrally concerned with how people manage to reduce complicated problems to a cognitively manageable size, with how they approximate and heuristically handle complexity. Descriptive analyses make it possible to develop theories and practices that account for the unrealistic parts of SEU theory. These theories illustrate how people respond

10 "Pascal's wager" is a classic example of a choice under uncertainty. The uncertainty is whether God exists. Belief or non-belief in God is the choice to be made. Pascal argues that the reward for belief in God if God actually does exist is infinite, while the cost of believing in God if God actually does not exist is low. Therefore, the expected value of belief exceeds that of non-belief, so Pascal contends that it is prudent to believe in God.

11 Pascal's Pensées by Blaise Pascal (1670).

12 Bernoulli's article was originally published in 1738. The 1954 version is a re-publication.

to complexity and limitations, while striving to achieve results that approximate the ideal (i.e., the results of normative theories). Bounded rationality and prospect theory are examples of such theories.

Bounded rationality theory relaxes the assumptions that perfect information is available and that all available information is processed according to expected utility theory. Bounded rationality acknowledges that individuals are limited in their abilities to gather and process information. Prospect theory relaxes the assumptions that individuals are risk-averse and make decisions consistent with expected utility theory. Prospect theory assumes that individuals are loss-averse.

3.2 Bounded Rationality

Simon (1957) proposed the notion of **bounded rationality**, recognizing that people are not fully rational when making decisions and do not necessarily optimize but rather satisfice (defined below) when arriving at their decisions. People have informational, intellectual, and computational limitations. Even supplementing the capabilities of individuals with computers, humans may not be able to make fully informed and rational decisions. Simon introduced the terms *bounded rationality* and *satisfice* to describe the phenomenon where people gather some (but not all) available information, use heuristics[13] to make the process of analyzing the information tractable, and stop when they have arrived at a satisfactory, not necessarily optimal, decision. In contrast to rational economic man making decisions according to expected utility theory, Simon describes individuals who are satisfied to gather what they deem to be enough information, who will process the information in ways they deem adequate, who are prone to identify with sub-goals and limited objectives rather than try to achieve an optimum, and who will stop when they have a decision that fits within parameters they deem satisfactory.[14]

Bounded rationality sets parameters on how much will be done in making a decision and within which decisions will be deemed as satisfactory. The term **satisfice** combines "satisfy" and "suffice" and describes decisions, actions, and outcomes that may not be optimal, but they are adequate.[15] To satisfice is to find a solution in a decision-making situation that meets the needs of the situation and achieves the goals of the decision maker. Satisficing is finding an acceptable solution as opposed to optimizing, which is finding the best (optimal) solution. The optimal solution is the one that maximizes the utility realizable from the situation. Individuals lack the cognitive resources to arrive at optimal solutions. For example, individuals typically do not know the relevant probabilities of the potential outcomes, can rarely identify or evaluate all outcomes, and have weak and unreliable memories.

Decision makers may choose to satisfice rather than optimize because the cost and time of finding the optimal solution can be very high. In these circumstances, satisficing creates a stop rule to the decision process and allows the cost incurred and time taken to be limited. Another reason for decision makers to use satisficing is that even when people can continue evaluating exhaustive alternatives and cost is not a factor, they still need to find new alternatives and their expected outcomes. This search for an optimum will often become so complicated and time consuming that it is eventually infeasible. The empirical evidence in Simon's studies suggests that consumers, employees, and business people typically satisfice rather than optimize.

13 Heuristics are mental shortcuts based on experience and knowledge that simplify decision making. They are sometimes called "rules of thumb."
14 See Simon (1991).
15 See Simon (1996).

The reason behind this is bounded rationality. It is infeasible to generate all possible alternatives, estimate the probability of each possible outcome of each alternative, and define consistent utility functions for every alternative prior to making a decision.

Instead of looking at every alternative, people set constraints as to what will satisfy their needs. These constraints indicate what is aspired to. This is not a minimum acceptable outcome but a satisfactory acceptable outcome. Simon refers to these constraints as aspiration levels. Aspiration levels are set based on experiences and on comparisons with what other individuals have achieved. People tend to aspire for a future that is better than the past. When aspirations are reached, people tend to adjust the aspirations upward; when aspirations are not reached, people tend to adjust downward.

When searching for alternative solutions to an issue or problem, decision makers may use heuristics to guide their search. Although using heuristics may simplify the search for alternatives, they also may result in alternatives being missed (not identified). Rather than taking a holistic approach, heuristics may use more of an incremental approach. An example of heuristics is means-ends analysis, where the problem solver is at a current state and decides on the goal state. Rather than looking for alternatives to achieve the goal, the decision maker moves toward the goal in stages. Decisions are made progressively until the goal state is achieved: The first decision is made to get one step closer to the goal state, the next decision results in getting still closer to the goal, and decisions continue to be made until the goal state is met. Another example is the divide-and-conquer procedure, where a problem or issue is divided into components. In this case, rather than attempt to find alternatives to solve the issue or problem, the decision makers attempt to find satisfactory solutions for each sub-problem.

An accepted principle of decision making is to attend to only the most important aspects of the situation. When evaluating alternatives, an investor needs to be aware of the surrounding economic and political environment. An investor needs to have an in-depth understanding of the aspiration levels and satisficing heuristics of business people, government officials, and other investors. One is rarely able to use optimization to determine what is best for a portfolio. Alternatives are almost infinite, and accurately estimating an outcome for each alternative is extremely difficult and both cost and time prohibitive. Because investors have only a limited capacity to assess alternatives and outcomes, they act within the constraints of bounded rationality. Thus, portfolio decisions are based on a limited set of factors, such as economic indicators, deemed most important to the end goal. When the alternatives are limited, a person can dedicate more time to evaluating the most likely outcomes to help make decisions that will satisfice the investment goals.

A decision maker is said to exhibit bounded rationality when he violates some commonly accepted precept of rational behavior but nevertheless acts in a manner consistent with the pursuit of an appropriate set of goals or objectives. Although this definition specifies neither the precept being violated nor conditions under which a set of goals may be considered appropriate, it is still usable.

EXAMPLE 2

Bounded Rationality

Harry Timmons has cash that he wishes to earn interest on, have accessible, and protect against loss. He is aware that the amount of cash to be deposited will be fully insured by a corporation backed by the government if it is deposited in an eligible account at an insured member institution. He has decided to deposit the funds in a checking account at the bank down the street. The bank clearly posts on its door that it is a member institution and only offers eligible accounts. The account will pay 0.25 percent.

Explain how this decision has violated rational behavior but is consistent with bounded rationality.

Solution:

Timmons did not behave totally rationally because he did not gather full information to identify a listing of insured members and what types of accounts are eligible. There may be other institutions that offer eligible accounts that pay higher interest. Further, he did not search for alternatives to depositing in an eligible account with a member institution that met his criteria.

Timmons' behavior is boundedly rational because his decision meets the criteria specified but is not necessarily optimal. Although the decision is undoubtedly suboptimal because higher returns may have been possible, it satisfices within the totality of the investor's decision-making environment. Timmons may have decided he had neither the time nor the resources to research all alternatives. Given the investor's apparently limited knowledge of alternatives, and considering time constraints and the three criteria (interest, accessibility, and loss protection), depositing in a fully insured checking account at 0.25 percent may be reasonable.

3.3 Prospect Theory

Kahneman and Tversky (1979) introduce prospect theory as an alternative to expected utility theory. Prospect theory describes how individuals make choices in situations in which they have to decide between alternatives that involve risk (e.g., financial decisions) and how individuals evaluate potential losses and gains. Prospect theory considers how prospects (alternatives) are perceived based on their framing, how gains and losses are evaluated, and how uncertain outcomes are weighted.

In prospect theory, based on descriptive analysis of how choices are made, there are two phases to making a choice: an early phase in which prospects are framed (or edited) and a subsequent phase in which prospects are evaluated and chosen. The framing (editing phase) consists of using heuristics to do a preliminary analysis of the prospects, often yielding a simpler representation of these prospects. More specifically, people decide which outcomes they see as economically identical and then establish a reference point to consider where these prospects rate. Outcomes below the reference point are viewed as losses, and those above the reference point are gains. In the second phase, the edited prospects are evaluated and the prospect of highest perceived value is chosen.

During the editing or framing stage, alternatives are ranked according to a basic heuristic that was identified and chosen by the decision maker. This contrasts with the elaborate algorithms of expected utility theory. Framing refers to the way a choice option or prospect can be affected by the way in which it is presented. Understanding that how choices are presented or framed impacts the final choice is a critical aspect of prospect theory. In many situations, a decision maker does not know all the options available. Depending on the number of prospects, there may be up to six operations in the editing process: codification, combination, segregation, cancellation, simplification, and detection of dominance. In the process, individuals identify their options, and choice can be affected by how that identification is done. The ultimate purpose behind editing is to simplify the evaluation of choices available by reducing the choices to be more thoroughly evaluated. People use editing when making choices because of cognitive constraints.

The following are examples of six operations in the editing process.[16] Some editing operations will permit or prevent others from being carried out. The sequence of editing operations is likely to vary with the offered set and the format of the display. In the editing phase, a decision maker organizes and reformulates the available options to simplify the choice.

- *Codification*: People perceive outcomes as gains and losses rather than final states of wealth or welfare. A gain or loss is, of course, defined with respect to some reference point. The location of the reference point affects whether the outcomes are coded as gains or losses. Prospects are coded as (gain or loss, probability; gain or loss, probability; …) such that the probabilities initially add to 100 percent or 1.0.
- *Combination*: Prospects are simplified by combining the probabilities associated with identical gains or losses. For example, a prospect initially coded as (250, 0.20; 200, 0.25; 200, 0.15; 150, 0.40) will be simplified to (250, 0.20; 200, 0.40; 150, 0.40).
- *Segregation*: The riskless component of any prospect is separated from its risky component. For example, a prospect initially coded as (300, 0.8; 200, 0.2) is decomposed into a sure gain of (200, 1.0) and a risky prospect of (100, 0.8; 0, 0.20). The same process is applied for losses.

The above operations are applied to each prospect separately. The following operations are applied to two or more prospects:

- *Cancellation*: Cancellation involves discarding common outcome probability pairs between choices. For example, the pairs (200, 0.2; 100, 0.5; 20, 0.3) and (200, 0.2; 300, 0.4; –50, 0.4) are reduced to (100, 0.5; 20, 0.3) and (300, 0.4; –50, 0.4).
- *Simplification*: Prospects are likely to be rounded off. A prospect of (51, 0.49) is likely to be seen as an even chance to win 50. Also, extremely unlikely outcomes are likely to be discarded or assigned a probability of zero.
- *Detection of Dominance*: Outcomes that are strictly dominated are scanned and rejected without further evaluation.

Preference anomalies may arise from the act of editing. An example of a preference anomaly is the isolation effect. This results from the tendency of people to disregard or discard outcome probability pairs that the alternatives share (cancellation) and to focus on those which distinguish them. Because different choice problems can be decomposed in different ways, this can lead to inconsistent preferences.

The following is an example of the isolation effect.[17] Experimental subjects were given the choice of Gambles A and B.

- Gamble A: A 25 percent chance of receiving $3,000 and a 75 percent chance of receiving nothing.
- Gamble B: A 20 percent chance of receiving $4,000 and an 80 percent chance of receiving nothing.

Sixty-five percent of the experimental subjects chose Gamble B. The expected value of Gamble B is $800 compared to an expected value of $750 for Gamble A, so it is not surprising that the majority of subjects chose Gamble B.

---

16 Readers should note that there is ongoing work in the area of prospect theory. There have been many papers written on this theory that include examples of the editing and evaluation phases. The examples here are merely presented as an overview.

17 This example comes from the Experimental Economics Center at Georgia State University in Atlanta.

Next, the experimental subjects were given a two-stage gamble. The first stage involves a 0.75 probability of ending the game without winning or losing anything and a 0.25 probability of moving to the second stage. The second stage involves a choice between Gambles C and D. The choice of Gamble C or D had to be made prior to the first stage.

- Gamble C: A 100 percent chance of receiving $3,000.
- Gamble D: An 80 percent chance of receiving $4,000 and a 20 percent chance of receiving nothing.

Seventy-eight percent of the experimental subjects chose C.

The fact that 65 percent of the subjects chose B in the first gamble and 78 percent chose C in the second gamble is viewed as surprising. It is surprising because the true probabilities and expected values of Gambles C and D in the two-stage gamble are respectively the same as those of Gambles A and B in the first gamble. In the two-stage gamble, the majority of subjects chose the gamble with the lower expected value.

- Gamble C: 0.25 × 1.0 = 25 percent chance of receiving $3,000 and a 75 percent chance of receiving nothing.
- Gamble D: 0.25 × 0.8 = 20 percent chance of receiving $4,000 and an 80 percent chance of receiving nothing.

Clearly, how the prospects were framed had an effect on the choice. Kahneman and Tversky interpret this finding in the following manner: To simplify the choice between alternatives, people frequently disregard components that the alternatives share and instead focus on those that distinguish them. Because different choice problems can be decomposed in different ways, inconsistent preferences can result, as above. They call this phenomenon the isolation effect.

3.3.1 *The Evaluation Phase*

In the evaluation phase of prospect theory, people behave as if they compute a value (utility) function based on the potential outcomes and their respective probabilities and then choose the alternative that has a higher utility. For this evaluation process, Kahneman and Tversky assume the following formula:

$$U = w(p_1)v(x_1) + w(p_2)v(x_2) + \ldots$$

where $x_1, x_2 \ldots$ are the potential outcomes and $p_1, p_2 \ldots$ their respective probabilities; v is a function that assigns a value to an outcome; and w is a probability-weighting function. The probability-weighting function expresses the fact that people tend to overreact to small probability events but underreact to mid-sized and large probabilities. The value function (see Exhibit 5), which passes through the reference point, is s-shaped; moreover, as its asymmetry implies, given the same variation in absolute value there is a bigger impact of losses than of gains (loss aversion). People are not risk-averse but rather are loss-averse.

Exhibit 5 Value Function

A quantitative illustration of the evaluation process is complex and not necessary to review here. What is important to know is that the quantitative elements resemble those of expected utility theory, although there are some important differences. Values are attached to changes rather than final states, and the decision weights need not coincide with probabilities. Experimental evidence shows that most people reject a gamble with even chances to win and lose, unless the amount of the possible win is at least twice the amount of the possible loss. In contrast to expected utility theory, the prospect theory value function measures gains and losses but not absolute wealth and is reference-dependent. Reference dependence is incompatible with the standard interpretation of expected utility theory. Reference dependence is a feature of prospect theory and is central to prospect theory's perspective on how people make decisions under uncertainty.

Kahneman and Tversky illustrate reference dependence with an example. People are presented with the following two situations and asked to make choices.

Situation 1 Given a 50 percent probability of winning $150 and a 50 percent probability of losing $100, is an individual likely to take this gamble? Is the individual's choice likely to change if overall wealth was lower by $100?

There will be few takers of the gamble because experimental evidence shows that most people reject a gamble with even chances to win and lose, unless the possible win is at least twice the size of the possible loss. In this case, the answer to the second question is negative.

Situation 2 Given the choice of losing $100 with certainty and a gamble with a 50 percent probability of winning $50 and a 50 percent probability of losing $200, which is an individual likely to choose? Would the individual's choice change if overall wealth were higher by $100?

In situation 2, the gamble may appear more attractive than the sure loss. Experimental results indicate that risk-seeking preferences are held by a large majority of respondents in choices of this kind. Here again, a change of $100 in total wealth is unlikely to alter preferences. Situations 1 and 2 evoke different preferences, but the difference is caused by a framing effect. In both cases, the gamble compared to the certain position provides an expected net gain of $25 {Situation 1 = E[gain of

gamble] – E[certainty] = \$25 – \$0 = \$25; Situation 2 = –\$75 – (–\$100) = \$25}. The situations differ only in that all values are lower by \$100 in situation 2. This should be an inconsequential variation.

Kahneman and Tversky examined many choice pairs of this type early in their explorations of risky choice, and they concluded that the abrupt transition from being risk-averse to risk-seeking could not plausibly be explained by a utility function for wealth. Preferences appear to be determined by attitudes toward gains and losses, which are defined relative to a reference point that frames the situation. The discarding of components that are common to all prospects (outcomes) may lead to inconsistent preferences depending on the framing of the choice.

Kahneman and Tversky's prospect theory explains apparent deviations in decision making from the rational decisions of traditional finance. These deviations result from overweighting low probability outcomes, underweighting moderate and high probability outcomes, and having a value function for changes in wealth (gains and losses) that is in general concave for gains, convex for losses, and steeper for losses than for gains. As a result, people are risk-averse when there is a moderate to high probability of gains or a low probability of losses; they are risk-seeking when there is a low probability of gains or a high probability of losses. This is consistent with people simultaneously buying lottery tickets and insurance while investing money conservatively.

4 PERSPECTIVES ON MARKET BEHAVIOR AND PORTFOLIO CONSTRUCTION

Traditional finance assumes that, at the market level, prices incorporate and reflect all available and relevant information. Markets that behave in a manner consistent with this assumption are referred to as efficient. Portfolios constructed in accordance with traditional finance assumptions are referred to as optimal. Section 4.1 provides an overview of the traditional finance perspectives of market behavior. Section 4.2 provides a brief overview of the traditional finance perspectives on portfolio construction. Section 4.3 discusses behavioral finance alternatives to the traditional finance perspective of market behavior and portfolio construction.

4.1 Traditional Perspectives on Market Behavior

Much of modern investment theory and practice is predicated on the efficient market hypothesis:

> Markets fully, accurately, and instantaneously incorporate all available information into market prices.

However, the efficient market hypothesis (EMH) is not universally accepted. In this section, we will discuss the EMH and explore some of the evidence supporting and opposing it.

Writing in the *Financial Times*, Thaler (2009) comments on two aspects of the EMH. He terms these "The Price is Right" and "No Free Lunch." The *price is right* assumes that asset prices fully reflect available information and that securities' prices can be used as a means to allocate resources. Accepting the EMH as fact, and noting the random nature (unpredictability) of prices, some economists infer that prices are

indeed right. Robert Shiller calls this inference "one of the most remarkable errors in the history of economic thought."[18] The price is right is a fallacy because mere randomness does not ensure that the prices are not wrong.[19]

No free lunch assumes that it is difficult for any investor to consistently outperform the market after taking risk into account given the inherent unpredictability of prices. Thaler notes that a myriad of studies over several decades have resulted in the same basic conclusion: There is no free lunch. With the exception of some apparent anomalies, the market is hard to beat. In fact, many of the investment strategies that seemed to beat the market did not do so once risk was more accurately measured.

Thaler concludes that the risks of investments are more correlated than previously thought, that high returns based on high leverage may be transitory and an illusion, and that revealed price distortions challenge the assumption of the price is right. Further, the acceptance of the price is right has led to significant misallocations of resources. However, Thaler leaves us with a quandary: If we abandon the efficient market hypothesis and its assumption that the price is right, how do we allocate resources? Thaler suggests that regulation may serve a useful function in the process of allocating resources.

4.1.1 *Review of the Efficient Market Hypothesis*

An efficient market is a market wherein prices fully reflect available information because of the actions of a large number of rational investors (the population of investors). Underlying market efficiency is the assumption that market participants are rational economic beings, always acting in their own self-interest and making optimal decisions by trading off costs and benefits weighted by statistically correct probabilities and marginal utilities. The efficient market hypothesis requires that agents have rational expectations. This means that, in aggregate, the population is correct, even if no one person is. Also, whenever new relevant information appears, the population updates its expectations. Another key assumption is that relevant information is freely available to all participants. Competition among participants results in a market wherein prices of individual investments always reflect the total effect of all information—including information about events that have already happened and events that the market expects to happen in the future. In sum, at any given time in an efficient market, the price of a security will match that security's intrinsic value. If markets are efficient, then no market participant should be able to consistently earn excess returns.

Grossman and Stiglitz (1980) argue that prices must offer a return to information acquisition, otherwise information will not be gathered and processed. If information is not gathered and processed, the market cannot be efficient. This is known as the Grossman–Stiglitz paradox. They conclude that in equilibrium, if markets are to be efficient, a return should accrue to information acquisition. A market is inefficient if, after deducting such costs, active investing can earn excess returns. An investor or researcher should consider transaction costs and information acquisition costs when evaluating the efficiency of a market.

Fama (1970) proposes three forms of market efficiency: the weak form, the semi-strong form, and the strong form. Weak-form market efficiency assumes that all past market price and volume data are fully reflected in securities' prices. Thus, if a market is weak-form efficient, technical analysis will not generate excess returns. Semi-strong-form market efficiency assumes that all publicly available information, past and present, is fully reflected in securities' prices. Thus, if a market is semi-strong-form efficient, technical and fundamental analyses will not generate excess returns. Strong-form

18 Quoted in Fox (2009).
19 See Lamont and Thaler (2003).

market efficiency assumes that all information, public and private, is fully reflected in securities' prices. Thus, if a market is strong-form efficient, even insider information will not generate excess returns.

4.1.2 *Studies in Support of the EMH*

The idea of efficient markets goes back to the turn of the 20th century. In 1900, a French mathematician named Louis Bachelier submitted a PhD dissertation to the Sorbonne titled "The Theory of Speculation" which describes market movements as random. The opening paragraphs show his early insights: "Past, present, and even discounted future events are reflected in market price, but often show no apparent relation to price changes….if the market, in effect, does not predict its fluctuations, it does assess them … mathematically." Many studies have been conducted that support the EMH. Typically, a study tests either the weak form or semi-strong form of efficiency with respect to a particular market. It is more difficult to test the strong form of efficiency. Extensive support for the weak-form and semi-strong forms of market efficiency has been published.

4.1.2.1 Support for the Weak Form of the EMH Initially, most statistical research of the stock market focused on the weak form of market efficiency and tested whether security prices are serially correlated (i.e., whether trends exist in stock prices) or whether they are random (i.e., whether prices of securities, on any given day, are as likely to go up as they are to go down). A number of studies conclude that the path of securities' prices cannot be predicted based on past prices. For example, Roberts (1959) plots the results of a series of randomly generated numbers to see whether any patterns identified by technical analysts are visible. Roberts notes that it is virtually impossible to tell whether his plots are generated using random numbers or actual stock market data. Roberts writes: "If the stock market behaved like a mechanically imperfect roulette wheel, people would notice the imperfections and, by acting on them, remove them."

Several other researchers have studied stock price movements. Fama (1965) concludes that daily changes in stock prices had nearly zero positive correlation. He proposes that the stock market works in a way that allows all information contained in past prices to be incorporated into the current price. In other words, markets efficiently process the information contained in past prices. Samuelson (1965) emphasizes the randomness of stock prices. Like Roberts, he finds that market prices follow random patterns and that future stock prices are unpredictable. Samuelson begins with the observation that "in competitive markets there is a buyer for every seller. If one could be sure that a price would rise, it would have already risen." Samuelson asserts that "we would expect people in the marketplace, in pursuit of avid and intelligent self-interest, to take account of those elements of future events that in a probability sense may be discerned to be casting their shadows before them." By presenting his proof in a general form, Samuelson adds strength to the idea that markets are efficient.

Malkiel (1973) provides credence to the idea of random stock price movements. He performed a test in which he gave students a fictional stock that was initially worth $50. The closing stock price for that stock was determined by a coin flip. If the result was heads, the price would close a half point higher; if the result was tails, it would close a half point lower. Thus, each time, the price had a fifty–fifty chance of closing higher or lower than the previous day. The results of the coin flips were assembled into a chart and graph form. Malkiel took his results in chart and graph form to a chartist (now known as a technical analyst), whom he defined as a person who "seeks to predict future movements by seeking to interpret past patterns on the assumption that 'history tends to repeat itself.'" The chartist told Malkiel that he needed to buy the stock immediately. When Malkiel told him it was based purely on flipping a coin,

the chartist was very unhappy. Malkiel argues that this indicates that the market and stocks can be just as random as flipping a coin. These studies of random stock price movements support the weak form of the EMH.

4.1.2.2 Support for the Semi-Strong Form of the EMH Several studies attempt to test the semi-strong form of market efficiency. These tests are typically event studies. An event study looks at a sample of similar events that occurred to different companies at different times and determines what effect(s) these events had on the stock price (on average) of each company. For example, Fama et al. (1969) study the stock market reaction to stock splits. The study finds that the market begins to anticipate a stock split more than two years before it actually happens and incorporates the consequences of the split the day it is announced. As may be seen in Exhibit 6, stock prices are shown to rise pre-split. This price action is a matter of some debate because stock splits do not technically add any value to a company. Fama et al. find that 72 percent of firms in their sample announced above-average dividend increases in the year after the split and proposed that stock splits signaled that dividend increases were on the horizon. On average, they find that stocks increased sharply prior to the split, but returns after the split were very stable. These results indicate that the implications of a stock split appear to be reflected in price immediately following the *announcement* of the split and not the event itself. This research supports the semi-strong form of market efficiency, because investors would not earn abnormal returns after the stock split information is publicly available. Numerous subsequent event studies also provide support for the semi-strong form of market efficiency.

Exhibit 6 Stock Split Event Study

Source: Fama et al. (1969).

Other studies investigate returns to active management. The absence of positive returns to active management is taken as evidence of market efficiency. For example, Alfred Cowles (1933) analyzes thousands of stock selections made by investment professionals from 1928 to 1933 and finds no evidence to suggest that professional

investors are able to outperform the market. Jensen (1967) investigates whether mutual fund managers had the skill to outperform the overall market over the long term. Using fund returns after fees but ignoring sales loads, he examines annual return data for the Standard and Poor's (S&P) 500, which he uses as a proxy for the market portfolio, and 115 mutual funds. He uses regression analysis to determine whether mutual funds in his data set generated positive alphas. His estimated alphas for all 115 mutual funds are summarized in Exhibit 7.

Exhibit 7 Estimated Alphas for 115 Mutual Funds

Source: Jensen (1967).

Jensen finds that the majority have estimated alphas below zero. The average fund's alpha is –0.011, or –1.1%. This means that after fees, but not including sales loads, the average fund underperforms the overall market by 110 basis points per year during the examination period. Examining the returns gross of fees, the results are marginally better. A majority still have negative alphas, with the average being –0.4%. Studies that demonstrate the ineffectiveness of professional investors, like this one, support the semi-strong form of market efficiency.

4.1.3 *Studies Challenging the EMH: Anomalies*

Some studies find evidence that appears to contradict market efficiency. These studies mainly describe apparent market anomalies or deviations from the efficient market hypothesis. A market anomaly must persist for a lengthy period to be considered evidence of market inefficiency. Otherwise, the market anomaly may be attributable to the sample period and a strategy that provided abnormal returns in the past may not provide abnormal returns in the future. Exhibit 8 provides a partial list of the studies that claim to identify market anomalies.

Exhibit 8 Selected Research Studies on Market Anomalies

Year	Authors	Article or Study Title	Anomalies Discovered
1968	Ball and Brown	"An Empirical Evaluation of Accounting Income Numbers"	Post earnings announcement drift
1976	Rozeff and Kinney	"Capital Market Seasonality: The Case of Stock Market Returns"	January effect: January stock returns were higher than in any other month
1981	Gibbons and Hess	"Day of the Week Effects and Asset Returns"	Monday effect: Stock prices tended to go down on Mondays
1981	Shiller	"Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends?"	Excess volatility
1982	Rendleman, Jr., Jones, and Latane	"Empirical Anomalies Based on Unexpected Earnings and the Importance of Risk Adjustments"	Earnings surprises and their effect on the stock price
1985	De Bondt and Thaler	"Does the Stock Market Overreact?"	Stock market overreacts to bad news
1991	Ritter	"The Long-Run Performance of Initial Public Offerings"	Negative long-run performance of IPOs
1992	Fama and French	"The Cross-Section of Expected Stock Returns"	Value investing
1993	Jegadeesh and Titman	"Returns to Buying Winners and Selling Losers; Implications for Stock Market Efficiency"	Momentum

There are three main types of identified market anomalies: fundamental, technical, and calendar. There is, however, disagreement about whether these are actual anomalies or the result of incomplete models being used in the testing. In effect, the test is often a joint test of market efficiency and the pricing model being used to test for it. We will now review some of the primary anomalies in each category.

4.1.3.1 Fundamental Anomalies A fundamental anomaly is an irregularity that emerges when one considers a stock's future performance based on a fundamental assessment of the stock's value. Examples of fundamental anomalies are the performance of small-capitalization companies and value companies compared to large-capitalization companies and growth companies, respectively. The effect of company size on performance has been documented in a number of studies.[20]

Value and growth investing inherently assume that anomalies from the efficient market hypothesis exist. Value investors attempt to identify stocks that are priced below their intrinsic values in order to earn excess returns. Growth investors attempt to identify stocks with high growth opportunities, which are not yet reflected in current market prices, in order to earn excess returns. Value companies typically have, on a per share basis, lower than average price-to-earnings, price-to-book value, and price-to-sales ratios and higher than average dividend yields. Growth companies typically have, on a per share basis, higher than average price-to-earnings, price-to-book value, and price-to-sales ratios and lower than average dividend yields. A large body of evidence supports the premise that investors consistently overestimate the prospects of growth companies and underestimate the prospects of value companies. As a result, value stocks appear to generate anomalously high returns compared to growth stocks.

20 For example, Banz (1981) and Fama and French (1992).

Numerous studies show that low price-to-book value ratios (high book value to price ratios) are reasonably consistent predictors of future value.[21] A low price-to-earnings ratio (P/E) is another attribute that tends to correlate anomalously with outperformance. Several studies show that low P/E stocks outperform both high P/E stocks and the market in general.[22] Securities with low price-to-sales ratios also appear to exhibit fundamentally anomalous performance. O'Shaughnessy (1996) demonstrates that stocks with low price-to-sales ratios outperform stocks with high price-to-sales ratios as well as stocks in general. He believes that the price-to-sales ratio is the strongest single determinant of excess return. These studies appear to support the existence of a market anomaly.

However, other studies, including Fama and French (1995, 2008), contend that the studies on value investing do not identify anomalies but rather are a function of incomplete models of asset pricing. Fama and French, for example, propose a three-factor model as a more complete model than the capital asset pricing model (CAPM) to predict stock returns. The proposed model includes a market risk premium as in the CAPM, size of the firm based on equity market value, and the ratio of the firm's book value of equity to market value of equity. The latter two factors proxy for sensitivity to risk, and thus their inclusion is consistent with the rational pricing of stocks. The apparent size and value stock anomalies may be a function of incomplete models being used in testing for inefficiency rather than actual anomalies.

4.1.3.2 Technical Anomalies A technical anomaly is an irregularity that emerges when one considers past prices and volume levels. Technical analysis encompasses a number of techniques that attempt to forecast securities prices by studying past prices and volume levels. Common technical analysis strategies are based on relative strength and moving averages, as well as on support and resistance. For example, Brock, Lakonishok, and LeBaron (1992) analyze moving averages and trading range breaks on the Dow Jones Industrial Index from 1897 to 1985. The technical rules addressed in the study are:

- *Moving Averages.* Buy and sell signals are generated by the crossing of a short moving average with a long moving average. When the short moving average moves above (below) the long moving average, the signal is to buy (sell). They test long moving averages of 50, 150, and 200 days with short moving averages of 1, 2, and 5 days.
- *Trading Range Break (Support and Resistance).* A buy signal is generated when the price penetrates the resistance level, and a sell signal is generated when the price penetrates the support level. Brock et al. test support and resistance based on past 50, 150, and 200 days with signals generated when a maximum or minimum is violated by 1 percent. They then compute 10-day holding period returns following the buy and sell signals.

The authors conclude that the "results are consistent with technical rules having predictive power." However, they warn that transaction costs may reduce the benefits of trading based on technical anomalies. Numerous other researchers dispute the validity of technical analysis. These researchers believe that prices adjust rapidly to new stock market information and that technical analysis is unlikely to provide any advantage to investors who use it. However, proponents of technical analysis continue to argue the validity of certain technical strategies.

---

21 For example, Stattman (1980); Rosenberg, Reid, and Lanstein (1985); Chan, Hamao, and Lakonishok (1991); Fama and French (1992); and Lakonishok, Shleifer, and Vishny (1994).

22 See Ball (1978); Basu (1983); Jaffe, Keim, and Westerfield (1989); Chan, Hamao, and Lakonishok (1991); and Fama and French (1992).

4.1.3.3 Calendar Anomalies A calendar anomaly is an irregularity identified when patterns of trading behavior that occur at certain times of the year are considered. A well known calendar anomaly is the January effect. Historically, stocks in general—and small stocks, in particular—have delivered abnormally high returns during the month of January. Haugen and Jorion, two researchers on the subject, note that "The January Effect is, perhaps, the best known example of anomalous behavior in security markets throughout the world."[23] The January effect is particularly interesting because it has not disappeared despite being well known for 25 years. Arbitrage theory tells us that anomalies should disappear as traders attempt to exploit them in advance.

Some studies have shown that stocks earn higher returns on the last day and first four days of each month—the turn-of-the-month effect. Hensel and Ziemba (1996) examined returns of the S&P 500 over a 65-year period and found that US large-cap stocks consistently generate higher returns at the turn of the month. In fact, they found "that the total return from the S&P 500 over this sixty-five-year period was received mostly during the turn of the month." The study implies that investors making regular stock purchases may benefit by scheduling those purchases prior to the turn of the month.

4.1.3.4 Anomalies: Conclusion Support exists for both efficient markets and anomalous markets. Studies that claim to identify anomalies are often critiqued for their use of an assumed pricing model. When an assumed pricing model is used, it is impossible to say if the observed results are indicative of a true anomaly or simply a consequence of using an incorrect pricing model. In reality, markets are neither perfectly efficient nor completely anomalous; market efficiency is not black or white, but rather gray. In markets exhibiting substantial inefficiency, sophisticated investors may be able to outperform less savvy participants. Many analysts believe that such US large-capitalization stocks as GE and Microsoft are quite efficient, but US small-capitalization and international stocks offer more opportunities for outperformance. Alternative investment markets, such as real estate and venture capital markets, may be less efficient. They lack fluid and continuous prices, and information asymmetries may exist between market participants. This may restrict arbitrage from pricing away market inefficiencies.

4.1.3.5 Limits to Arbitrage Shleifer and Vishny (1997) develop a theory of limited arbitrage. They assume that implicit restrictions are placed on a fund's ability to arbitrage by investors' ability to withdraw their money. The potential for withdrawal of money imposes limits on the ability of the fund to take advantage of arbitrage situations in which two securities are not rationally priced (priced at intrinsic or fundamental value based on all available information), because securities' prices may remain in a non-equilibrium (irrational) state for long periods of time. In other words, when a firm or portfolio manager is viewed as incompetent or simply wrong about a trade, because certain securities remain irrationally priced for extended periods of time, investors may withdraw their money before the irrational pricing corrects itself and the position may have to be closed prematurely. In his 2010 book "The Big Short," Michael Lewis describes the situation where a hedge fund manager, Michael Burry, was criticized for years by his investors and backers for holding credit default swaps on sub-prime mortgages (effectively shorting the sub-prime housing market) only to have the investment pay off handsomely in the end. His ability to impose restrictions on withdrawal of money from his fund was the only reason he was able to make his investment strategy pay off.

Shleifer and Vishny's theory of limited arbitrage is in stark contrast to the EMH, which assumes that whenever mispricing of a publicly traded stock occurs, an opportunity for arbitrage profit is created for rational traders who should act on those opportunities, resulting in rational pricing (efficient markets). Why might rational traders

23 Haugen and Jorion (1996).

choose not to act on observed opportunities? If market participants are engaged in highly leveraged arbitrage trades and prices move against them and stay there for an extended time before returning to intrinsic value, they may eventually need to liquidate prior to realizing the gains expected to result from the prices moving to intrinsic value. In the professional money management business, clients may demand liquidity before a manager's strategy is fully implemented and a successful outcome is realized. To deliver funds, the manager may have to sell or close out positions at a loss. The possibility of an extended period of mispricing and the potential need for liquidity makes market participants less prone to take advantage of arbitrage opportunities. This action has the tendency to exacerbate the problem of pricing inefficiency.

Implicit in the limits to the arbitrage idea is that the EMH does not hold. Specifically, if market participants are engaged in highly leveraged arbitrage trades and prices move against them and stay there irrationally before returning to fundamental value, they may eventually need to liquidate prior to realizing the gains expected to result from the prices moving to fundamental value. Rational traders often work for professional asset management firms and invest other peoples' money. If they engage in arbitrage in reaction to a stock mispricing and the mispricing persists for an extended period, clients of the money management firm can (and do) withdraw their funds. The clients are not willing to wait for the manager's expectations to be met. To deliver funds, the manager must unwind positions at a loss. This is a reason for the restrictions placed on hedge fund withdrawals (i.e., lock-up periods).

4.2 Traditional Perspectives on Portfolio Construction

From a traditional finance perspective, a "rational" portfolio is one that is mean–variance efficient. The appropriate portfolio for an investor is constructed holistically by considering the investor's tolerance for risk, investment objectives, investment constraints, and investor circumstances. An investor will typically take or administer a risk tolerance questionnaire, document financial goals and constraints, and then adopt the output of a mean–variance model (optimized using software or human judgment) that matches the investor's risk tolerance category and accomplishes the investor's financial goals. In the case of institutional investors, they will consider these items from the perspective of the entity they are acting on behalf of. An investment adviser will consider these items from the perspective of the client when developing investment policy statements and asset allocations. Subject to investment objectives and constraints, a suitable portfolio is chosen from the opportunity set of mean–variance efficient portfolios. The output of the mean–variance model may be considered as a "rational" or optimal portfolio allocation.

However, this approach to portfolio construction implicitly assumes that investors (or their advisers) have perfect information and that investors behave rationally in forming their portfolios. If these assumptions do not apply, then portfolios may be constructed using other approaches resulting in portfolios that have too much or too little risk when compared to the optimal portfolio. Further, although a portfolio based on mean–variance optimization may be theoretically sound, it may fail to meet the needs of the investor because of behavioral considerations.

4.3 Alternative Models of Market Behavior and Portfolio Construction

The traditional finance perspective of market behavior may not satisfactorily explain observed market behavior and portfolio construction, but a significant challenge also exists for behavioral finance. There is no single unifying theory of behavioral finance to explain the observed market behaviors. In the absence of such a theory, supporters

of traditional finance perspectives contend that the traditional finance perspectives remain superior to behavioral finance perspectives. A number of behavioral models have been advanced, but none has yet been accepted as presenting a complete or unifying description of market behavior. Four of the behavioral models advanced to explain market behavior and portfolio construction are discussed in the following sections. None of these models has yet achieved the kind of general acceptance among finance practitioners and academics that the EMH and mean–variance portfolio construction models have.

4.3.1 *A Behavioral Approach to Consumption and Savings*

Shefrin and Thaler (1988) propose an alternative to the traditional life-cycle model in which people are assumed to spend and save money rationally to achieve an optimal short-term and long-term consumption plan. They developed a behavioral life-cycle theory that incorporates self-control, mental accounting, and framing biases. In the traditional life-cycle model, self-control allows people to pursue long-term goals rather than focus on short-term satisfaction. In behavioral finance, the self-control bias recognizes that people may focus on short-term satisfaction to the detriment of long-term goals. Mental accounting is the phenomenon whereby people treat one sum of money differently from another sum of money even though money is fungible (interchangeable). Framing bias results in different responses based on how questions are asked (framed).

Shefrin and Thaler suggest that people classify their sources of wealth into three basic accounts: current income, currently owned assets, and the present value of future income. This mental accounting exists even though money is fungible. Mental accounting is a partial response to the issue of self-control. By classifying some wealth so that it is considered less available, it is less likely to be consumed in the short-term. People are assumed to be most likely to spend from current income (high marginal propensity to consume) and least likely to spend based on expectations of future income (low marginal propensity to consume). In other words, people lack self-control when it comes to current income. Any current income that is saved is reclassified as current assets or future income. The portion saved will increase with income. As Shefrin and Thaler indicated, "To the poor, saving is a luxury." Mental accounting and framing help people accommodate the competing goals of short-term gratification and long-term benefits. Rather than viewing money (their wealth) as fungible, people tend to frame their expenditure decisions taking into account the source of the wealth.

Individuals are hypothesized to first spend current income, then to spend based on current assets, and finally to spend based on future income. These propensities to consume have a variety of implications. For example, people may save a higher proportion of bonus income because they may classify bonus income as a current asset rather than current income and thus have a lower marginal propensity to consume it. If a government cuts taxes but does not reduce withholding rates, the ensuing tax refunds may be treated as current assets rather than current income. This may result in greater savings than if the tax reduction had been treated as current income. When spending from current assets, liquidity and maturity are taken into account. Basically, such short-term liquid assets as cash and checking accounts are liquidated first to finance current expenditures. Long-term, less-liquid assets, such as homes and retirement savings, are less likely to be used to finance current expenditures. However, individuals who view home equity as part of current assets are more likely to take out loans based on their home's value to finance current consumption than individuals who view their home as part of their retirement assets or future income. Similarly, individuals who classify pension assets as current assets rather than as a source of future retirement income are more prone to take loans against or spend their pension assets.

Shefrin and Thaler hypothesize that individuals will spend, for current consumption, most of their current income, varying portions of their currently owned assets, and very little based on their expectations of future income. The consumption/saving (investment) decisions made when individuals are subject to self-control, mental accounting, and framing biases differ from those of the rational economic individuals of traditional finance. Although mental accounting and framing will result in some saving for long-term goals, the outcome will not necessarily match the optimal short-term and long-term consumption plan of traditional life-cycle models. As a result, individuals will not achieve their theoretically optimal short-term and long-term consumption opportunities. Knowledge of behavioral propensities may help people move closer to the optimal solutions of traditional finance.

4.3.2 *A Behavioral Approach to Asset Pricing*

Some researchers believe that market behaviors are better explained from a behavioral perspective than a traditional perspective, which assumes that perfectly rational investors make wealth-maximizing decisions at all times using all available information. They find the traditional perspective difficult to accept because they observe investors displaying biased behaviors that lead to less-than-optimal decisions.

Shefrin and Statman (1994) begin to develop an alternative to the classic capital asset pricing model. Shefrin (2005, 2008) develops the idea further and proposes a behavioral approach to asset pricing using models, which Shefrin terms behavioral stochastic discount factor-based (SDF-based) asset pricing models. Shefrin, based on the results of empirical tests, concludes that investors do not make their decisions in an unbiased way. The stochastic discount factor to reflect this bias is a function of investor sentiment relative to fundamental value. The model focuses on market sentiment as a major determinant of asset pricing, which in turn is derived from systematic errors in judgment committed by investors. Shefrin asserts that sentiment causes asset prices to deviate from values determined using traditional finance approaches.

In order to have a tractable behavioral approach to asset pricing, it is necessary to have a well-defined measure of sentiment with an impact that can be traced on market prices and risk premiums. Shefrin (2005) proposes that the dispersion of analysts' forecasts serves as a proxy for the sentiment risk premium in the model. In support of this theory, he cites Ghysels and Juergens (2004), who determine that dispersion of analysts' forecasts is statistically significant in a Fama–French multi-risk-factor framework. Alternatively, the dispersion of analysts' forecasts may be a systematic risk factor not accounted for by other factors in the model. Doukas, Kim, and Pantzalis (2004) find that value stocks earn higher returns than growth stocks because the dispersion of analysts' forecasts is greater for value stocks—which supports dispersion of opinion as a measure for a source of risk.

Shefrin develops a stochastic process for sentiment and a fundamental SDF-based asset-pricing equation. The price of an asset is the expected value of its discounted payoffs. The discount rate captures the effects of the time value of money, fundamental risk, and sentiment risk. Sentiment pertains to erroneous, subjectively determined beliefs. If an investor's subjective beliefs about the discount rate match those of traditional finance, the investor is said to have zero risk sentiment. If an investor's subjective beliefs about the discount rate do not match those of traditional finance, the investor's beliefs are said to include risk sentiment. Thus, the discount rate on a security is the sum of the risk-free rate and fundamental premiums (corresponding to efficient prices) and a sentiment premium (reflecting sentiment-based risk).[24]

24 See Shefrin (2008).

Although Shefrin cites evidence that investors commit errors that result in inefficient prices in the aggregate, it is important to determine if these errors are either systematic or essentially random in nature. If they are systematic, then the errors may be predicted and exploited to earn excess returns. A logical assumption, in that case, is that rational and informed investors—however few in number—would act on these inefficiencies and thereby limit the scope of the pricing errors. If investors' errors are random in nature, however, then observing and modeling them presents a formidable challenge, as indicated in the original work by Shefrin and Statman (1994).

4.3.3 *Behavioral Portfolio Theory*

Shefrin and Statman (2000) extend their 1994 work to develop behavioral portfolio theory (BPT). BPT uses a probability-weighting function rather than the real probability distribution used in Markowitz's portfolio theory (1952). The optimal portfolio under BPT can differ from the perfectly diversified portfolio of Markowitz. In Markowitz's portfolio theory, risk-averse investors construct diversified portfolios based on mean–variance analysis and consideration of the covariance between assets. They are concerned about the expected return and variance of the portfolio as a whole. In behavioral portfolio theory, however, investors construct their portfolios in layers and expectations of returns and attitudes toward risk vary between the layers. The resulting portfolio may appear well-diversified, but diversification is incidental to and not necessarily an objective of the portfolio construction.

Shefrin and Statman contend that portfolio construction is primarily a function of five factors. First, the allocation to different layers depends on investor goals and the importance assigned to each goal. For example, if high importance is assigned to an upside potential goal, then the allocation of funds to the layer with the highest upside potential will be greater than if high importance is attached to minimizing potential downside losses. Second, the allocation of funds within a layer to specific assets will depend on the goal set for the layer. If a higher goal is set, then the assets selected for the layer are likely to be riskier or more speculative in nature. Third, the number of assets chosen for a layer depends on the shape of the investor's utility function. Risk-averse individuals have concave utility functions, meaning that utility increases at a decreasing rate with increases in wealth (diminishing marginal utility of wealth). The greater the concavity of the utility curve, the earlier the satiation for a specific security. Thus, the greater the concavity of the utility curve, the greater the number of securities included in a layer. Fourth, concentrated positions in some securities may occur if investors believe they have an informational advantage with respect to the securities. Fifth, investors reluctant to realize losses may hold higher amounts of cash so that they do not have to meet liquidity needs by selling assets that may be in a loss position. Further, the portfolios of investors reluctant to realize losses may continue to hold some securities not because of the securities' potential, but rather because of the investor's aversion to realize losses. Although the resulting portfolios may appear well-diversified, they may not, in fact, be well-diversified from a mean–variance perspective. In other words, the portfolio may not be mean–variance efficient.

Shefrin and Statman explain how BPT is consistent with the apparently irrational behavioral tendency of many people to purchase insurance policies and also buy lottery tickets, as discussed in Friedman and Savage (1948). A BPT investor maximizes expected wealth subject to the constraint that the probability of the wealth being less than some aspirational level cannot exceed some specified probability. A BPT investor can tolerate failure to achieve at least the aspirational level of wealth but only with a small probability. In other words, the investor maximizes expected wealth on a particular portfolio subject to a safety constraint. As a result, the optimal portfolio of a BPT investor is a combination of bonds or riskless assets and highly speculative assets. The BPT investor is essentially constructing a portfolio equivalent to an insurance policy and a lottery ticket.

In the first layer, the investor seeks safety by buying bonds or riskless assets in order to insure his aspirational level of wealth with a small maximum chance of failure. In the second layer, the investor is willing to take risk with the residual wealth. In consequence, a BPT-optimal portfolio can differ from the rational diversified portfolio that is mean–variance efficient. In the BPT model, risk aversion is taken into account by the constraint that limits the risk of failing to achieve the aspirational level of wealth.

EXAMPLE 3

Behavioral Portfolio Theory

Two BPT investors are developing portfolios. The portfolios will contain at most three layers: a layer of riskless investments, a layer of moderately risky investments, and a layer of highly risky speculative investments. The riskless investments (layer 1) are expected to return 1 percent; the moderately risky investments (layer 2) are expected to return –3 percent with 10 percent probability, 5 percent with 80 percent probability, and 9 percent with 10 percent probability; and the speculative investments (layer 3) are expected to return –50 percent with 15 percent probability, 12 percent with 50 percent probability, and 75 percent with 35 percent probability.

The first BPT investor has 2,000,000 euros and an aspirational level of 2,000,000 euros with a probability of 100 percent. In other words, this BPT investor will not tolerate any loss in wealth. The second BPT investor has 2,000,000 euros and an aspirational level of 2,100,000 euros with a probability of 80 percent. Further, this investor can tolerate some potential loss in wealth but cannot tolerate the portfolio declining below 1,800,000 euros. Construct the BPT optimal portfolio for each investor.

Solution:

The first BPT investor's portfolio will be approximately 100 percent in the layer of riskless investments given the inability to tolerate any losses. The second BPT investor has an aspirational level of return of 5 percent (100,000 euros). Given the safety level and a maximum potential loss of 50 percent on the speculative assets, the investor may put approximately 1,568,627 euros in layer 1 and 431,373 euros in layer 3. This portfolio will result in an expected return of 6.123 percent.

	Allocation	Expected Return	Portfolio Return
Layer 1	78.43%	1.00%	0.784%
Layer 2	0.00%	4.60%	0.000%
Layer 3	21.57%	24.75%	5.339%
Total	100.00%		6.123%

This portfolio will result in 1,800,000 euros with 15 percent probability, 2,067,451 euros with 50 percent probability, and 2,339,216 euros with 35 percent probability. The safety objective is met, but the portfolio is short of the aspirational goal. The portfolio will result in at least 2,067,451 euros with 85 percent probability rather than 2,100,000 euros with 80 percent probability. Based on risk tolerance, the investor may decide this is acceptable or may decide to lower her safety level objective.

(*Note*: The resulting portfolios are not necessarily mean–variance efficient because no consideration is given to the covariance of the investment layers.)

4.3.4 *Adaptive Markets Hypothesis*

Lo (2004) proposes the **adaptive markets hypothesis** (AMH). The AMH applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives. Similar to factors that influence an ecological system, markets are influenced by competition for scarce resources and the adaptability of participants. The greater the competition for scarce resources or in markets for profits and the less adaptable the participants, the greater the likelihood of not surviving. Following are two examples that have been simplified but serve to demonstrate the ideas behind the AMH. In a natural example, pandas are extremely non-adaptable, eating only bamboo. This reduces the likelihood of pandas surviving in significant numbers outside of protected settings. In a financial example, Long-Term Capital Management (LTCM) was faced with increasing competition that used the same arbitrage techniques as LTCM did. Rather than adapting and changing techniques, LTCM increased leverage and ultimately faced the possibility of non-survival.

Lo notes that biases identified by those researching in behavioral finance may be consistent with the AMH. These biases are simply the result of applying previously learned heuristics to a changed environment where they no longer work. The successful participant will adapt to the changed environment and develop new heuristics. Success is defined as survival rather than as having maximized expected utility.

Behavior of market participants is not necessarily that of a REM, but is rather behavior that is perceived to result in less-than-optimal rational outcomes. Lo discusses this in the context of Simon's notions of bounded rationality and satisficing.[25] As a result of informational, intellectual, and computational limitations, individuals use judgment to gather sufficient information, to adequately process the information, to identify with satisfactory sub-goals and limited objectives rather than try to achieve an optimum, and to make decisions that meet these sub-goals and objectives. Applying an evolutionary perspective to Simon's framework provides useful insights. For example, the choice of satisfactory goals is determined through trial and error, which can be viewed as equivalent to a process of natural selection. As experience increases, individuals learn and the heuristics they apply to a situation evolve. As these heuristics based on past experiences are applied to new situations, they may or may not be appropriate and additional learning takes place.

The AMH is a revised version of the EMH that considers bounded rationality, satisficing, and evolutionary principles. Under the AMH, individuals act in their own self-interest, make mistakes, and learn and adapt; competition motivates adaptation and innovation; and natural selection and evolution determine market dynamics. Five implications of the AMH are: 1) The relationship between risk and reward varies over time (risk premiums change over time) because of changes in risk preferences and such other factors as changes in the competitive environment; 2) active management can add value by exploiting arbitrage opportunities; 3) any particular investment strategy will not consistently do well but will have periods of superior and inferior performance; 4) the ability to adapt and innovate is critical for survival; and 5) survival is the essential objective. In other words, recognizing that things change, the survivors will be those who successfully learn and adapt to changes.

25 See Simon (1957).

SUMMARY

With its simplifying assumption of rational investors and efficient markets, traditional finance has gained wide acceptance among academics and investment professionals as a guide to financial decision making. Over time, however, the limitations of traditional finance have become increasingly apparent. Individual decision making is not nearly as objective and intellectually rigorous, and financial markets are not always as rational and efficiently priced as traditional finance assumes. To bridge this gap between theory and practice, behavioral finance approaches decision making from an empirical perspective. It identifies patterns of individual behavior without trying to justify or rationalize them.

A practical integration of behavioral and traditional finance may lead to a better outcome than either approach used in isolation. By knowing how investors should behave and how investors are likely to behave, it may be possible to construct investment solutions that are both more rational from a traditional perspective and, because of adjustments reflecting behavioral insights, easier to accept and remain committed to. Although these behavioral insights will not lead easily or automatically to superior results, it is hoped that they will help many improve their investment approach and enhance risk management.

Among the points made in this reading are the following:

- Traditional finance assumes that investors are rational: Investors are risk-averse, self-interested utility-maximizers who process available information in an unbiased way.
- Traditional finance assumes that investors construct and hold optimal portfolios; optimal portfolios are mean–variance efficient.
- Traditional finance hypothesizes that markets are efficient: Market prices incorporate and reflect all available and relevant information.
- Behavioral finance makes different (non-normative) assumptions about investor and market behaviors.
- Behavioral finance attempts to understand and explain observed investor and market behaviors; observed behaviors often differ from the idealized behaviors assumed under traditional finance.
- Behavioral biases are observed to affect the financial decisions of individuals.
- Bounded rationality is proposed as an alternative to assuming perfect information and perfect rationality on the part of individuals: Individuals are acknowledged to have informational, intellectual, and computational limitations and as a result may satisfice rather than optimize when making decisions.
- Prospect theory is proposed as an alternative to expected utility theory. Within prospect theory, loss aversion is proposed as an alternative to risk aversion.
- Markets are not always observed to be efficient; anomalous markets are observed.
- Theories and models based on behavioral perspectives have been advanced to explain observed market behavior and portfolio construction.
- One behavioral approach to asset pricing suggests that the discount rate used to value an asset should include a sentiment risk premium.
- Behavioral portfolio theory suggests that portfolios are constructed in layers to satisfy investor goals rather than to be mean–variance efficient.

- The behavioral life-cycle hypothesis suggests that people classify their assets into non-fungible mental accounts and develop spending (current consumption) and savings (future consumption) plans that, although not optimal, achieve some balance between short-term gratification and long-term goals.
- The adaptive markets hypothesis, based on some principles of evolutionary biology, suggests that the degree of market efficiency is related to environmental factors characterizing market ecology. These factors include the number of competitors in the market, the magnitude of profit opportunities available, and the adaptability of the market participants.
- By understanding investor behavior, it may be possible to construct investment solutions that will be closer to the rational solution of traditional finance and, because of adjustments reflecting behavioral insights, easier to accept and remain committed to.

REFERENCES

Ball, R. 1978. "Anomalies in Relationships between Securities' Yields and Yield-Surrogates." *Journal of Financial Economics*, vol. 6:103–126.

Banz, R.W. 1981. "The Relationship between Return and Market Value of Common Stocks." *Journal of Financial Economics*, vol. 9:3–18.

Basu, Sanjoy. 1983. "The Relationship between Earnings Yield, Market Value, and Return for NYSE Common Stocks: Further Evidence." *Journal of Financial Economics*, vol. 12:129–156.

Bernanke, Ben S. 2009. Commencement of the Boston College School of Law. Newton, MA (22 May).

Bernoulli, Daniel. 1954. (originally published in 1738). "Exposition of a New Theory on the Measurement of Risk." *Econometrica: Journal of the Econometric Society*, vol. 22, no. 1:23–36.

Brock, William, Josef Lakonishok, and Blake LeBaron. 1992. "Simple Technical Trading Rules and the Stochastic Properties of Stock Returns." *Journal of Finance*, vol. 47, no. 5 (December):1731–1764.

Chan, L., Y. Hamao, and Josef Lakonishok. 1991. "Fundamentals and Stock Returns in Japan." *Journal of Finance*, vol. 46, no. 5 (December):1739–1764.

Cowles, Alfred. 1933. "Can Stock Market Forecasters Forecast?" *Econometrica: Journal of the Econometric Society*, vol. 1:309–324.

Doukas, John, Chansog (Francis) Kim, and Christos Pantzalis. 2004. "Divergent Opinions and the Performance of Value Stocks." *Financial Analysts Journal*, vol. 60, no. 6:55–64.

Fama, Eugene F. 1965. "Random Walks in Stock Market Prices." *Financial Analysts Journal*, vol. 21, no. 5 (September/October):55–59.

Fama, Eugene F., M. Jensen, L. Fisher, and R. Roll. 1969. "The Adjustment of Stock Prices to New Information." *International Economic Review*, vol. 10, no. 1 (February):1–21.

Fama, Eugene F. 1970. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance*, vol. 25, no. 2 (May):383–417.

Fama, Eugene F., and Kenneth R. French. 1992. "The Cross-Section of Expected Stock Returns." *Journal of Finance*, vol. 47, no. 2 (June):427–465.

Fama, Eugene F., and Kenneth R. French. 1995. "Size and Book-to-Market Factors in Earnings and Returns." *Journal of Finance*, vol. 50:131–155.

Fama, Eugene F., and Kenneth R. French. 2008. "Average Returns, B/M, and Share Issues." *Journal of Finance*, vol. 63:2971–2995.

Fox, Justin. 2009. *The Myth of the Rational Market*. New York: HarperCollins.

Friedman, M., and L. J. Savage. 1948. "The Utility Analysis of Choices Involving Risk." *Journal of Political Economy*, vol. 56, no. 4 (August):279–304.

Ghysels, E., and J. Juergens. 2004. "Do Heterogeneous Beliefs Matter for Asset Pricing?" Working Paper, University of North Carolina.

Glimcher, Paul. 2003. *Decisions, Uncertainty, and the Brain: The Science of Neuroeconomics*. Cambridge, MA: MIT Press.

Grossman, Sanford J., and Joseph E. Stiglitz. 1980. "On the Impossibility of Informationally Efficient Markets." *American Economic Review*, vol. 70, no. 3:393–408.

Gul, F., and W. Pesendorfer. 2008. "The Case for Mindless Economics." In *The Foundations of Positive and Normative Economics*. A. Caplin and A. Schotter, eds. New York: Oxford University Press.

Haugen, Robert, and Philippe Jorion. 1996. "The January Effect." *Financial Analysts Journal*, vol. 52, no. 1 (January/February):27–31.

Hensel, C., and W. Ziemba. 1996. "Investment Results from Exploiting Turn-of-the-Month Effects." *Journal of Portfolio Management*, vol. 22, no. 3 (Spring):17–23.

Jaffe, J., D. Keim, and R. Westerfield. 1989. "Earnings Yields, Market Values, and Stock Returns." *Journal of Finance*, vol. 44, no. 1 (March):135–148.

Jensen, Michael C. 1967. "The Performance of Mutual Funds in the Period 1945–1964." *Journal of Finance*, vol. 23, no. 2:389–416.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica: Journal of the Econometric Society*, vol. 47, no. 2 (March):263–291.

Keynes, John Maynard. 1936. *The General Theory of Employment, Interest, and Money*. New York: Harcourt, Brace.

Knight, Frank. 1921. *Risk, Uncertainty, and Profit*. Boston: Beard Books.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny. 1994. "Contrarian Investment, Extrapolation, and Risk." *Journal of Finance*, vol. 49, no. 5:1541–1578.

Lamont, Owen A., and Richard H. Thaler. 2003. "Can the Market Add and Subtract? Mispricing in Tech Stock Carve-Outs." *Journal of Political Economy*, vol. 111, no. 2:227–268.

Lewis, Michael. 2010. *The Big Short*. New York: W.W. Norton & Company.

Lo, Andrew. 2004. "The Adaptive Markets Hypothesis." *Journal of Portfolio Management*, vol. 30, no. 5 (30th anniversary issue):15–29.

Malkiel, Burton. 1973. *A Random Walk Down Wall Street*. New York: W.W. Norton & Company.

Markowitz, Harry. 1952. "Portfolio Selection." *Journal of Finance*, vol. 7, no. 1:77–91.

O'Shaughnessy, James P. 1996. *What Works on Wall Street*. Columbus, OH: McGraw-Hill.

Raiffa, Howard. 1997. *Decision Analysis: Introductory Readings on Choices under Uncertainty*. Columbus, OH: McGraw-Hill.

Roberts, Harry V. 1959. "Stock-Market 'Patterns' and Financial Analysis: Methodological Suggestions." *Journal of Finance*, vol. 14, no. 1.

Rosenberg, B., K. Reid, and R. Lanstein. 1985. "Persuasive Evidence of Market Inefficiency." *Journal of Portfolio Management*, vol. 11:9–17.

Samuelson, Paul A. 1937. "A Note on Measurement of Utility." *Review of Economic Studies*, vol. 4, no. 2 (February).

Samuelson, Paul A. 1965. "Proof That Properly Anticipated Prices Fluctuate Randomly." *Industrial Management Review*, vol. 6, no. 2:41.

Savage, L.J. 1954. *The Foundation of Statistics*. New York: John Wiley.

Shefrin, Hersh. 2005. *A Behavioral Approach to Asset Pricing*. Burlington, MA: Elsevier.

Shefrin, Hersh. 2008. "Risk and Return in Behavioral SDF-Based Asset Pricing Models." *Journal of Investment Management*, vol. 6, no. 3:1–18.

Shefrin, Hersh, and Meir Statman. 1994. "Behavioral Capital Asset Pricing Theory." *Journal of Financial and Quantitative Analysis*, vol. 29:323–349.

Shefrin, Hersh, and Meir Statman. 2000. "Behavioral Portfolio Theory." *Journal of Financial and Quantitative Analysis*, vol. 35, no. 2.

Shefrin, Hersh, and Richard Thaler. 1988. "The Behavioral Life-Cycle Hypothesis." *Economic Inquiry*, vol. 26, no. 4:609–643.

Shleifer, Andrei, and Robert W. Vishny. 1997. "The Limits of Arbitrage." *Journal of Finance*, vol. 52, no. 1 (March):35–55.

Simon, Herbert A. 1957. *Models of Man: Social and Rational*. New York: John Wiley and Sons.

Simon, Herbert A. 1991. *Models of My Life*. New York: Basic Books.

Simon, Herbert A. 1996. *The Sciences of the Artificial*. 3rd ed. Cambridge, MA: MIT Press.

Statman, Meir. 1999. "Behavioral Finance: Past Battles and Future Engagements." *Financial Analysts Journal*, vol. 55, no. 6 (November/December):18–27.

Stattman, D. 1980. "Book Values and Stock Returns." *The Chicago MBA: A Journal of Selected Papers*, vol. 4:25–45.

Thaler, Richard. 2009. "Markets Can Be Wrong and the Price Is Not Always Right." *Financial Times* (4 August).

von Neumann, John, and Oskar Morgenstern. 1944. *Theory of Games and Economic Behavior*. Princeton, NJ: Princeton University Press.

PRACTICE PROBLEMS

The following information relates to Questions 1–6

Mimi Fong, CFA, a private wealth manager with an asset management firm, has been asked to make a presentation to her colleagues comparing traditional and behavioral finance. She decides to enliven her presentation with statements from colleagues and clients. These statements are intended to demonstrate some key aspects of and differences between traditional and behavioral finance.

Statement 1 (from a colleague): "When new information on a company becomes available, I adjust my expectations for that company's stock based on past experiences with similar information."

Statement 2 (from a client): "When considering investments, I have always liked using long option positions. I like their risk/return tradeoffs. My personal estimates of the probability of gains seem to be higher than that implied by the market prices. I am not sure how to explain that, but to me long options provide tremendous upside potential with little risk, given the low probability of limited losses."

Statement 3 (from a client): "I have always followed a budget and have been a disciplined saver for decades. Even in hard times when I had to reduce my usual discretionary spending, I always managed to save."

Statement 4 (from a colleague): "While I try to make decisions analytically, I do believe the markets can be driven by the emotions of others. So I have frequently used buy/sell signals when investing. Also, my 20 years of experience with managers who actively trade on such information makes me think they are worth the fees they charge."

Statement 5 (from a colleague): "Most of my clients need a well-informed advisor to analyze investment choices and to educate them on their opportunities. They prefer to be presented with three to six viable strategies to achieve their goals. They like to be able to match their goals with specific investment allocations or layers of their portfolio."

Statement 6 (from a client): "I follow a disciplined approach to investing. When a stock has appreciated by 15 percent, I sell it. Also, I sell a stock when its price has declined by 25 percent from my initial purchase price."

Statement 7 (from a client): "Overall, I have always been willing to take a small chance of losing up to 8 percent of the portfolio annually. I can accept any asset classes to meet my financial goals if this

© 2011 CFA Institute. All rights reserved.

constraint is considered. In other words, an acceptable portfolio will satisfy the following condition: Expected return – 1.645 × Expected standard deviation ≥ –8%."

1 Which of the following statements is *most* consistent with expected utility theory?

A Statement 1.

B Statement 2.

C Statement 3.

2 Which of the following statements *most likely* indicates a belief that technical anomalies exist in the capital markets?

A Statement 2.

B Statement 4.

C Statement 6.

3 Statement 4 is *most* consistent with:

A the adaptive markets hypothesis.

B a behavioral approach to asset pricing.

C Savage's subjective expected utility theory.

4 The clients of Statement 5 *most likely* exhibit:

A loss-aversion.

B bounded rationality.

C mental accounting bias.

5 The client of Statement 6 is *most likely* behaving consistently with:

A prospect theory.

B expected utility theory.

C behavioral portfolio theory.

6 The client of Statement 7 would *most likely* agree with which of the following statements?

A I strive for a mean–variance efficient portfolio.

B I construct my portfolio in layers to meet my goals.

C I am loss-averse and have a value function that is steeper for losses than gains.

SOLUTIONS

1 C is correct. Statement 3 is most consistent with expected utility theory. The client exhibits self-control and is able to defer consumption. This client is considering short-term and long-term goals and attempting to maximize the present value of utility. In Statement 1, beliefs are being updated using heuristics rather than Bayes' formula. Statement 2 is consistent with prospect theory; the client is overweighting the probability of a high financial impact outcome (gains on options) and underweighting the probability of a loss (the option premium cost).

2 B is correct. Statement 4 indicates the belief that buy/sell signals can be used to earn excess returns.

3 B is correct. Statement 4 indicates that markets can be influenced by the emotions of others (sentiment). This is consistent with a behavioral approach to asset pricing that includes sentiment such as the behavioral stochastic discount factor-based asset pricing model proposed by Shefrin.

4 C is correct. The clients discussed in Statement 5 exhibit mental accounting bias because they consider their portfolio by matching its layers to goals. The clients may not have time themselves to examine the investment universe and arrive at optimal solutions, but they rely on their adviser to do this for them. Thus, they do not exhibit bounded rationality.

5 C is correct. The client of Statement 6 is behaving consistently with behavioral portfolio theory. The client sells and holds a stock not because of the stock's potential, but rather from a fear of the stock declining in value and gains dissipating and an aversion to realizing losses. Loss-aversion in prospect theory is discussed from a different perspective.

6 A is correct. The client is expressing a portfolio goal that considers expected return and standard deviation. This is consistent with traditional finance and the client is likely to prefer a mean–variance efficient portfolio. There is nothing in the statement that indicates loss-aversion as opposed to risk-aversion or a preference for constructing a portfolio in layers.

CUSTOMER SERVICE

68

READING

6

The Behavioral Biases of Individuals

by Michael M. Pompian, CFA

Michael M. Pompian, CFA (USA)

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** distinguish between cognitive errors and emotional biases;
☐	**b.** discuss commonly recognized behavioral biases and their implications for financial decision making;
☐	**c.** identify and evaluate an individual's behavioral biases;
☐	**d.** evaluate how behavioral biases affect investment policy and asset allocation decisions and recommend approaches to mitigate their effects.

INTRODUCTION

1

Much of traditional economic and financial theory is based on the assumptions that individuals act rationally and consider all available information in the decision-making process and that markets are efficient. Behavioral finance challenges these assumptions and explores how individuals and markets actually behave. To differentiate the study of individual investor behavior from the study of collective market behavior, the subject of behavioral finance can be classified as **Behavioral Finance Micro** (BFMI) and **Behavioral Finance Macro** (BFMA).

BFMI examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance. BFMA detects and describes market anomalies that distinguish markets from the efficient markets of traditional finance. In this reading, we focus on BFMI and the behavioral biases that individuals may exhibit when making financial decisions. BFMI attempts to observe and explain how individuals make financial decisions. This approach is in contrast to traditional theories of financial decision making that describe how people *should* make decisions under uncertainty.

Many prominent researchers have demonstrated that when people are faced with complex decision-making situations that demand substantial time and effort, they have difficulty devising completely rational approaches to developing and analyzing

© 2011 CFA Institute. All rights reserved.

various courses of action. Facing uncertainty and an abundance of information to process, individuals may not systematically describe problems, record necessary data, or synthesize information to create rules for making decisions. Instead, individuals may follow a more subjective, suboptimal path of reasoning to determine a course of action consistent with their basic judgments and preferences.

A decision maker may have neither the time nor the ability to arrive at a perfectly optimal decision. Individuals strive to make good decisions by simplifying the choices available, using a subset of the information available, and discarding some possible alternatives to choose among a smaller number. They are content to accept a solution that is "good enough" rather than attempting to find the optimal answer. In doing so, they may unintentionally bias the decision-making process. These biases may lead to irrational behaviors and decisions.

By understanding behavioral biases, investment professionals may be able to improve economic outcomes. This may entail identifying behavioral biases they themselves exhibit or behavioral biases of others, including clients. Once a behavioral bias has been identified, it may be possible to either moderate the bias or adapt to the bias so that the resulting financial decisions more closely match the rational financial decisions assumed by traditional finance. Knowledge of and integration of behavioral and traditional finance may lead to superior results.

Section 2 describes and broadly characterizes behavioral biases. Sections 3 and 4 discuss specific behavioral biases within two broad categories: cognitive errors and emotional biases. The discussion will include a description of the bias, potential consequences of the bias, detection of the bias, and guidance on moderating the effects of the bias. Section 5 considers the implications of behavioral biases for investment policy development and asset allocation decisions. A summary and practice problems conclude the reading.

2 CATEGORIZATIONS OF BEHAVIORAL BIASES

Dictionary definitions of bias include the following: a statistical sampling or testing error caused by systematically favoring some outcomes over others; a preference or an inclination, especially one that inhibits impartial judgment; an inclination or prejudice in favor of a particular viewpoint; an inclination of temperament or outlook, especially a personal and sometimes unreasoned judgment. In the context of this reading, we are considering biases that result in irrational financial decisions caused by faulty cognitive reasoning or reasoning influenced by feelings. The first dictionary definition of bias is consistent with faulty cognitive reasoning; the other three definitions are more consistent with reasoning influenced by feelings or emotions.

The simple categorization of distinguishing between biases based on faulty cognitive reasoning (**cognitive errors**) and those based on reasoning influenced by feelings or emotions (**emotional biases**) is used in this reading. Although researchers in the field of psychology have developed many different classifications and identifying factors to categorize and better understand biases, it is possible to see how each of these fit within the two categories. For example, psychologists' factors include cognitive information-processing shortcuts or heuristics, memory errors, emotional and/or motivational factors, and such social influences as family upbringing or societal culture. The first two are cognitive; the last two are emotional. Some biases identified by psychologists are understood in relation to human needs, such as those identified by Maslow (e.g., physiological, safety, social, esteem, and self-actualizing). In satisfying these needs, people will generally attempt to avoid pain and seek pleasure. The avoidance of pain can be as subtle as avoiding acknowledging mistakes in order to maintain a positive self-image. The biases that help to avoid pain and produce pleasure may be classified

as emotional. Other biases found by psychologists are attributed to the particular way the brain perceives, forms memories, and makes judgments; the inability to do complex mathematical calculations, such as updating probabilities; and the processing and filtering of information. These can be classified as cognitive.

In summary, cognitive errors stem from basic statistical, information-processing, or memory errors; cognitive errors may be considered the result of faulty reasoning. Emotional biases stem from impulse or intuition; emotional biases may be considered to result from reasoning influenced by feelings. Behavioral biases, regardless of their source, may cause decisions to deviate from the assumed rational decisions of traditional finance.

2.1 Differences between Cognitive Errors and Emotional Biases

In this reading, behavioral biases are classified as either cognitive errors or emotional biases. This distinction is not only simple and easily understood, but it also provides a useful framework for understanding how effectively biases can be corrected for. If we think of decision making as occurring along a spectrum from the totally rational decision making of traditional finance to purely emotional decision making, cognitive errors are basic statistical, information-processing, or memory errors that cause the decision to deviate from the rational decisions of traditional finance. Emotional biases arise spontaneously as a result of attitudes and feelings that can cause the decision to deviate from the rational decisions of traditional finance.

Cognitive errors are more easily corrected than emotional biases. Individuals are better able to adapt their behaviors or modify their processes if the source of the bias is logically identifiable, even if not completely understood. For instance, an individual may not understand the complex mathematical process to update probabilities but may comprehend that the process initially used was incorrect. Cognitive errors can also be thought of as "blind spots" or distortions in the human mind. Cognitive errors do not result from emotional or intellectual predispositions toward certain judgments, but rather from subconscious mental procedures for processing information. Because cognitive errors stem from faulty reasoning, better information, education, and advice can often correct for them. Thus, most cognitive biases can be "moderated"—to moderate the impact of a bias is to recognize it and attempt to reduce or even eliminate it within the individual.

Because emotional biases stem from impulse or intuition—especially personal and sometimes unreasoned judgments—they are less easily corrected. It is generally agreed that an emotion is a mental state that arises spontaneously rather than through conscious effort. Emotions are related to feelings, perceptions, or beliefs about elements, objects, or relations between them and can be a function of reality or the imagination. In the world of investing, emotions can cause investors to make suboptimal decisions. Emotions may be undesired to the individual feeling them; he or she may wish to control them but often cannot. Thus, it may only be possible to recognize an emotional bias and "adapt" to it. When a bias is adapted to, it is accepted and decisions are made that recognize and adjust for it (rather than making an attempt to reduce or eliminate it).

The cognitive–emotional distinction will help us determine when and how to adjust for behavioral biases in financial decision making. However, it should be noted that specific biases may have some common aspects and that a specific bias may seem to have both cognitive and emotional aspects. Researchers in financial decision making have identified numerous specific behavioral biases. This reading will not attempt to discuss all identified biases. Rather, this reading will discuss some of the more publicized and recognized biases within the cognitive–emotional framework. This framework

will be useful in developing an awareness of biases, their implications, and ways of moderating their impact or adapting to them. The intent is not to develop a list of biases to be memorized but rather to create an awareness of biases so that financial decisions and resulting economic outcomes are potentially improved.

In Sections 3 and 4, specific behavioral biases will be discussed. Cognitive errors will be discussed in Section 3 and emotional biases in Section 4. For each bias we will 1) describe the bias, including evidence supporting the existence of the bias; 2) describe the consequences of the bias; and 3) offer guidance on detecting and overcoming the bias. We will limit our focus to gauging the presence or absence—not the magnitude—of each bias discussed. That is, we will not try to measure how strongly the bias is exhibited, but rather we will describe the behavioral bias, its potential consequences, and the detection of and correction for the behavioral bias. In detecting a bias, we will identify statements or thought processes that may be indicative of the bias. Diagnostic tests of varying degrees of complexity are available to detect biases but are beyond the scope of this reading.[1]

3 COGNITIVE ERRORS

We will now review nine specific cognitive errors, their implications for financial decision making, and suggestions for correcting for them. We classify cognitive errors into two categories. The first category contains "belief perseverance" biases. In general, belief perseverance is the tendency to cling to one's previously held beliefs irrationally or illogically. The belief continues to be held and justified by committing statistical, information-processing, or memory errors. A second category of cognitive error has to do with "processing errors," describing how information may be processed and used illogically or irrationally in financial decision making.

The belief perseverance biases discussed are conservatism, confirmation, representativeness, illusion of control, and hindsight. The processing errors discussed are anchoring and adjustment, mental accounting, framing, and availability.

In this reading, the individuals of interest are "financial market participants" ("FMPs") engaged in financial decision making. These include both individual investors and financial services professionals.

3.1 Belief Perseverance Biases

Belief perseverance biases are closely related to the psychological concept of **cognitive dissonance**. Cognitive dissonance is the mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions. To resolve this dissonance, people may notice only information of interest (selective exposure), ignore or modify information that conflicts with existing cognitions (selective perception), or remember and consider only information that confirms existing cognitions (selective retention). Aspects of these behaviors are contained in the biases categorized as belief perseverance.

3.1.1 *Conservatism Bias*

Conservatism bias is a belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information. This bias has aspects of both statistical and information-processing errors. Academic studies have demonstrated that conservatism causes individuals to overweight initial beliefs about

1 Some diagnostic tests are included in *Behavioral Finance and Wealth Management* by Pompian (2006).

probabilities and outcomes and under-react to new information; they fail to modify their beliefs and actions to the extent rationally justified by the new information. In Bayesian terms, they tend to overweight the base rates[2] and underweight the new information, resulting in revised beliefs about probabilities and outcomes that demonstrate an underreaction to the new information. As a result of conservatism bias, FMPs may underreact to or fail to act on new information and continue to maintain beliefs close to those based on previous estimates and information.

EXAMPLE 1

Conservatism in Action

James Montier writes, "The stock market has a tendency to underreact to fundamental information—be it dividend omissions, initiations or an earnings report."[3] When discussing the behavior of security analysts, Montier explains, "People tend to cling tenaciously to a view or a forecast. Once a position has been stated, most people find it very hard to move away from that view. When movement does occur, it does so only very slowly. Psychologists call this conservatism bias. The chart below shows conservatism in analysts' forecasts. We have taken a linear time trend out of both the operating earnings numbers, and the analysts' forecasts. A cursory glance at the chart reveals that analysts are exceptionally good at telling you what has just happened. They have invested too heavily in their view, and hence will only change it when presented with indisputable evidence of its falsehood."[4] The chart accompanying Montier's analysis (2002b) appears as Exhibit 1. Discuss Montier's analysis in the context of biases of individuals.

Exhibit 1 Analysts Lag Reality

2 The base rate is the probability of the event without the new information.
3 Montier (2002a).
4 Montier (2002b).

Solution:

In relating conservatism to security analysts, Montier provides clear evidence of the conservatism bias in action: The analysts maintain their forecasts even when presented with new information. The behavior observed in security analysts can logically be extended to individual investors who are likely to engage in similar behavior when managing their own investment portfolios.

Consequences of Conservatism Bias As a result of conservatism bias, FMPs may do the following:

- Maintain or be slow to update a view or a forecast, even when presented with new information. For example, if an investor purchases a security of a pharmaceutical company based on the belief that the company is about to receive regulatory approval for a new drug, and then the company announces that it is experiencing problems getting the approval, the investor may cling to his initial valuation of the company and fail to respond or respond slowly to the new information. As a result, the investor may hold the security longer than a rational decision maker would.
- Opt to maintain a prior belief rather than deal with the mental stress of updating beliefs given complex data. This behavior relates to an underlying difficulty in processing new information. For example, if an investor purchases a security based on the belief that the company is entering a period of significant earnings growth, and then the company announces its growth rate may appear lower than expected because of a number of difficult-to-interpret accounting changes, the investor may maintain the prior belief rather than attempt to decipher the fundamental impact, if any, reflected in the accounting changes. As a result, the investor may hold the security longer than a rational decision maker would.

Detection of and Guidance for Overcoming Conservatism Bias The effect of conservatism bias may be corrected for or reduced by properly analyzing and weighting new information. The first step is to be aware that a bias exists. If FMPs find themselves ignoring new information or not adequately processing new information on the basis that the information is not relevant, is difficult to understand, or would not change beliefs, a conservatism bias may exist.

Hirshleifer (2001) provides evidence that the processing of new information and the updating of beliefs are inversely correlated with the effort involved in processing the information and updating the beliefs. He terms this effort cognitive cost. The higher the cognitive cost, the less likely information will be processed and beliefs updated. Information that is abstract and statistical is cognitively costly, and it thus receives less weighting. As a result, the base rate is overweighted. Information that is cognitively inexpensive (easily processed) may receive a higher weighting. As a result, individuals may overreact to information that is easily processed and may even underweight base rates. The costly processing idea can explain base rate overweighting and underweighting.

When new information is presented, the FMP should ask such questions as, "How does this information change my forecast?" or "What impact does this information have on my forecast?" Specifically, FMPs should react decisively to new information and avoid retaining old forecasts by disregarding new information. This reaction does not imply action before analysis. FMPs should conduct careful analysis incorporating the new information and then respond appropriately. When an appropriate course of action becomes clear, even if it deviates from the course of action based on previous information and beliefs, it should be implemented without hesitation.

When investors are ignoring information because it is difficult to interpret or understand, they should seek advice from a professional who can either explain how to interpret the data or can explain the action implications of the data to the satisfaction of the investor. Otherwise, investors may fail to make appropriate financial decisions. Inappropriate decisions may include making or failing to make investments because they are poorly understood.

3.1.2 *Confirmation Bias*

Confirmation bias is a belief perseverance bias in which people tend to look for and notice what confirms their beliefs, and to ignore or undervalue what contradicts their beliefs. This behavior has aspects of selective exposure, perception, and retention and may be thought of as a selection bias. It is an all too natural response to cognitive dissonance and reflects an ability to convince ourselves of what we want to believe by giving more weight to evidence that supports our beliefs and to ignore or modify evidence that conflicts with our beliefs.

Numerous studies have demonstrated that people generally place excessive weight on confirmatory information; that is, they place greater weight on information that supports their beliefs. Information is considered positive if it supports their beliefs and negative if it fails to support or refutes their beliefs. Thomas Gilovich, a researcher in the field of human psychology, notes that, "The most likely reason for the excessive influence of confirmatory information is that it is easier to deal with cognitively."[5] Researchers are sometimes guilty of confirmation bias when they set up experiments or frame their data in ways that tend to confirm their hypotheses. They compound the problem by proceeding in ways that avoid dealing with data that would contradict their hypotheses.

All FMPs—whether individual investors, analysts, investment advisers, or fund managers—may, after making an investment decision, tend to notice and consider information in a manner consistent with resolving cognitive dissonance. They may notice and consider only confirmatory information and ignore or modify contradictory information. Most experienced private wealth advisers have dealt with a client who conducts some research and insists on adding a particular investment to his portfolio. Unfortunately, the client may have failed to consider how the investment fits in his portfolio, as well as evidence of its fundamental value. This type of client may insist on continuing to hold the investment, even when the adviser recommends otherwise, because the client's follow-up research seeks only information that confirms his belief that the investment is still a good value. The confirmation bias is not limited to individual investors; all FMPs should be wary of the potential confirmation biases within themselves.

Consequences of Confirmation Bias In the investment world, confirmation bias is exhibited repeatedly. As a result of confirmation bias, FMPs may do the following:

- Consider only the positive information about an existing investment and ignore any negative information about the investment.
- Develop screening criteria and ignore information that either refutes the validity of the screening criteria or supports other screening criteria. As a result, some good investments that do not meet the screening criteria may be ignored; conversely, some bad investments that do meet the screening criteria may be made.

5 Gilovich (1993).

- Under-diversify portfolios, leading to excessive exposure to risk. FMPs may become convinced of the value of a single company and its stock. They ignore negative news about the company and its stock, and they gather and process only information confirming that the company is a good investment. They build a large position and eventually own a poorly diversified portfolio.
- Hold a disproportionate amount of their investment assets in their employing company's stock because they believe in their company and are convinced of its favorable prospects. Favorable information is cited, and unfavorable information is ignored. If the employee was to acknowledge unfavorable information, the associated mental discomfort might make work very difficult for the employee.

Detection of and Guidance for Overcoming Confirmation Bias The effect of confirmation bias may be corrected for or reduced by actively seeking out information that challenges your beliefs. The conscious effort to gather and process negative information (information that challenges a belief), as well as positive information, provides more complete information on which to base a decision. Even well-informed decisions can lead to unfavorable results; however, making the extra effort to gather complete information, positive and negative, will likely result in better decisions.

Another useful step is to get corroborating support for an investment decision. For example, if investment selections are based on criteria confirming an existing belief, such as stocks breaking through their 52-week highs, it is usually advisable to obtain supporting information (e.g., fundamental research on the company, industry or sector information) to assure that a good investment is being made. Accepting an investment idea unquestioningly and confirming it through purchases is not a proven investment strategy. Additional research is highly recommended.

3.1.3 *Representativeness Bias*

Representativeness bias is a belief perseverance bias in which people tend to classify new information based on past experiences and classifications. They believe their classifications are appropriate and place undue weight on them. This bias occurs because people attempting to derive meaning from their experiences tend to classify objects and thoughts into personalized categories. When confronted with new information, they use those categories even if the new information does not necessarily fit. They rely on a "best fit" approximation to determine which category should provide a frame of reference from which to understand the new information.

Although this perceptual framework provides an expedient tool for processing new information, it may lead to statistical and information-processing errors. The new information superficially resembles or is *representative* of familiar elements already classified, but in reality it can be very different. In these instances, the classification reflex deceives people, producing an incorrect understanding that often persists and biases all future thinking about the information. *Base-rate neglect* and *sample-size neglect* are two types of representativeness bias that apply to FMPs. In Bayesian terms, FMPs tend to underweight the base rates and overweight the new information—resulting in revised beliefs about probabilities and outcomes that demonstrate an overreaction to the new information.

Base-Rate Neglect In **base-rate neglect**, the base rate or probability of the categorization is not adequately considered. For example, an FMP attempting to determine the potential success of an investment in Company ABC might use a familiar, easy to understand classification scheme and categorize Company ABC as a "growth stock." This classification is based on some information about ABC that is consistent with the FMP's beliefs about growth companies, but it ignores the base probability that a company is a growth company. The FMP draws conclusions about ABC's risks and rewards based

on that categorization. FMPs often follow this erroneous path because it is an easy alternative to the diligent research actually required when evaluating investments. To rephrase this error, some FMPs rely on *stereotypes* when making investment decisions without adequately incorporating the base probability of the stereotype occurring.

Sample-Size Neglect A second type of representativeness bias is **sample-size neglect**. In sample-size neglect, FMPs incorrectly assume that small sample sizes are *representative* of populations (or "real" data). Some researchers call this phenomenon the "law of small numbers." This bias reflects erroneous beliefs about the laws of probability; they mistakenly believe that a small sample is representative of or similar in characteristics to the population. When people do not initially comprehend a trend or pattern reflected in a series of data, they may make assumptions relying on only a few data points. Individuals prone to sample-size neglect are quick to treat properties reflected in small samples as properties that accurately describe large pools of data. They overweight the information in the small sample.

EXAMPLE 2

Representativeness

APM Company is a large, 50-year old auto parts manufacturer having some business difficulties. It has previously been classified as a value stock. Jacques Verte is evaluating the future prospects of the company. Over the 50-year life of APM, there have been few failures of large auto parts manufacturers even given periods of difficulty. There have been a number of recent headlines about auto parts manufacturers having business and financial difficulty and potentially going out of business. He is considering two possibilities:

A APM will solve its difficulties, the company's performance will revert to the mean, and the stock will again be a value stock.

B APM will go out of business, and the stock will become valueless.

1 Is Scenario A or B more likely? Explain why.

2 If Verte is subject to representativeness bias, is he more likely to classify APM into A or B? Explain why.

Solution to 1:

Scenario A. It is more likely that APM will solve its difficulties, the company's performance will revert to the mean, and the stock will again be a value stock. The base rate, based on 50 years of data, is that more auto parts companies revert to the mean rather than go out of business.

Solution to 2:

Verte is likely to classify APM as B, predicting that it will go out of business because he read some headlines about other auto parts manufacturers going out of business. Verte, in classifying APM as likely to go out of business, may be guilty of both base-rate neglect and sample-size neglect. He has potentially ignored the base-rate information that far more auto parts manufacturers revert to the mean rather than go out of business, and he has assumed that the small sample of failing auto parts manufacturers is representative of all auto parts manufacturers.

Consequences of Representativeness Bias A wide variety of FMP behaviors indicate susceptibility to the premise of the representativeness bias: FMPs often overweight new information and small samples because they view the information or sample as representative of the population as a whole. As a result of representativeness bias, FMPs may do the following:

- Adopt a view or a forecast based almost exclusively on new information or a small sample. For example, when evaluating investment managers, FMPs may place undue emphasis on high returns during a one-, two-, or three-year period, ignoring the base probability of such a return occurring. As a result, the investor may hire an investment manager without adequately considering the likelihood of such returns continuing. This situation may also result in high investment manager turnover as the investor changes investment managers based on short-term results.
- Update beliefs using simple classifications rather than deal with the mental stress of updating beliefs given complex data. This issue relates to an underlying difficulty (cognitive cost) in properly processing new information. For example, if an investor purchases a security based on the belief that the company is entering a period of significant earnings growth, and then the company announces that its growth rate may appear lower than expected because of a number of difficult-to-interpret accounting changes, the investor may simply reclassify the stock rather than attempt to decipher the fundamental impact, if any, reflected in the accounting changes. As a result, the investor may sell the security when fundamentals would not justify such a decision.

Detection of and Guidance on Overcoming Representativeness Bias In both base-rate neglect and sample size neglect, investors ignore the laws of probability to satisfy their need for patterns. FMPs need to be aware of statistical mistakes they may be making and constantly ask themselves if they are overlooking the reality of the investment situation being considered.

For example, an FMP might conclude that a mutual fund manager possesses remarkable skill based on performance over a short time period, such as one, two, or three years. However, over a short time period, a manager's track record may benefit as much from luck as from skill. Several studies demonstrate this concept.

A study conducted by Vanguard Investments Australia (2004), later released by Morningstar, analyzes the five best-performing funds from 1994 to 2003. The results of the study are as follows:

- Only 16 percent of top five funds made it to the following year's list.
- Top five funds averaged 15 percent lower returns the following year.
- Top five funds barely beat the market the following year (by 0.3 percent).
- 21 percent of all top five funds ceased to exist within the following 10 years.

Barras, Scaillet, and Wermers (2010) evaluate the skill of active managers. Their study was intended to make general statements about the mutual fund industry rather than about any single mutual fund. They evaluate performance over the full set of mutual funds and separate them into three categories—skilled (generating positive alpha), unskilled (generating negative alpha), and zero-alpha. They add to previous research by explicitly accounting for skill and luck. Earlier empirical work either assumes no luck or full luck, thus producing biased conclusions about the prevalence of truly skilled and truly unskilled fund managers. Barras et al. conclude that 75.4 percent of the 2,076 funds analyzed were zero-alpha funds over their lifetimes. Of

the remainder, only 0.6 percent were skilled and 24.0 percent were unskilled. In sum, Barras et al. conclude that the majority of actively managed domestic equity mutual funds have generated at most zero alpha after adjusting for luck, trading costs, and fees.

DALBAR's 2008 *Quantitative Analysis of Investor Behavior*[6] demonstrates that investors tend to buy into a fund immediately following rapid price appreciation. They seem to categorize the funds as good investments based on this recent information. These periods tend to precede a subsequent decline in the fund's performance. Then, when prices fall, FMPs sell their holdings and search for the next hot fund. Based on an analysis of actual investor behavior over the 20 years ended 31 December 2007, the average equity fund investor earned an annualized return of just 4.48 percent—underperforming the S&P 500 by more than 7 percent and outpacing inflation by a mere 1.44 percent. Fixed-income investors fared far worse, losing an average of 1.49 percent in purchasing power per year. Asset allocation fund investors did a bit better, beating inflation by 0.41 percent per year.[7]

These results are consistent with Bogle (2005). Bogle illustrates that returns earned by a group of investors must fall short of the reported market returns or mutual fund returns by the amount of the aggregate costs the investors incur. Thus, we can conclude that the additional costs of moving in and out of funds and lack of performance persistence will generally result in returns lower than those expected by investors. Moving in and out of investments based on categorizations that place undue reliance on recent performance and new information is likely to result in excessive trading and inferior performance results.

Prudent methods for identifying appropriate long-term investments exist. Use an asset allocation strategy to increase the likelihood of better long-term portfolio returns. Invest in a diversified portfolio to meet financial goals, and stick with it. The following questions should help FMPs avoid the futility of chasing returns and also help them select appropriate investments.

1. How does the fund under consideration perform relative to similarly sized and similarly styled funds?
2. What is the tenure of the managers and advisers at the fund?
3. Are the managers well-known and/or highly regarded?
4. Has the fund consistently pursued its strategy, or has its style drifted during different market conditions?

To counteract the effects of the representativeness bias when considering returns, many practitioners use what has become known as the "periodic table of investment returns," as shown in Exhibit 2.

---

6 DALBAR has conducted its annual *Quantitative Analysis of Investor Behavior* since 1994. The analysis measures the effect of investor decisions to transact into and out of mutual funds on returns. The results consistently show that the average investor earns less than indicated on mutual fund performance reports. www.QAIB.com

7 Average stock investor, average bond investor, and average asset allocation investor performance results are calculated using data supplied by the Investment Company Institute. Investor returns are represented by the change in total mutual fund assets after excluding sales, redemptions, and exchanges. This method of calculation captures realized and unrealized capital gains, dividends, interest, trading costs, sales charges, fees, expenses, and any other costs. After calculating investor returns in dollar terms, two percentages are calculated for the period examined: total investor return rate and annualized investor return rate. Total return rate is determined by calculating the investor return dollars as a percentage of the net of the sales, redemptions, and exchanges for the period.

Exhibit 2 Sample of a Periodic Table of Investment Returns

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Highest Return	MSCI Em Mkts 32.59%	MSCI Em Mkts 39.78%	Barclays Agg Fx Inc 5.24%	MSCI Em Mkts 79.02%	Russell 2000 26.85%	NCREIF Property 14.26%	MSCI Em Mkts 18.63%	Russell 2000 38.82%	S&P 500 13.69%	NCREIF Property 13.33%
	MSCI EAFE 26.34%	Cambridge Private Eq. 17.69%	Barclays US TIPS −2.35%	Barclays Corp HY 58.21%	Cambridge Private Eq. 19.42%	Barclays US TIPS 13.56%	MSCI EAFE 17.32%	S&P 500 32.39%	Cambridge Private Eq. 12.81%	S&P 500 1.38%
	Cambridge Private Eq. 25.40%	NCREIF Property 15.85%	NCREIF Property −6.46%	MSCI EAFE 31.78%	MSCI Em Mkts 19.20%	Cambridge Private Eq. 10.99%	Russell 2000 16.35%	MSCI EAFE 22.78%	NCREIF Property 11.82%	Barclays Agg Fx Inc 0.55%
	Russell 2000 18.37%	CS Hedge Fund 12.56%	CS Hedge Fund −19.07%	Russell 2000 27.17%	Bloomberg Commodity 16.67%	Barclays Agg Fx Inc 7.84%	S&P 500 16.00%	Cambridge Private Eq. 22.28%	Diversified 6.10%	Diversified −0.50%
	NCREIF Property 16.59%	Barclays US TIPS 11.63%	Cambridge Private Eq. −22.37%	S&P 500 26.47%	Barclays Corp HY 15.12%	Barclays Corp HY 4.98%	Barclays Corp HY 15.81%	Diversified 14.70%	Barclays Agg Fx Inc 5.97%	CS Hedge Fund −0.71%
	S&P 500 15.79%	MSCI EAFE 11.17%	Diversified −25.10%	Diversified −20.20%	S&P 500 15.06%	S&P 500 2.11%	Cambridge Private Eq. 13.27%	NCREIF Property 10.98%	Russell 2000 4.89%	MSCI EAFE −0.81%
	CS Hedge Fund 13.86%	Bloomberg Commodity 11.08%	Barclays Corp HY −26.16%	Bloomberg Commodity 18.72%	NCREIF Property 13.11%	Diversified 1.10%	Diversified 12.60%	CS Hedge Fund 9.73%	CS Hedge Fund 4.13%	Barclays US TIPS −1.44%
	Diversified* 13.20%	Diversified 8.00%	Russell 2000 −33.79%	CS Hedge Fund 18.57%	Diversified 12.90%	CS Hedge Fund −2.52%	NCREIF Property 10.54%	Barclays Corp HY 7.44%	Barclays US TIPS 3.64%	Russell 2000 −4.41%
	Barclays Corp HY 11.85%	Barclays Agg Fx Inc 6.97%	Bloomberg Commodity −36.61%	Cambridge Private Eq. 13.98%	CS Hedge Fund 10.95%	Russell 2000 −4.18%	CS Hedge Fund 7.67%	Barclays Agg Fx Inc −2.02%	Barclays Corp HY 2.45%	Barclays Corp HY −4.47%
	Barclays Agg Fx Inc 4.33%	S&P 500 5.49%	S&P 500 −37.00%	Barclays US TIPS 11.41%	MSCI EAFE 7.75%	MSCI EAFE −12.14%	Barclays US TIPS 6.98%	MSCI Em Mkts −2.27%	MSCI Em Mkts −1.82%	MSCI Em Mkts −14.60%
	Barclays US TIPS 0.41%	Barclays Corp HY 1.87%	MSCI EAFE −43.38%	Barclays Agg Fx Inc 5.93%	Barclays Agg Fx Inc 6.54%	Bloomberg Commodity −13.37%	Barclays Agg Fx Inc 4.21%	Barclays US TIPS −8.61%	MSCI EAFE −4.90%	Bloomberg Commodity −24.70%
Lowest Return	Bloomberg Commodity −2.71%	Russell 2000 −1.57%	MSCI Em Mkts −53.18%	NCREIF Property −16.86%	Barclays US TIPS 6.31%	MSCI Em Mkts −18.17%	Bloomberg Commodity −1.14%	Bloomberg Commodity −9.58%	Bloomberg Commodity −17.04%	

* "Diversified" is the median return of the funds in Callan Associates' mid-sized defined-benefit fund universe.
Source: Callan Associates

Exhibit 2 shows that asset class returns are highly variable. Many FMPs fail to heed the advice offered by the chart—namely, that it is nearly impossible to accurately predict which asset class will be the best performer from one year to the next. Thus, diversification is prudent (note how the diversified portfolio consistently appears near the center of each column). Practitioners would be wise to present this chart when establishing asset allocations with new clients to emphasize the advantages of diversification over return chasing.

When FMPs sense that base-rate or sample-size neglect may be a problem, they should ask the following question: "What is the probability that X (the investment under consideration) belongs to Group A (the group it resembles or is considered representative of) versus Group B (the group it is statistically more likely to belong to)?" This question, or a similar question, will help FMPs think through whether they are failing to consider base-rate probabilities or neglecting the law of small numbers and thus inaccurately assessing a particular situation. It may be necessary to do more research to determine if a statistical error has indeed been made. In the end, this process should improve investment decisions.

3.1.4 *Illusion of Control Bias*

Illusion of control bias is a bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Langer (1983) defines the illusion of control bias as the "expectancy of a personal success probability inappropriately higher than the objective probability would warrant." Langer finds that choices, task familiarity, competition, and active involvement can all inflate confidence and generate such illusions. For example, Langer observed that people permitted to select their own numbers in a hypothetical lottery game were willing to pay a higher price per ticket than subjects gambling on randomly assigned numbers. Since this initial study, many other researchers have uncovered similar situations, where people perceived themselves as possessing more control than they did, inferred causal connections where none existed, or displayed surprisingly great certainty in their predictions for the outcomes of chance events.

Consequences of Illusion of Control As a result of illusion of control bias, FMPs may do the following:

- Trade more than is prudent. Researchers have found that traders, especially online traders, believe that they have "control" over the outcomes of their investments. This view leads to excessive trading, which may lead to lower realized returns than a strategy where securities are held longer and traded less frequently.
- Lead investors to inadequately diversify portfolios. Researchers have found that some investors prefer to invest in companies that they may feel they have some control over, like the companies they work for, leading them to hold concentrated positions. In fact, most investors have almost no control over the companies they work for. If the company performs poorly, the investor may experience both the loss of employment and investment losses.

Detection of and Guidelines for Overcoming Illusion of Control Bias There are some useful guidelines to help investors detect and overcome illusion of control bias. The first and most basic idea is that investors need to recognize that successful investing is a probabilistic activity. The first step on the road to understanding illusion of control bias is to be aware that global capitalism is highly complex, and even the most powerful investors have little control over the outcomes of the investments they make.

Second, it is advisable to seek contrary viewpoints. As you contemplate a new investment, take a moment to ponder any considerations that might weigh against the trade. Ask yourself: Why am I making this investment? Is this investment part of an overall plan? What are the downside risks? What might go wrong? When will I sell? These important questions can help you logically evaluate an investment decision before implementation.

Finally, it is critical to keep records. Once you have decided to move forward with an investment, an effective way to prevent illusions of control is to maintain records of your transactions, including reminders outlining the rationale behind each trade. Write down some of the important features of each investment that you make, and emphasize those attributes that you have determined to be in favor of the investment's success.

Rationally, we know that returns on long-term investments are not impacted by the short-term beliefs, emotions, and impulses that often surround financial transactions. Success, or the lack thereof, is usually a result of such uncontrollable factors as corporate performance or general economic conditions. During periods of market turmoil, it can be difficult to keep this fact in mind. One of the best ways to prevent your biases from affecting your decisions is to keep the rational side of your brain as engaged as possible. Investing success is ultimately achieved by those who can conquer the daily psychological challenges and maintain a long-term perspective.

3.1.5 *Hindsight Bias*

Hindsight bias is a bias with selective perception and retention aspects. People may see past events as having been predictable and reasonable to expect. This behavior is based on the obvious fact that outcomes that did occur are more readily evident than outcomes that did not occur. Also, people tend to remember their own predictions of the future as more accurate than they actually were because they are biased by the knowledge of what has actually happened. To alleviate the discomfort associated with the unexpected, people tend to view things that have already happened as being relatively inevitable and predictable. This view is often caused by the reconstructive nature of memory. When people look back, they do not have perfect memory; they tend to "fill in the gaps" with what they prefer to believe. In doing so, people may prevent themselves from learning from the past.

In a classic example of hindsight bias, Fischhoff (1975) describes an experiment in which he asked subjects to answer general knowledge questions from almanacs and encyclopedias. Next, he gave his subjects the correct answers and asked them to recall their original ones. Fischhoff found that, in general, people overestimate the quality of their initial knowledge and forget their initial errors. Hindsight bias is a serious problem for historically minded market followers. Once an event is part of history, there is a tendency to see the sequence that led to it as inevitable, as if uncertainty and chance were banished. As Posner (1998) notes, outcomes exert irresistible pressure on their interpretations. In hindsight, poorly reasoned decisions with positive results may be described as brilliant tactical moves, and poor results of well-reasoned decisions may be described as avoidable mistakes.

Consequences of Hindsight Bias As a result of hindsight bias, FMPs may do the following:

- Overestimate the degree to which they predicted an investment outcome, thus giving them a false sense of confidence. For example, when an investment appreciates for unforeseen reasons, FMPs may rewrite their own memories to reflect those reasons. The hindsight bias may cause FMPs to take on excessive risk, leading to future investment mistakes.
- Cause FMPs to unfairly assess money manager or security performance. Based on their ability to look back at what has taken place in securities markets, performance is compared against what has happened as opposed to expectations. For example, a given manager may have followed his or her strategy faithfully, and possibly even ranked near the top of the relevant peer group, but the investment results may be disappointing compared to another segment of the market or the market as a whole.

Detection of and Guidelines for Overcoming Hindsight Bias Once understood, hindsight bias should be recognizable. FMPs need to be aware of the possibility of hindsight bias and ask such questions as, "Am I re-writing history or being honest with myself about the mistakes I made?" Achieving success with investments requires investors to recognize and come to terms with mistakes. This approach is contrary to human nature. However, understanding how markets work and why investments go wrong is critical to achieving investment success.

To guard against hindsight bias, FMPs need to carefully record and examine their investment decisions, both good and bad, to avoid repeating past investment mistakes. In addition, FMPs should constantly remind themselves that markets move in cycles and that good managers stay true to their strategies through good times and bad. Expectations must be managed; there will inevitably be periods when even good

managers underperform the broader market. Education is critical here. It is important that all investment managers be evaluated relative to appropriate benchmarks and peer groups.

3.2 Information-Processing Biases

The second category of cognitive errors includes information-processing errors or biases. Information-processing biases result in information being processed and used illogically or irrationally. As opposed to belief perseverance biases, these are less related to errors of memory or in assigning and updating probabilities and more to do with how information is processed.

3.2.1 *Anchoring and Adjustment Bias*

Anchoring and adjustment bias is an information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities. When required to estimate a value with unknown magnitude, people generally begin by envisioning some initial default number—an "anchor"—which they then adjust up or down to reflect subsequent information and analysis. Regardless of how the initial anchor was chosen, people tend to adjust their anchors insufficiently and produce end approximations that are, consequently, biased. This bias is closely related to the conservatism bias. In the conservatism bias, people overweight past information compared to new information. In anchoring and adjustment, people place undue weight on the anchor. People anchor and adjust because they are generally better at estimating relative comparisons than absolute figures.

For example, FMPs exhibiting this bias are often influenced by purchase "points," or arbitrary price levels or price indexes, and tend to cling to these numbers when facing questions like, "Should I buy or sell this security?" or "Is the market overvalued or undervalued right now?" This approach is especially prevalent when the introduction of new information regarding the security further complicates the situation. Rational investors treat these new pieces of information objectively, and they do not reflect upon purchase prices or target prices in deciding how to act. Investors with an anchoring and adjustment bias, however, perceive new information through a warped lens. They place undue emphasis on statistically arbitrary, psychologically determined anchor points. Decision making therefore deviates from neo-classically prescribed "rational" norms. Readers interested in academic research on anchoring and adjustment behavior should see Slovic and Lichtenstein (1971), Joyce and Biddle (1981), and Butler (1986), among other studies.

Consequences of Anchoring and Adjustment Bias As a result of anchoring and adjustment bias, FMPs may stick too closely to their original estimates when new information is learned. For example, if the FMP originally estimates next year's earnings for a company as $2.00 per share and the company experiences difficulties during the year, FMPs may not adequately adjust the $2.00 estimate given the difficulties. They remain "anchored" to the $2.00 estimate. This mindset is not limited to downside adjustments; the same phenomenon occurs when companies have upside surprises. In another example, FMPs may become anchored to the "economic states" of countries or companies. In the 1980s, Japan was viewed as a model economy, and many FMPs believed it would remain dominant for decades. It took many FMPs a significant period to revise their beliefs about Japan when its growth slowed. FMPs can similarly anchor on beliefs about companies.

Detection of and Guidelines for Overcoming Anchoring and Adjustment Bias The primary action FMPs can take is to consciously ask questions that may reveal an anchoring and adjustment bias. Examples of such questions include, "Am I holding

onto this stock based on rational analysis, or am I trying to attain a price that I am anchored to, such as the purchase price or a high water mark?" and "Am I making this market or security forecast based on rational analysis, or am I anchored to last year's market levels or ending securities prices?"

It is important to remember that past prices, market levels, and reputation provide little information about an investment's future potential and thus should not influence buy-and-sell decisions to any great extent. This advice is particularly relevant when analyzing the recommendations of securities' analysts. FMPs should look at the basis for any recommendations to see whether they are anchored to previous estimates or based on an objective, rational view of changes in company fundamentals.

3.2.2 *Mental Accounting Bias*

Mental accounting bias is an information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to. Richard Thaler (1980) describes mental accounting as a process in which people code, categorize, and evaluate economic outcomes by grouping their assets into any number of non-fungible (non-interchangeable) mental accounts. This method contradicts rational economic thought because money is inherently fungible. Mental accounts are based on such arbitrary classifications as the source of the money (e.g., salary, bonus, inheritance, gambling) or the planned use of the money (e.g., leisure, necessities). According to traditional finance theory, FMPs should consider portfolios holistically in a risk/return context.

Consequences of Mental Accounting Bias A potentially serious problem that mental accounting creates is the placement of investments into discrete "buckets" without regard for the correlations among these assets. Meir Statman (1999) contends that the difficulty individuals have in addressing the interaction of different investments leads investors to construct portfolios in a layered pyramid format. Statman (2008) also notes that behavioral portfolio theory is a goal-based theory. Each layer of the portfolio addresses a particular investment goal (such as money for retirement) that is independent of other investment goals (such as college funds). Investors may target such low-risk investments as cash and money market funds to preserve wealth, bonds and dividend-paying stocks to provide income, and such risky investments as emerging market stocks and initial public offerings (IPOs) in an attempt to get rich.

As a result of mental accounting bias, FMPs may do the following:

- Neglect opportunities to reduce risk by combining assets with low correlations. Inefficient investing may result from offsetting positions in the various layers (Shefrin and Statman 1984). This approach can lead to suboptimal aggregate portfolio performance (Kroll, Levy, and Rapoport 1988).
- Irrationally distinguish between returns derived from income and those derived from capital appreciation. Although many people feel the need to preserve capital appreciation (principal), they focus on the idea of spending income that the principal generates. As a result, many FMPs chase income streams, unwittingly eroding principal in the process. Consider a high-yield or "junk" bond that pays a high dividend but can suffer significant loss of principal if the company issuing the bond experiences financial difficulties. Mental accounting can make such instruments appear tremendously appealing, but it is also possible that the original investment could shrink, ultimately reducing or even eliminating income payments.

Detection of and Guidelines for Overcoming Mental Accounting Bias An effective way to detect and overcome mental accounting behavior that causes investors to place money in discrete investment "buckets" is to recognize the drawbacks of engaging in

this behavior. The primary drawback is that correlations between investments are not taken into account when creating an overall portfolio. FMPs should go through the exercise of combining all of their assets onto one spreadsheet or other summary document to see the true asset allocation of various mental account holdings. This exercise often produces information that is surprising when seen as whole, such as higher cash balances than expected. Going through this process will show the suboptimal nature of the portfolio constructed using mental accounting. The logical next step would be to create a portfolio strategy taking all assets into consideration.

With regard to the income versus total return issue, an effective way to manage the tendency of some FMPs to treat investment income and capital appreciation differently is to focus on total return. FMPs should learn the benefits of integrating the two sources of return, allocating sufficient assets to lower income investments to allow principal to continue to grow even after inflation.

3.2.3 *Framing Bias*

Framing bias is an information-processing bias in which a person answers a question differently based on the way in which it is asked (framed). How information is processed is dependent upon how the question is framed. In actual choice contexts, a decision maker has flexibility in how to think about a problem. A decision frame is the decision maker's subjective conception of the acts, outcomes, and contingencies associated with a particular choice. The frame that a decision maker adopts is controlled partly by the formulation of the problem and partly by the norms, habits, and personal characteristics of the decision maker. It is often possible to frame a given decision problem in more than one way.

A framing effect results in a change of preferences between options as a function of the variation of frames, perhaps through variation of the formulation of the decision context. For example, a decision may be presented within a *gain* context (25 percent of the people with disease X given medicine Z will survive) or within a *loss* context (75 percent of the people with disease X will die even if given medicine Z). In the first presentation, people with disease X tend to adopt a positive outlook based on a gain frame of reference and are generally less likely to engage in risky behavior; they are risk-averse because they view themselves as having a potential to gain (survive in this case). In the second presentation, people with disease X tend to adopt a negative outlook based on a loss frame of reference; they may seek risk because they view themselves as having nothing to lose (likely to die in this case).

Narrow framing occurs when people evaluate the information to make a decision based on a *narrow frame* of reference. People lose sight of the big picture and focus on one or two specific points. For example, a consumer considering an automobile purchase might focus on style or design but overlook safety features, fuel economy, and reliability. FMPs may exhibit similar behaviors when choosing securities.

EXAMPLE 3

Effect of Framing

Decision-making frames are quite prevalent in the context of investor behavior. Risk tolerance questionnaires can demonstrate how framing bias may occur in practice and how FMPs should be aware of its effects.

Suppose an investor is to take a risk tolerance questionnaire for the purpose of determining which "risk category" he or she is in. The risk category will determine asset allocations and the appropriate types of investments. The following information is provided to each questionnaire taker:

Over a 10-year period, Portfolio ABC has averaged an annual return of 10 percent with an annual standard deviation of 16 percent. Assuming a normal return distribution, in a given year there is a 67 percent probability that the return will fall within one standard deviation of the mean, a 95 percent probability that the return will fall within two standard deviations of the mean, and a 99.7 percent probability that the return will fall within three standard deviations of the mean. Thus, there is a 67 percent chance that the return earned by Portfolio ABC will be between –6 percent and 26 percent, a 95 percent chance that the return will be between –22 percent and 42 percent, and a 99.7 percent chance that the return will be between –38 percent and 58 percent.

The following two questions focus on hypothetical Portfolio ABC, DEF, and XYZ. The risk and return for each portfolio is the same in each of the two questions, but the presentation of information differs. Will an investor choose the same portfolio or different portfolios when asked Question 1 compared to Question 2? Explain your answer.

1 Based on the chart below, which investment portfolio fits your risk tolerance and desire for long-term return?

A Portfolio XYZ.

B Portfolio DEF.

C Portfolio ABC.

Portfolio	95% Probability Return Range	10-Year Average Return
XYZ	0.5% to 6.5%	3.5%
DEF	–18.0% to 30.0%	6.0%
ABC	–22.0% to 42.0%	10.0%

2 Based on the chart below, which investment portfolio fits your risk tolerance and desire for long-term return?

A Portfolio XYZ.

B Portfolio DEF.

C Portfolio ABC.

Portfolio	10-Year Average Return	Standard Deviation of Returns
XYZ	3.5%	1.5%
DEF	6%	12%
ABC	10%	16%

Solution:

An investor may choose different portfolios when asked Question 1 compared to Question 2. Portfolio XYZ may appear more attractive in the first question, where two standard deviations are used to define the range of returns and show the risk, than in the second, where only the standard deviations are shown. Also in the second question, the returns are presented first and the measure of risk second. Thus, how questions are framed and the order in which questions are presented can have a significant impact on how they are answered. FMPs should be acutely aware of how framing can affect investment choices.

Consequences of Framing Bias FMPs' willingness to accept risk can be influenced by how situations are presented or framed. Similar to what we saw in the standard deviation example previously presented, a common framing problem occurs when investment questions are posed positively or negatively. For example, suppose Mrs. Ang has a choice of Portfolio A or Portfolio B, which are identical in terms of expected risk and return. Mrs. Ang is told that Portfolio A offers a 70 percent chance of attaining her financial goals, and Portfolio B offers a 30 percent chance of falling short of her financial goals. Mrs. Ang is likely to choose Portfolio A because of the positive way the question was framed.

As a result of framing bias, FMPs may do the following:

- Misidentify risk tolerances because of how questions about risk tolerance were framed; may become more risk-averse when presented with a gain frame of reference and more risk-seeking when presented with a loss frame of reference. This may result in suboptimal portfolios.
- Choose suboptimal investments, even with properly identified risk tolerances, based on how information about the specific investments is framed.
- Focus on short-term price fluctuations, which may result in excessive trading.

Detection of and Guidelines for Overcoming Framing Bias Framing bias is detected by asking such questions as, "Is the decision the result of focusing on a net gain or net loss position?" As discussed above, an investor who has framed the decision as a potential net loss is more likely to select a riskier investment; however, if the decision is framed as a potential net gain, the investor is more likely to go with a less risky investment. When making decisions, FMPs should try to eliminate any reference to gains and losses already incurred; instead, they should focus on the future prospects of an investment.

Regarding susceptibility to the positive and negative presentation of information, investors should try to be as neutral and open-minded as possible when interpreting investment-related situations. This approach can eliminate biased responses, help FMPs create better portfolios, and give FMPs a better chance of meeting long-term financial objectives.

3.2.4 *Availability Bias*

Availability bias is an information-processing bias in which people take a heuristic (sometimes called a rule of thumb or a mental shortcut) approach to estimating the probability of an outcome based on how easily the outcome comes to mind. Easily recalled outcomes are often perceived as being more likely than those that are harder to recall or understand. People often unconsciously assume that readily available thoughts, ideas, or images represent unbiased estimates of statistical probabilities. People decide the probability of an event by how easily they can recall a memory of the event. The basic problem is that there are biases in our memories. For instance, recent events are much more easily remembered and available.

There are various sources of availability bias. We will examine the four most applicable to FMPs: retrievability, categorization, narrow range of experience, and resonance. Each of these categories will be described, and then we will review examples of each as applied to FMPs.

Retrievability If an answer or idea comes to mind more quickly than another answer or idea, the first answer or idea will likely be chosen as correct even if it is not the reality. For example, Tversky and Kahneman (1973) performed an experiment in which subjects listened to a list of names and were then asked to judge if the list contained more men or women. In reality, the list contained more women than men, but the list of

men included famous names. As availability theory would predict, most of the subjects concluded that the list contained more men than women because they immediately recalled the names of the famous men.

Categorization When solving problems, people gather information from what they perceive as relevant search sets. Different problems require different search sets, which are often based on familiar categorizations. If it is difficult to come up with a search set, the estimated probability of an event may be biased. For example, if an American is asked to come up with a list of famous baseball players and a list of famous soccer players, the list of soccer players is likely to be quite short. This assignment might lead the American to erroneously conclude that there are fewer famous soccer players than baseball players.

Narrow Range of Experience This bias occurs when a person with a narrow range of experience uses too narrow a frame of reference based upon that experience when making an estimate. For example, assume that a CFA charterholder goes to work for a hedge fund. Because this person encounters other CFA charterholders every day at her own and other hedge funds, she is likely to overestimate the proportion of CFA charterholders who work for hedge funds. She is also likely to underestimate the proportion of CFA charterholders who work in other areas, such as private wealth management, because that is not within her frame of reference. In reality, a small percentage of CFA charterholders work for hedge funds.

Resonance People are often biased by how closely a situation parallels their own personal situation. For example, jazz music lovers are likely to overestimate how many people listen to jazz music. On the other hand, people who dislike jazz music are likely to overestimate the number of people who dislike jazz music.

Clearly, overlap exists between the sources of availability bias. For instance, a person's range of experience will affect his search sets, what information is retrieved, and what resonates with him. The critical aspect is not to be able to identify the specific source of bias, but rather to know the sources of bias in order to detect and overcome the availability bias. The questions to ask can be much more specific and helpful when based on the sources of availability bias rather than on the more general definition of availability bias.

Consequences of Availability Bias FMPs' investment choices may be influenced by how easily information is recalled. As a result of availability bias, FMPs may do the following:

- Choose an investment, investment adviser, or mutual fund based on advertising rather than on a thorough analysis of the options. For instance, when asked to name potential mutual fund companies to invest with, many people will name only the funds that do extensive advertising. In reality, many mutual fund companies do little or no advertising. The choice of mutual fund should be based on a variety of factors that make it a good fit given the investor's objectives and risk/return profile. Choices based on advertising are consistent with retrievability as a source of availability bias.
- Limit their investment opportunity set. This may be because they use familiar classification schemes. They may restrict investments to stocks and bonds of one country or may fail to consider alternative investments when appropriate.
- Fail to diversify. This may be because they make their choices based on a narrow range of experience. For example, an investor who works for a fast-growing company in a particular industry may overweight investments in that industry.
- Fail to achieve an appropriate asset allocation. This consequence may occur because they invest in companies that match their own personal likes and dislikes without properly taking into account risk and return.

Detection of and Guidelines for Overcoming Availability Bias To overcome availability bias, investors need to develop an appropriate investment policy strategy, carefully research and analyze investment decisions before making them, and focus on long-term results. A disciplined approach will prevent the investor from overemphasizing the most recent financial events based on easy recall. It will also help establish suitable asset allocations based on return objectives, risk tolerances, and constraints. It should also help assure that the portfolio of investments is adequately diversified and not affected by the availability bias from any source. FMPs need to recognize that it is a human tendency to overemphasize the most recent financial events because of easy recall.

When selecting stocks, it is crucial to consider your availability bias. Such questions as, "Did you hear about the stocks on Bloomberg, read about them in the *Wall Street Journal*, see them on CNBC, or receive a sell-side research report?" and "Am I buying or selling a group of investments because of some recent market event or trend without doing adequate analysis?" focus on retrievability. A valuable study done by Gadarowski (2001) found that stocks with the highest press coverage underperformed in the subsequent two years.

Such additional questions as, "How did you decide which investments to consider? Did you choose investments based on your familiarity with the industry or country?" and "Did you choose your investments because you like the companies' products?" help identify issues of categorization, narrow range of experience, and resonance as sources of availability bias.

It is also important to realize that humans generally disregard or forget about events that happened more than a few years ago. For example, if you were in a car accident last week, it would be natural for you to drive more cautiously than you normally would for a period of time. However, as time passed, you would likely resume your normal driving behavior. Availability bias causes investors to *overreact* to market conditions, whether positive or negative. An excellent illustration is the technology bubble in the late 1990s. Investors got caught up in technology mania, causing them to disregard the risks. It is natural for people to be influenced by current events.

Another problem is that much of the information we receive is inaccurate, outdated, or confusing. The information may be based on opinions that are not based on sound analysis. Availability bias causes people to think that events that receive heavy media attention are more important than they may actually be. Many FMPs ignore the fact that they lack the training, experience, and objectivity to interpret the massive amount of investment information available.

3.3 Cognitive Errors: Conclusion

Cognitive errors are statistical, information-processing, or memory errors that result in faulty reasoning and analysis. The individual may be attempting to follow a rational decision-making process but fail to do so because of cognitive errors. For example, the person may fail to update probabilities correctly, properly weigh and consider information, or gather information. If these errors are drawn to the attention of an individual attempting to follow a rational decision-making process, he or she is likely to be receptive to correcting the errors.

Individuals are less likely to make cognitive errors if they remain vigilant to the possibility of their occurrence. A systematic process to describe problems and objectives; to gather, record, and synthesize information; to document decisions and the reasoning behind them; and to compare the actual outcomes with expected results will help reduce cognitive errors.

4 EMOTIONAL BIASES

We will now review six emotional biases, their implications for investment decision making, and suggestions for managing the effects of these biases. Although emotion has no single universally accepted definition, an emotion may be thought of as a mental state that arises spontaneously rather than through conscious effort. Emotions may be undesired to the individuals feeling them; although they may wish to control the emotion and their response to it, they often cannot. Emotional biases are harder to correct for than cognitive errors because they originate from impulse or intuition rather than conscious calculations. In the case of emotional biases, it may only be possible to recognize the bias and adapt to it rather than correct for it.

Emotional biases can cause investors to make suboptimal decisions. Because emotions are rarely identified and recorded in the decision-making process—they have to do with how people feel rather than what and how they think—fewer emotional biases have been identified. The six emotional biases discussed are loss aversion, overconfidence, self-control, status quo, endowment, and regret aversion. In the discussion of each of these biases, some related biases may also be discussed.

4.1 Loss-Aversion Bias

Loss-aversion bias was identified by Daniel Kahneman and Amos Tversky in 1979 while they were working on developing prospect theory.[8] In prospect theory, loss-aversion bias is a bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains. A number of studies on loss aversion suggest that, psychologically, losses are significantly more powerful than gains. When comparing absolute values, the utility derived from a gain is much lower than the utility given up with an equivalent loss.

Rational FMPs should accept more risk to increase gains, not to mitigate losses. However, paradoxically, FMPs tend to accept more risk to avoid losses than to achieve gains. Loss aversion leads people to hold their losers even if an investment has little or no chance of going back up. Similarly, loss-aversion bias leads to risk avoidance when people evaluate a potential gain. Given the possibility of giving back gains already realized, FMPs lock in profits, thus limiting their upside profits.

Kahneman and Tversky describe loss-averse investor behavior as the evaluation of gains and losses based on a reference point. A value function that passes through this reference point is seen in Exhibit 3. It is s-shaped and asymmetric, implying a greater impact of losses than of gains for the same variation in absolute value. This utility function implies risk-seeking behavior in the domain of losses (below the horizontal axis) and risk avoidance in the domain of gains (above the horizontal axis). An important concept embedded in this utility representation is what Shefrin and Statman (1985) coined the *disposition effect*: the holding (not selling) of investments that have experienced losses (losers) too long, and the selling (not holding) of investments that have experienced gains (winners) too quickly. The resulting portfolio may be riskier than the optimal portfolio based on the risk/return objectives of the investor.

8 Kahneman and Tversky (1979).

Exhibit 3 Value Function of Loss Aversion

EXAMPLE 4

Effect of Loss-Aversion Bias

Loss-aversion bias, executed in practice as the *disposition effect*, is observed often by wealth management practitioners. The classic case of this bias is when an investor opens the monthly account statement and scans the individual investments for winners and losers. Seeing that some investments have lost money and others have gained, discuss how the investor is likely to respond given a loss-aversion bias.

Sample Solution:

The investor is likely to respond by continuing to hold the losing investments. The idea of actually losing money is so painful that the first reaction is to hold the investment until it breaks even. The investor is acting based on emotions, not cognitive reasoning. In this case, if the investor did some research, he or she might learn that the company in question is experiencing difficulty and that holding the investment actually adds to the risk in the portfolio (hence the term risk-seeking in the domain of losses).

Conversely, the winners are making money. Loss-averse FMPs have a tendency to sell these investments and realize their gains to avoid any further risk. In this case, if the investor did some research, he or she might learn that the company in question actually improves the risk/return profile of the portfolio. By selling the investment, not only is the potential for future losses eliminated, but the potential for future gains is also eliminated. Combining the added risk of holding the losers with the elimination of potential gains from selling the winners may make investors' portfolios less efficient than portfolios based on fundamental analysis.

Consequences of Loss Aversion As a result of loss-aversion bias, FMPs may do the following:

- Hold investments in a loss position longer than justified by fundamental analysis. FMPs hold losing investments in the hope that they will return to break even.
- Sell investments in a gain position earlier than justified by fundamental analysis. FMPs sell winning investments because they fear that their profit will erode.
- Limit the upside potential of a portfolio by selling winners and holding losers.
- Trade excessively as a result of selling winners. Excessive trading has been shown to lower investment returns.
- Hold riskier portfolios than is acceptable based on the risk/return objectives of the FMP. This is caused by the sale of investments that are winners and the retention of investments that are losers. FMPs may accept more risk in their portfolios than they would if they had based their decision on risk/return objectives and fundamental analysis.

Further, framing and loss-aversion biases may affect the FMP simultaneously, and is a potentially dangerous combination. When people have suffered losses, they may view risky alternatives as a source of opportunity; when people have gained, they may view choices involving additional risk as a threat. For example, an investor who has a net loss is more likely than average to choose the riskier investment, while a net gainer is more likely to go with a less risky alternative.[9] A caveat to this basic principle is that once money is made through a profitable trade, some investors may view the profit differently from other money and decide to engage in additional risky behavior with it. Richard H. Thaler of the University of Chicago refers to this as the "house money effect," which is based on the willingness of gamblers to engage in increasingly risky gambles with previous winnings. The gamblers view themselves as risking someone else's money; in the case of the gambler, it is the casino or house's money they view as at risk.[10]

Special Application: Myopic Loss Aversion As a possible explanation for the *equity premium puzzle*, a phenomenon that describes the anomalously higher historical real returns of stocks over government bonds, Benartzi and Thaler (1995) conceived *myopic loss aversion*. This combines aspects of time horizon-based framing, mental accounting, and loss-aversion biases. Investors presented with annual return data for stocks and bonds tend to adopt more conservative strategies (lower allocation to equities) than those presented with longer-term return data, such as 30-year compound returns. Investors place stocks and bonds into separate mental accounts rather than thinking of them together in a portfolio context; they seem to be more concerned with the potential for short-term losses than with planning for the relevant time horizon and focusing on long-term results. Benartzi and Thaler use the term *myopic loss aversion* in reference to this behavior. They argue that investors evaluate their portfolios on an annual basis and as a result overemphasize short-term gains and losses and weigh losses more heavily than gains. The overemphasis on short-term losses results in a higher than theoretically justified equity risk premium.

Paul A. Samuelson (1963) presented an example that is illustrative of myopic loss aversion (this was written before the term myopic loss aversion had been introduced). Samuelson offered a colleague the following bet: Flip a coin; if it comes up heads you

9 Depending on the incentive structure, an investment manager may be especially prone to this. In essence, having experienced losses, the investment manager may having nothing further to lose by choosing risky investments; or having experienced gains, the investment manager may be motivated to lock in those gains.
10 Thaler and Johnson (1990).

win \$200, and if it comes up tails you pay or lose \$100. The distribution of outcomes of this bet can be shown as {\$200, 0.50; –\$100, 0.50}. Samuelson reports that his colleague turned this bet down but said that he would be happy to take 100 such bets. Samuelson then proved that this pair of choices is irrational. That is, someone should not be willing to play a bet many times if he is not willing to play it just once. Of more interest is the explanation offered by the colleague for turning down the bet: "I won't bet because I would feel the \$100 loss more than the \$200 gain." This view is consistent with loss aversion. A simple utility function that would capture this notion is the following:

$$(1)\ \mathrm{U}(x) = x, \text{ when } x \geq 0 \text{ and}$$
$$\mathrm{U}(x) = 2.5x, \text{ when } x < 0,$$

where x is a change in wealth relative to the status quo.

With this loss-averse utility function, the utility of a single play of the gamble is negative (less than the status quo of not playing). The expected utility is –25 [= 0.5(200) + 0.5(2.5(–100))]. However, with two plays, you have a 25 percent chance of winning \$400, a 50 percent chance of winning \$100, and a 25 percent chance of losing \$200. The distribution of outcomes created by the portfolio of two bets {\$400, 0.25; \$100, 0.50; –\$200, 0.25} yields a positive expected utility of 25 [= 0.25(400) + 0.5(100) + 0.25(2.5(–200))]. Whether a decision maker accepts taking the gamble twice depends on mental accounting. A myopic decision maker will first determine whether he likes the prospect of the initial gamble in the series, will conclude that he does not, and consequently will reject the entire series. Samuelson's friend was evidently loss averse, but he was not myopic because he was willing to accept the series. He did not focus on the short term but considered the long term.

The argument developed by Benartzi and Thaler (1995) is that the price of financial assets reflects the preferences of FMPs who are both loss averse and myopic. To appreciate the effect of myopia on risk attitudes, consider an investor with the utility function defined above who must choose between a risky asset that pays an expected 7 percent per year with a standard deviation of 20 percent (like stocks) and a safe asset that pays a sure 1 percent per year. According to the logic we applied to Samuelson's colleague, the attractiveness of the risky asset depends on the time horizon of the investor. An investor who is prepared to wait a long time before evaluating the outcome of the investment as a gain or a loss will find the risky asset more attractive than another investor (equally loss averse, but more myopic), who expects to evaluate the outcome soon. Furthermore, FMPs who differ in the frequency with which they evaluate outcomes will not derive the same utility from owning stocks. The probability of observing a loss is higher when the frequency of evaluation is high. If losses cause more mental anguish than equivalent gains cause pleasure, the experienced utility associated with owning stocks is lower for the more myopic investor (Kahneman, Wakker, and Sarin, 1997). Over time, the myopic investor is expected to gravitate to a lower level of risk.

Detection of and Guidelines for Overcoming Loss Aversion A disciplined approach to investment based on fundamental analysis is a good way to alleviate the impact of the loss-aversion bias. It is impossible to make experiencing losses any less painful emotionally, but analyzing investments and realistically considering the probabilities of future losses and gains may help guide the FMP to a rational decision.

4.2 Overconfidence Bias

Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities. This overconfidence may be the result of overestimating knowledge levels, abilities, and access to information.

For example, people generally do a poor job of estimating probabilities; still, they believe they do it well because they believe that they are smarter and more informed than they actually are. This view is sometimes referred to as the *illusion of knowledge bias*. Overconfidence may be intensified when combined with *self-attribution bias*. Self-attribution bias is a bias in which people take credit for successes and assign responsibility for failures. In other words, success is attributed to the individual's skill, while failures are attributed to external factors. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Overconfidence bias has aspects of both cognitive and emotional errors but is classified as emotional because the bias is primarily the result of emotion. It is difficult to correct for because it is difficult for people to revise self-perceptions of their knowledge and abilities. The concept of overconfidence has been derived from a large number of psychological experiments and surveys in which subjects overestimate both their own predictive abilities as well as the precision of the information they have been given.

There are two basic types of overconfidence bias rooted in the illusion of knowledge: *prediction overconfidence* and *certainty overconfidence*. Both types have cognitive and emotional aspects; both types demonstrate faulty reasoning combined with "gut feel" and such emotional elements as hope. Hope frequently underpins the probabilities assumed when investment decisions are made in an overconfident state. When the FMP feels lucky and bases probabilities on that luck rather than on the actual likelihood of an event, the resulting financial decision is likely to generate results less than those expected by the FMP.

Prediction overconfidence occurs when the confidence intervals that FMPs assign to their investment predictions are too narrow. For example, when estimating the future value of a stock, overconfident FMPs will incorporate far too little variation—using a narrower range of expected payoffs and a lower standard deviation of returns—than justified based on historical results and fundamental analysis. As a result of underestimating risks, particularly downside risks, FMPs may hold poorly diversified portfolios.

Certainty overconfidence occurs when the probabilities that FMPs assign to outcomes are too high because they are too certain of their judgments. This certainty is often an emotional response rather than a cognitive evaluation. For example, having decided that a company is a good investment, people may become blind to the prospect of a loss and predict high returns with virtual certainty. When the results are less than expected, the FMPs are surprised and disappointed. In response, they are likely to sell the investment and look for a replacement that they feel is certain to generate high returns. People susceptible to certainty overconfidence often trade too frequently.

Self-attribution bias is the tendency of individuals to ascribe their successes to innate personal traits, such as talent or foresight, while blaming failures on exogenous factors, such as bad luck. It can be broken down into two subsidiary biases: *self-enhancing* and *self-protecting*. Self-enhancing bias describes people's propensity to claim too much credit for their successes. Self-protecting bias describes the denial of personal responsibility for failures. The need for self-esteem affects the attribution of task outcomes; people protect themselves psychologically as they attempt to comprehend their successes and failures.

EXAMPLE 5

Prediction and Certainty Overconfidence

Prediction Overconfidence:

Clarke and Statman (2000) demonstrated prediction overconfidence when they asked investors the following question: "In 1896, the Dow Jones Industrial Average, which is a price index that does not include dividend reinvestment,

was at 40. In 1998 it crossed 9,000. If dividends had been reinvested, what do you think the value of the DJIA would be in 1998? In addition to that guess, also predict a high and low range so that you feel 90 percent confident that your answer is between your high and low guesses." In the survey, few responses reasonably approximated the potential 1998 value of the Dow, and no one estimated a correct confidence interval. (The 1998 value of the DJIA, under the conditions posed in the survey, would have been 652,230!)

Certainty Overconfidence:

People display certainty overconfidence in everyday life situations, and that overconfidence carries over into the investment arena. People have too much confidence in the accuracy of their own judgments. As people learn more about a situation, the accuracy of their judgments may increase but their confidence may increase even more; as a result, they may fallaciously equate the quantity of information with its quality. Confidence also tends to increase if people are given incentives to perform. Overconfidence is greatest when accuracy is near chance levels, and reduces as accuracy increases from 50 percent to 80 percent. Slovic, Fischhoff, and Lichtenstein (1982) gave subjects a general knowledge test and then asked them how sure they were of their answer. Subjects reported being 100 percent sure when they were actually only 70 percent to 80 percent correct.

Consequences of Overconfidence Bias As a result of overconfidence bias, FMPs may do the following:

- Underestimate risks and overestimate expected returns.
- Hold poorly diversified portfolios.
- Trade excessively.
- Experience lower returns than those of the market.

Many overconfident FMPs claim above-average aptitude for selecting stocks, with little supporting evidence. Barber and Odean (2001) found that after trading costs and before taxes, the average investor underperformed the market by approximately 2 percent per year.

Barber and Odean also found that the average subject's annual portfolio turnover was 80 percent (slightly less than the 84 percent averaged by mutual funds). The least active quintile of participants, with an average annual turnover of 1 percent, earned 17.5 percent annual returns, outperforming the 16.9 percent garnered by the S&P during this period. The most active 20 percent of FMPs averaged a *monthly* turnover of over 9 percent, but they realized pre-tax returns of only 10 percent annually. The authors of the study do, indeed, seem justified in labeling frequent trading as hazardous.

Many overconfident FMPs also believe they can pick mutual funds that will deliver superior future performance. The market-trailing performance of the average mutual fund is proof that most mutual fund clients also fail in this endeavor. Worse yet, FMPs tend to trade in and out of mutual funds at the worst possible times, chasing returns with poor results, as we learned in the previously referenced DALBAR study.

Detection of and Guidelines for Overcoming Overconfidence Bias FMPs should review their trading records, identify the winners and losers, and calculate portfolio performance over at least two years. Investors with an unfounded belief in their own ability to identify good investments may recall winners and their results but underestimate the number and results of their losers. A conscious review process will force them to acknowledge their losers, because a review of trading activity will demonstrate not only the winners but also the losers. This review will also identify the amount of

trading. When FMPs engage in too much trading, they should be advised to keep track of every investment trade and then calculate returns. This exercise will demonstrate the detrimental effects of excessive trading. Because overconfidence is also a cognitive error, more complete information can often help FMPs understand the error of their ways.

It is critical that investors be objective when making and evaluating investment decisions. There is an old Wall Street adage, "Don't confuse brains with a bull market," that warns about self-attribution. It is advisable to view the reasoning behind and the results of investments, winning and losing, as objectively as possible. Unfortunately, most people have difficulty being objective about their own behavior. This can lead to self-attribution and overconfidence biases and result in repeating the same mistakes: overtrading and chasing returns to the detriment of actual realized returns.

To stay objective, it is a good idea to perform post-investment analysis on both successful and unsuccessful investments. When did you make money? When did you lose money? Mentally separate your good money-making decisions from your bad ones. Then, review the beneficial decisions and try to discern what, exactly, you did correctly. Did you purchase an investment at a particularly advantageous time based on fundamentals, or did you luck out by timing a market upswing? Similarly, review the decisions that you categorized as poor. Did you make an investment aptly based on fundamentals and then make an error when it came time to sell, or was the market going through a correction? When reviewing unprofitable decisions, look for patterns or common mistakes that perhaps you were unaware you were making. Note any such tendencies that you discover, and try to remain mindful of them by brainstorming a rule or reminder such as: "I will do X in the future" or "I will not do Y in the future." Being conscious of these rules will help overcome any bad habits you may have acquired, and it can also reinforce your reliance on strategies that have served you well.

4.3 Self-Control Bias

Self-control bias is a bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline. There is an inherent conflict between short-term satisfaction and achievement of some long-term goals. Money is an area in which people are notorious for displaying a lack of self-control, but it is not the only one. Attitudes toward weight loss, smoking, and studying provide other examples. A person who is 100 pounds overweight is told by a doctor that weight loss is essential to long-term good health. Despite this knowledge, the individual may fail to cut back on food consumption. The short-term satisfaction of eating conflicts with the long-term goal of good health. Similarly, smokers may continue to smoke even though they are aware of the long-term health risks involved. People pursuing the CFA charter may fail to study sufficiently because of short-term competing demands on their time. Rational behavior would suggest that people would do whatever was necessary to achieve their long-term goals—whether to stay healthy or become a CFA charterholder—but it often does not happen.

When it comes to money, people may know they need to save for retirement, but they often have difficulty sacrificing present consumption because of a lack of self-control. The apparent lack of self-control may also be a function of hyperbolic discounting. Hyperbolic discounting is the human tendency to prefer small payoffs now compared to larger payoffs in the future. Sacrifices in the present require much greater payoffs in the future; otherwise, people will not be willing to make current sacrifices. People seem to have temporal short-sightedness or temporal myopia, focusing on the present and discounting the future. They spend today rather than save for tomorrow. This behavior can lead to high short-term utility and disastrous long-term utility.

Consequences of Self-Control Bias As a result of self-control bias, FMPs may do the following:

- Save insufficiently for the future.

  Upon realizing that their savings are insufficient, FMPs may do the following:

- Accept too much risk in their portfolios in an attempt to generate higher returns. In this attempt to make up for less than adequate savings, the capital base is put at risk.
- Cause asset allocation imbalance problems. For example, some FMPs prefer income-producing assets in order to have income to spend. This behavior can be hazardous to long-term wealth because income-producing assets may offer less total return potential, particularly when the income is not reinvested, which may inhibit a portfolio's ability to maintain spending power after inflation. Other FMPs may favor equities over bonds simply because they like to take risks. Asset allocations should be based upon a variety of factors, including level of risk tolerance, but they should not be entirely driven by risk tolerance.

Detection of and Guidelines for Overcoming Self-Control Bias People have a strong desire to consume today, which can be counterproductive to attaining long-term financial goals. FMPs should ensure that a proper investment plan is in place and should have a personal budget. Investing without planning is like building without a blueprint. Planning is the key to attaining long-term financial goals; plans need to be in writing, so that they can be reviewed regularly. Failing to plan is planning to fail. FMPs need to maintain a proper balance in asset allocations to attain their long-term financial goals. Adhering to a saving plan and an appropriate asset allocation strategy are critical to long-term financial success.

4.4 Status Quo Bias

Status quo bias, coined by Samuelson and Zeckhauser (1988), is an emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change. People are generally more comfortable keeping things the same than with change and thus do not necessarily look for opportunities where change is beneficial. Given no apparent problem requiring a decision, the status quo is maintained. Further, if given a situation where one choice is the default choice, people will frequently let that choice stand rather than opting out of it and making another choice. Thus, the process in presenting choices can influence decisions. For example, companies that enroll employees in defined contribution pension plans but give the employees the ability to opt out of the plan have a much higher participation rate than companies where employees have to opt in to the plan.

Status quo bias is often discussed in tandem with endowment and regret-aversion biases (described later) because the outcome of the biases, maintaining existing positions, may be similar. However, the reasons for maintaining the existing positions differ among the biases. In the status quo bias, the positions are maintained largely because of inertia rather than conscious choice. In the endowment and regret-aversion biases, the positions are maintained because of conscious, but possibly incorrect, choices. When endowment bias exists, ownership imbues an investment with intangible value beyond the true value to the holder. Endowment bias creates a preference for no change or the status quo. With regard to regret aversion, an FMP presented with two investment choices may opt for the status quo rather than potentially experience the regret of selling shares that then went up in price. When status quo, endowment, and regret-aversion biases are combined, people will tend to strongly prefer that things stay as they are, even at some personal cost.

Consequences of Status Quo Bias As a result of status quo bias, FMPs may do the following:

- Unknowingly maintain portfolios with risk characteristics that are inappropriate for their circumstances.
- Fail to explore other opportunities.

Detection of and Guidelines for Overcoming Status Quo Bias Status quo bias may be exceptionally strong and difficult to overcome. Education is essential. FMPs should quantify the risk-reducing and return-enhancing advantages of diversification and proper asset allocation. For example, with a concentrated stock position, showing what can happen to overall wealth levels if the stock collapses may persuade an FMP to diversify.

4.5 Endowment Bias

Endowment bias is an emotional bias in which people value an asset more when they hold rights to it than when they do not. Endowment bias is inconsistent with standard economic theory, which asserts that the price a person is *willing to pay* for a good should equal the price at which that person would be *willing to sell* the same good. However, psychologists have found that when asked, people tend to state minimum selling prices for a good that exceed maximum purchase prices that they are willing to pay for the same good. Effectively, ownership "endows" the asset with added value. Endowment bias can affect attitudes toward items owned for long periods of time or can occur immediately when an item is acquired. Endowment bias may apply to inherited or purchased securities.

FMPs may irrationally hold on to securities they already own, which is particularly true regarding their inherited investments. For example, a child or grandchild may hold an outsized inherited stock position because of an emotional attachment, despite the risk of a sizable loss if the stock stumbles. These investors are often resistant to selling even in the face of poor prospects. Again using the example of an inheritance, an FMP may hold an inherited municipal bond portfolio because of an emotional attachment, when a more aggressive asset mix may be more appropriate.

Samuelson and Zeckhauser (1988) aptly illustrate investor susceptibility to endowment bias and the resulting status quo bias. They performed trials in which subjects were told that they had inherited a large sum from their uncle and had four portfolios in which they could invest the sum. The portfolios bore various risks and rates of return. A second trial was performed with a single difference: subjects were told that the uncle had already invested the sum in a moderate risk company (one of the portfolio options in the previous trial). Subjects were presented with the same four portfolio options as in the first trial. The first trial had no status quo; the alternatives were all new. In the second trial, however, the moderate risk company portfolio was the status quo. Subjects chose the moderate risk company portfolio more often when it was in the status quo position than when it was not. Similarly, outcomes occurred for the other options when they (and not the moderate risk company portfolio) held the role of the status quo. This is a classic case of endowment and status quo biases combining. Many wealth management practitioners have encountered clients who are reluctant to sell securities bequeathed by previous generations. Often in these situations, investors cite feelings of disloyalty associated with the prospect of selling inherited securities, general uncertainty in determining the right choice, and concerns with tax issues. Although the latter may be a rational concern, the tax implications are most likely not being considered rationally. Sometimes the appropriate action may be to pay taxes and alter the investment portfolio.

Consequences of Endowment Bias As is the case with status quo bias, endowment bias may lead FMPs to do the following:

- Fail to sell off certain assets and replace them with other assets.
- Maintain an inappropriate asset allocation. The portfolio may be inappropriate for investors' levels of risk tolerance and financial goals.
- Continue to hold classes of assets with which they are familiar. FMPs may believe they understand the characteristics of the investments they already own and may be reluctant to purchase assets with which they have less experience. Familiarity adds to owners' perceived value of a security.

Detection of and Guidelines for Overcoming Endowment Bias Inherited securities are often the cause of endowment bias. In the case of inherited investments, an FMP should ask such a question as, "If an equivalent sum to the value of the investments inherited had been received in cash, how would you invest the cash?" Often, the answer is into a very different investment portfolio than the one inherited. It may also be useful to explore the deceased's intent in owning the investment and bequeathing it. "Was the primary intent to leave the specific investment portfolio because it was perceived to be a suitable investment based on fundamental analysis, or was it to leave financial resources to benefit the heirs?" Heirs who affirm the latter conclusion are receptive to considering alternative asset allocations.

When financial goals are in jeopardy, emotional attachment must be moderated; it cannot be accepted and adapted to. Several good resources are available on "emotional intelligence." FMPs should familiarize themselves with the topic so they can help themselves or their clients work through emotional attachment issues.

An effective way to address a desire for familiarity, when that desire contradicts good financial sense, is to review the historical performance and risk of the unfamiliar securities in question and contemplate the reasoning underlying the recommendation. Rather than replacing all familiar holdings with new, intimidating ones, start with a small purchase of the unfamiliar investments until a comfort level with them is achieved.

4.6 Regret-Aversion Bias

Regret-aversion bias is an emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly. Simply put, people try to avoid the pain of regret associated with bad decisions. This tendency is especially prevalent in investment decision making. Regret aversion can cause FMPs to hold onto positions too long. They are reluctant to sell because they fear that the position will increase in value and then they will regret having sold it.

Regret aversion can also keep FMPs out of a market that has recently generated sharp losses or gains. Having experienced losses, our instincts tell us that to continue investing is not prudent. Yet periods of depressed prices may present great buying opportunities. Regret aversion can persuade us to stay out of the stock market just when the time is right for investing. On the upside, fear of getting in at the high point can restrict new investments from taking place.

Regret bias can have two dimensions: actions that people take and actions that people *could have* taken. More formally, regret from an action taken is called an *error of commission*, whereas regret from an action not taken is called an *error of omission*. Regret may be distinguished from disappointment in that regret includes strong feelings of responsibility for the choice that has been made. Regret is more intense when the unfavorable outcomes are the result of an error of commission versus an error of omission. Thus, no action becomes the preferred decision.

Koening (1999) argues that regret aversion can initiate herding behavior. Regret aversion causes FMPs to avoid the pain of regret resulting from a poor investment decision, whether the loss comes from an investment that goes down or a "loss" resulting from a stock that went up that they did not own. It is not just the financial loss they regret; it is also the feeling of responsibility for the decision that gave rise to the loss. In order to avoid the burden of responsibility, regret aversion can encourage FMPs to invest in a similar fashion and in the same stocks as others. This herding behavior alleviates some of the burden of responsibility. As John Maynard Keynes (1936) writes in Chapter 12, "Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally."

Consequences of Regret-Aversion Bias As a result of regret-aversion bias, FMPs may do the following:

- Be too conservative in their investment choices as a result of poor outcomes on risky investments in the past. FMPs may wish to avoid the regret of making another bad investment and decide that low-risk instruments are better. This behavior can lead to long-term underperformance and potential failure to reach investment goals.
- Engage in herding behavior. FMPs may feel safer in popular investments in order to limit potential future regret. It seems safe to be with the crowd, and a reduction in potential emotional pain is perceived. Regret aversion may lead to preference for stocks of well-known companies even in the face of equal risk and return expectations. Choosing the stocks of less familiar companies is perceived as riskier and involves more personal responsibility and greater potential for regret.

Detection of and Guidelines for Overcoming Regret-Aversion Bias In overcoming regret-aversion bias, education is essential. FMPs should quantify the risk-reducing and return-enhancing advantages of diversification and proper asset allocation. Regret aversion can cause some FMPs to invest too conservatively or too riskily depending on the current trends. With proper diversification, FMPs will accept the appropriate level of risk in their portfolios depending, of course, on return objectives. To prevent investments from being too conservative, FMPs must recognize that losses happen to everyone and keep in mind the long-term benefits of including risky assets in portfolios. Recognizing that bubbles happen and keeping in mind long-term objectives will prevent a client from making investments that are too risky. Efficient frontier research can be quite helpful as an educational tool. Investing too conservatively or too riskily can potentially inhibit the ability to reach long-term financial goals.

4.7 Emotional Biases: Conclusion

Emotional biases stem from impulse, intuition, and feelings and may result in personal and unreasoned decisions. When possible, focusing on cognitive aspects of the biases may be more effective than trying to alter an emotional response. Also, educating about the investment decision-making process and portfolio theory can be helpful in moving the decision making from an emotional basis to a cognitive basis. When biases are emotional in nature, drawing these to the attention of an individual making the decision is unlikely to lead to positive outcomes; the individual is likely to become defensive rather than receptive to considering alternatives. Thinking of the appropriate questions to ask to potentially alter the decision-making process is likely to be most effective.

Such questions as, "If an equivalent sum to the value of the investments inherited had been received in cash, how would you invest the cash?" or "Was the primary intent to leave the specific investment portfolio because it was perceived to be a suitable investment based on fundamental analysis, or was it to leave financial resources to benefit the heirs?" are unlikely to elicit defensiveness. These types of questions are likely to open the way to a more rational investment approach.

INVESTMENT POLICY AND ASSET ALLOCATION

5

Behavioral biases can and should be accounted for by investors and their advisers in the investment policy development and asset allocation selection process. Behavioral finance considerations may have their own place in the constraints section of the investment policy statement along with liquidity, time horizon, taxes, legal and regulatory environment, and unique circumstances. Responses to such questions as the following may help develop the behavioral finance considerations that have an impact on investment decisions and the resulting portfolio.

1. Which biases does the client show evidence of?
2. Which bias type dominates (cognitive or emotional)?
3. What effect do the client's biases have on the asset allocation decision?
4. What adjustment should be made to a "rational" (risk tolerance-based) asset allocation that can account for the client's behavioral make-up?
   - **A** When should behavior be *moderated* to counteract the potentially negative effects of these biases on the investment decision-making process?
   - **B** When should asset allocations be created that *adapt* to the investor's behavioral biases so the investor can comfortably abide by his or her asset allocation decisions?
   - **C** When is it appropriate to design a *behaviorally modified asset allocation* (referred to as a modified portfolio, for convenience) for an investor?
   - **D** Once the decision is made to recommend a modified portfolio, what quantitative parameters should be used when putting the recommendation into action?

At the end of this section, we will review two case studies to help demonstrate these concepts. A variety of approaches exist to incorporate behavioral finance considerations into an investment policy statement and portfolio—including the use of a goals-based investing approach that is consistent with loss aversion (prospect theory) and mental accounting. Goals-based investing involves identifying an investor's specific goals and the risk tolerance associated with each goal. Investments are chosen considering each goal individually. Thus, a portfolio is constructed in layers rather than using the holistic approach to portfolio construction of modern portfolio theory (MPT). In goals-based investing, a portfolio is evaluated in terms of attaining financial goals and risk management focuses on the size and likelihood of potential losses. Investors are assumed to be loss averse, not risk averse.

Investment portfolios are managed and updated based on changing circumstances and goals of the client. This approach may be attractive to investors who are more focused on wealth preservation (i.e., minimizing losses) than on wealth accumulation (i.e., maximizing returns). This approach can also be useful in highlighting the consequences of selecting an asset allocation that is riskier than is appropriate for the investor. Taking a goals-based investment approach to asset allocation is helpful in terms of keeping financial goals in mind and understanding how much risk can be

taken when creating a portfolio. Exhibit 4 illustrates a goals-based investing approach. Such an approach matches many investors' natural desire to put money in separate mental accounts and to focus on loss as a measure of risk.

Exhibit 4 Goals-Based Investing Approach

Financial advisers using this approach will typically first get their clients to consider their obligations and needs. The advisers will then estimate how much should be invested in low-risk (capital preservation) assets to meet those needs and obligations. Next, riskier assets are considered to attain priorities and desires. Finally, even riskier assets are added to meet aspirational goals. Typically, investors will end up having a diversified portfolio using this approach, but the resulting portfolio may not be efficient from a traditional finance perspective. The lack of efficiency is because the components of the portfolio are individually justified rather than based on modern portfolio theory that considers correlations between investments. However, risk may be better understood by the investor using this methodology. As a result, investors may find it easier to adhere to investment decisions and portfolio allocations made using this approach.

In the following sections, we will discuss the use of another approach that begins with the rational portfolio and makes modifications to accommodate behavioral finance considerations. The concept of *behaviorally modified asset allocation* is introduced, and guidelines for creating such an allocation are discussed.

5.1 Behaviorally Modified Asset Allocation

When designing a standard asset allocation program, an investor, often working with an adviser, will typically answer a risk tolerance questionnaire, document financial goals and constraints, and then adopt the output of a portfolio optimization model that matches the investor's risk tolerance category and accomplishes the investor's financial goals. In the case of institutional investors, they will consider these items from the perspective of the entity they are acting on behalf of. An investment adviser will consider these items from the perspective of their clients when developing investment policy statements and asset allocations. The output of the portfolio optimization model will be referred to as a "rational" portfolio allocation.

The process described above takes into account risk tolerance and financial goals but fails to take into account behavioral biases. For example, in response to major short-term market movements, some investors, individual and institutional, may

change their asset allocations to the detriment of the long-term investment plan. This behavior may be the result of a bias, such as the regret-aversion bias, that may lead to herding behavior or simply loss aversion. An investor's interest may be better served by the adoption of an asset allocation that suits the investor's natural psychological preferences—and it may not be one that maximizes expected return for a given level of risk. For example, one investor's behaviorally modified asset allocation (modified portfolio) may be a modest, lower-returning, long-term investment program compared to the rational portfolio allocation. This modified asset allocation is one to which the investor can comfortably adhere. Another investor with similar natural psychological tendencies may be persuaded of the merits of taking on more risk and as a result have a riskier modified portfolio. In both cases, the investor must be comfortable with the modified portfolio.

In creating a modified portfolio, it is critical to distinguish between emotional and cognitive biases and to consider the level of wealth of the investor in question. Individual biases should primarily be assessed for the purpose of identifying which type of biases dominate (cognitive or emotional) and what actions should be taken in response to observed behaviors while considering the investor's overall wealth level. The basic actions are to adapt to a bias or to moderate the impact of the bias. When a bias is adapted to, it is accepted and decisions are made that recognize and adjust for the bias rather than making an attempt to reduce the impact of the bias. The resulting portfolio represents an alteration of the rational portfolio; the alteration responds to the investor's biases while considering financial goals and level of wealth. To moderate the impact of a bias is to recognize the bias and to attempt to reduce or even eliminate the bias within the individual rather than to accept the bias. The resulting portfolio is similar to the rational portfolio, and a program is adopted to reduce or eliminate the investor's biases.

The next section will examine guidelines for determining a modified portfolio, including an explanation of how to assess wealth level. The perspective taken in the next section is that of a private wealth manager working with an individual client. The approach can be used with modification in other situations.

5.1.1 *Guidelines for Determining a Behaviorally Modified Asset Allocation*

Pompian and Longo (2005) offer two guidelines for helping a private wealth manager identify a behaviorally modified asset allocation for a client.

Guideline I	The decision to moderate or adapt to a client's behavioral biases during the asset allocation process depends fundamentally on the client's level of wealth. Specifically, the wealthier the client, the more the practitioner should adapt to the client's behavioral biases. The less wealthy, the more the practitioner should moderate a client's biases.
Rationale	A client's outliving his or her assets constitutes a far graver investment failure than a client's inability to accumulate wealth. The likelihood of a client outliving his or her assets is a function of the level of wealth. If a bias is likely to endanger a client's standard of living, moderating is an appropriate course of action. If a bias will only jeopardize the client's standard of living if a highly unlikely event occurs, adapting may be more appropriate. However, the potential impact of low-probability, high-impact events should be discussed with the client.

(continued)

Guideline II	The decision to moderate or adapt to a client's behavioral biases during the asset allocation process depends fundamentally on the type of behavioral bias the client exhibits. Specifically, clients exhibiting cognitive errors should be moderated, and those exhibiting emotional biases should be adapted to.
Rationale	Because cognitive errors stem from faulty reasoning, better information and advice can often correct them. Conversely, emotional biases originate from feelings or intuition rather than conscious reasoning, and thus they are more difficult to correct.

Naturally, the determination of high wealth level and low wealth level is a subjective one that must be determined by the adviser in concert with the client. In this context, wealth is determined in relation to lifestyle, not just based on the level of assets. Some people have high levels of assets but also have an extravagant financial lifestyle to match, implying a "low" level of wealth; in other words, some people have a lot of assets but also spend accordingly. This behavior is related to *standard of living risk*. Standard of living risk (SLR) is the risk that the current or a specified acceptable lifestyle may not be sustainable. For example, individuals with modest assets and modest lifestyles that they do not wish to alter may not have a standard of living risk; as such, they might be viewed as having a moderate to high level of wealth. On the other hand, individuals with a high level of assets and extravagant lifestyles that they wish to maintain may have a standard of living risk; these individuals, regardless of level of assets, might be viewed as having a low to moderate level of wealth.

Guidelines I and II may, for some clients, yield a blended recommendation. For instance, a less wealthy client with strong emotional biases should be both adapted to and moderated. Exhibit 5 illustrates when to moderate and when to adapt.

Exhibit 5 Visual Depiction of Guideline I and Guideline II

5.1.2 *How Much to Moderate or Adapt*

A key concept in creating a behaviorally modified asset allocation is to decide how much it should deviate from the "rational" allocation of traditional finance. Exhibit 6 offers useful guidelines for helping to determine how much to adjust an allocation for behavioral bias.

Exhibit 6 Deviations from a "Rational" Portfolio

	Bias Type: Cognitive	Bias Type: Emotional
High Wealth Level/Low SLR	Modest Asset Allocation Change Suggestion: +/– 5 to 10% Max Per Asset Class	Stronger Asset Allocation Change Suggestion: +/– 10 to 15% Max Per Asset Class
Low Wealth Level/High SLR	Close to the Rational Asset Allocation Suggestion: +/– 0 to 3% Max Per Asset Class	Modest Asset Allocation Change Suggestion: +/– 5 to 10% Max Per Asset Class

Note that the percentages listed in the chart are *suggested* percentage adjustments from the "rational" allocation to asset classes based on behavioral bias. In terms of the magnitude of the suggested changes, to some these ranges may appear too narrow or too small in absolute terms, while others may see them as reasonable. The amount of change appropriate to modify an allocation will in large part depend on the number of asset classes used in the allocation. A 5 percent change in 10 asset classes, for example, could yield a substantial tilt to or away from risky assets; however, for an asset allocation with 4 asset classes, 5 percent would not be enough.

It is important to recognize the *relative* differences between these cases. The case requiring the least adjustment to the rational portfolio is a low wealth level client with cognitive bias. Here, the low wealth investor needs to modify his or her behavior to reach his or her financial goals, and with appropriate education and information, he or she should be able to adjust behavior to match the rational allocation. If an adjustment is needed, a +/– 0 to 2 percent maximum asset class adjustment is suggested. We will see an example of this case in the case studies later. The case that will likely require the most adjustment per asset class is emotional bias at high wealth level. Here, a +/– 10 percent maximum adjustment per asset class is suggested. The rationale for such a potentially high adjustment is that a wealthy investor with emotional bias may need substantial flexibility because emotional biases are difficult to correct; a high wealth level permits flexibility. The "middle of the road" cases are the high wealth level with cognitive biases and the low wealth level with emotional biases. With these two cases, a suggested maximum asset class adjustment is +/– 5 percent. The rationale for this adjustment is that there is a need to both adapt to and moderate behavioral biases, and the offsetting that takes place likely requires a modest adjustment. Naturally these are only conceptual guidelines; actual client situations will likely require additional customization.

Through the following case studies, we will identify an investor's behaviorally modified asset allocation. Thus equipped, investors and their advisers can more effectively apply behavioral finance research to investing activities. Institutional investors and money managers are not immune to behavioral biases. They should be particularly wary of cognitive errors. They should attempt to accept their knowledge limits and avoid belief perseverance and information-processing errors. Overconfidence is an emotional bias to which they may be particularly susceptible.

As discussed earlier, designing a standard asset allocation program with a client involves the following steps: 1) Advisers first administer a risk tolerance questionnaire; 2) Advisers discuss the client's financial goals and constraints; 3) Advisers typically recommend the output of a mean–variance optimization from any number of financial planning software programs. This approach may work better for institutional and individual investors who are familiar with financial theory, but institutional and individual investors and investment advisers, along with other financial market participants, are all susceptible to behavioral biases.

In a scenario familiar to investment advisers, in response to short-term market movements, a client may request that his or her asset allocation be changed—to the detriment of the long-term investment plan. Kahneman and Riepe (1998) describe financial advising as "a prescriptive activity whose main objective should be to guide investors to make decisions that serve their best interest." Serving the best interest of the client may be the recommendation of an asset allocation that suits the client's natural psychological preferences; it may not be the rational asset allocation (one that maximizes expected return for a given level of risk). More simply, a client's most appropriate behaviorally modified portfolio may be the long-term allocation recommendation that the client can comfortably adhere to. Conversely, another client's recommended portfolio may be one that goes against his or her natural psychological tendencies, but the client may be well served to accept more risk than he or she might otherwise be comfortable with in order to attain a higher return for that level of risk. Note here that allocation recommendations do not necessarily need to be inefficient; they can still be on the efficient frontier. They can move up or down it based on the client's behavioral make-up. However, even if the portfolio is on the efficient frontier, it may be inefficient considering transaction costs and the financial objectives of the investor.

5.2 Case Studies

The following case studies involve two hypothetical investors, Mr. Renaldo and Mrs. Maradona, and their adviser, Mr. Bobby Moore. Considering two dimensions, level of wealth and type of dominant biases, these case studies will consider two extreme examples: an investor with high wealth and emotional biases (Mr. Renaldo) and an investor with lower wealth and cognitive biases (Mrs. Maradona). Because of space constraints, we will not be able to review the two other extreme examples: an investor with high wealth and cognitive biases and an investor with lower wealth and emotional biases. Still, readers should understand that these cases will likely fall in between the two cases presented here in terms of behavioral adjustments to "rational" portfolio allocations.

These case studies were designed to answer four key questions in determining an investor's modified portfolio.

1. Which biases does the client show evidence of?
2. What effect do the client's biases have on the asset allocation decision?
3. What action should Mr. Moore take: moderate or adapt to these biases?
4. What is the appropriate behaviorally modified asset allocation for each client?

In the real world of investing, each client and each adviser is different; therefore, these case studies illustrate an approach to diagnosing and devising strategies for behaviorally biased clients rather than specific strategies. In each case, put yourself in the role of the adviser, Mr. Bobby Moore, and consider how you (Moore) should deal with the client and the given situation and approach the issues presented. The case studies will contain the following format, which is a simulation of the approach that advisers might encounter with a client:

- Introductory description of the case
- Identification of behavioral finance biases
- Effect of biases on asset allocation decision
- Action to be taken in response to identified biases (moderate or adapt)
- Recommendation of the behaviorally modified asset allocation

These cases involve hypothetical investors and are not intended to represent all investor types. Each client is unique and will differ from the clients described in these case studies. What is important is to follow the process that is being described on how to identify biases, how to determine what the appropriate course of action is for dealing with the biases, and how to adjust or not adjust the rational mean–variance portfolio recommendation for biased behavior.

Capital Markets Assumptions: For each of the case studies, assume that for the last three years, the stock market has experienced moderate and steady increases and interest rates have been stable. For simplicity, we will assume that the investors in the case studies will be limited to investing in three asset classes: stocks, bonds, and cash. Diagnosis for biases is done in two steps in the following way. First, a basic questionnaire (Exhibit 7) is given that assesses the 15 biases presented in this reading per the following list. *Note that the choice of responses would normally be in a multiple choice format, but in the interest of length, only the questions are shown here.* The questions do not follow the order of presentation of biases in the reading but instead intersperse emotional, belief perseverance, and information-processing biases. The question order can be altered, but it is advisable to not cluster questions about similar types of biases. Second, after reviewing the responses, the adviser focuses on biases identified by the questionnaire and delves further into them with the client to help create a modified portfolio.

Exhibit 7 Basic Diagnostic Questions for Behavioral Bias

Behavioral Bias	Diagnostic Question
Loss Aversion	Imagine you make an investment that drops 25 percent in the first six months. You are unsure if it will come back. What would you normally do (NOT what you *think* you should do; what you *would* do)?
Endowment	How would you describe your emotional attachment to possessions or investment holdings?
Status Quo	How would you describe the frequency of your trading?
Anchoring	You purchase a stock at $50 per share. It goes up to $60 in a few months, and then it drops to $40 a few months later. You are uncertain what will happen next. How would you respond to this scenario?
Mental Accounting	Generally, do you categorize your money by different financial goals, or do you look at the bigger financial picture?
Regret Aversion	Have you ever made an investment that you have regretted making? How did that affect your future investing decisions?
Hindsight	Do you believe investment outcomes are generally predictable or unpredictable?
Framing	Assume you have agreed to a financial plan created by your adviser that has a projected return of 9 percent and an annual standard deviation of +/–15% (a typical plan). Would it surprise you to know that statistically in the worst case, the plan's return could be negative 36 percent or more in one year out of 100? Would this information cause you to rethink your risk tolerance?
Conservatism	Assume you make an investment based on your own research. An adviser presents you with information that contradicts your belief about this investment. How would you respond?
Availability	Do you ever make investment decisions (such as selecting a mutual fund or online broker) based on word-of-mouth or name recognition?
Representativeness	Have you ever made a new investment because of its apparent similarity to a past successful investment (e.g., a tech stock or value stock) without doing research to validate the new investment's merits?

(continued)

Exhibit 7 (Continued)

Behavioral Bias	Diagnostic Question
Overconfidence	Suppose you make a winning investment. How do you generally attribute the success of your decision?
Confirmation	Suppose you make an investment based on your own research. The investment doesn't move up as much as you thought it might. How are you likely to respond?
Illusion of Control	You are offered two free lottery tickets. You may either select your own numbers or have a machine do it. What would you do?
Self-Control	Do you tend to save or spend disposable income?

5.2.1 *Case Study #1: Mr. Renaldo (High Wealth Level, Emotional Biases)*

Mr. Renaldo ("Mr. R") is a single, 58-year-old, hard-working, international corporate lawyer (an employee of a large multinational company). He earns a salary of £600,000 annually. He has residences in both London and New York and generally lives within his annual income net of taxes. He occasionally spends more than his net income, but in other years he saves and invests. His current portfolio is worth approximately £3,500,000. It reached this value primarily because of some successful high risk oil and technology investments as well as stock options granted by his employer. Mr. R has no plans for marriage or children. He had a mild heart attack last year, but he has made a full recovery. His primary financial goal is to retire comfortably at age 65 with a reduced spending level of £150,000 and to bequeath any assets remaining at his death to his alma mater, Oxford University. Mr. R's financial adviser, Mr. Bobby Moore, has been working with Mr. R for less than a year. During that time, Moore has proposed a comprehensive financial plan. Despite Moore's recommendations, however, Mr. R's asset allocation has remained the same at nearly 80 percent equities, with 40 percent in his employing company's publicly traded stock. Still, Moore has developed a good working relationship with Mr. R.

Moore believes that Mr. R. is a well-grounded, fairly rational person, but he also believes that Mr. R has some behavioral issues to address. In Moore's view, the most important issue is that Mr. R has not taken action yet on the new, more conservative allocation that Moore proposed months ago of 60 percent stocks, 30 percent bonds, and 10 percent cash. Moore worries about the lack of diversification in Mr. R's portfolio. Moore's concern is that a severe downward market fluctuation or drop in Mr. R's employing company's stock may cause him to sell assets irrationally, affecting his long-term financial plan. Moore's financial plan demonstrates that even with a somewhat less aggressive portfolio, Mr. R could still meet his primary financial objectives if he could save just £25,000 annually. Moore believes that one of the issues is that Mr. R thinks of himself as a very savvy investor because of some risky bets that worked out well for him in the past. Moore suspects that Mr. R hasn't changed his allocation because he thinks Moore's allocation recommendation is too conservative. Moore also notices that Mr. R constantly worries about missing out on hot stocks that go up because he was not aggressive enough. Moore decides that the appropriate course of action is to ask Mr. R to take a behavioral bias diagnostic questionnaire. When Moore gets the answers to the questionnaire, he decides to delve further into three biases: *regret aversion, overconfidence, and self-control*. Moore asks Mr. R further questions on these three biases. Exhibit 8 shows Mr. R's answers to these questions in **bold**.

Exhibit 8 Mr. Renaldo's Bias Diagnostic Tests

Regret-Aversion Diagnostic Test

Question 1:

Suppose you make an investment in Stock ABC, and over the next six months, ABC appreciates by your target of 15 percent. You contemplate selling but then come across an item in the *Financial Times* that rehashes the company's recent successes and also sparks new optimism. You wonder whether ABC could climb even higher. Which answer describes your likeliest response given ABC's recent performance and the FT article?

A **I think I'll hold off and wait to see what happens. I'd really "kick" myself if I sold now and ABC continued to go up.**

B I'll probably sell because ABC has hit the target I set, and I try to stick to the targets I set.

Question 2:

Suppose you have decided to invest £10,000 in one individual company stock, and you have narrowed your choice down to two companies: Blue, Inc., and Red, Inc. Blue is a well-followed, eminently established company whose shareholders include many large pension funds. Red is newer but has performed well; it has not garnered the same kind of public profile as Blue, and it has few well-known investors. According to your calculations, both stocks are expected to have equal risk and return payoffs. Which answer most closely matches your thought process in this situation?

A I would probably feel indifferent between the two investments, because both generated the same expected parameters with respect to risk and return.

B **I will most likely invest in Blue because if I invested in Red and my investment failed, I would feel foolish. Few well-known investors backed Red, and I would really regret going against their informed consensus only to discover that I was wrong.**

C I will most likely invest in Blue because I feel safe taking the same course as so many respected institutional investors. If Blue does decline in value, I know I won't be the only one caught by surprise. With so many savvy professionals sharing my predicament, I could hardly blame myself for poor judgment.

Scoring Guidelines:

People answering A in Question 1 and/or B or C in Question 2 may harbor susceptibility to regret-aversion bias.

Overconfidence Bias Diagnostic

Question 1:

How easy do you think it was to predict the collapse of the housing market in the United States in 2007–2008?

A Easy.

B **Somewhat easy.**

C Somewhat difficult.

D Difficult.

(continued)

Exhibit 8 (Continued)

Question 2:

Assume that from 1926 through 2006, the compound annual return for equities was 10 percent. In any given year, what returns do you expect your equity investments to produce?

A Below 10 percent.

B About 10 percent.

C Above 10 percent.

D **Well above 10 percent.**

Question 3:

How much ability do you believe you have in picking investments that will outperform the market?

A Absolutely no ability.

B Little if any ability.

C Some ability.

D **A fair amount of ability.**

Scoring Guidelines:

Answering A or B in Question 1, answering C or D in Question 2, or answering C or D in Question 3 indicates susceptibility to overconfidence bias.

Self-Control Bias Diagnostic

Question 1:

Suppose that you are in need of a new automobile. You have been driving your current car for seven years, and it's time for a change. Which of the following approaches are you most likely to take?

A I would typically "under spend" on a car because I view a car as transportation and I don't need anything fancy. Besides, I can save the extra money I might have spent on a fancy car and put it away in my savings accounts.

B I would typically purchase a medium-priced model, with some fancy options, simply because I enjoy a nice car. I may forego other purchases in order to afford a nice car. I would not purchase anything extravagant, but a nice car is something that I value to an extent and am willing to spend money to obtain.

C **When it comes to cars, I like to indulge myself. I'd probably splurge on a top-of-the-line model and select most or all available luxury options. Even if I must purchase this car at the expense of saving money, for the long term, I believe that it's vital to "live in the moment." This car is simply my way of living in the moment.**

Question 2:

How would you characterize your retirement savings patterns?

A I consult my advisers and make sure that every tax-favored investment vehicle is "maxed out" (e.g., 401(k), IRA), and I will often save additional funds in taxable accounts.

Exhibit 8 (Continued)

B I will usually take advantage of most tax-favored investment vehicles, though in some cases I'm sure that details may have escaped my attention. I may or may not save something in taxable investment accounts.

C **I hardly ever save for retirement. I spend most of my disposable income, so very little remains available for savings.**

Scoring Guidelines:

People answering B or C to Questions 1 or 2 may be susceptible to self-control bias. Lack of self-control is very common.

Through this process, Moore finds that Mr. R is indeed susceptible to the following emotional biases:

- **Regret-aversion bias** (the tendency to avoid making a decision for fear the decision may cause regret later).
- **Overconfidence bias** (the tendency to overestimate one's investment savvy).
- **Self-control bias** (the tendency to spend today rather than save for tomorrow).

As part of the original financial planning process, Moore administered a risk tolerance questionnaire to Mr. R for the purpose of generating a mean–variance optimization portfolio recommendation. When Moore generated the optimization recommendation, Mr. R's proposed asset allocation was 60 percent stocks, 30 percent bonds, and 10 percent cash. Moore's job is now to answer the following three questions:

- What effect do Mr. R's biases have on the asset allocation decision?
- Should Moore moderate or adapt to Mr. R's biases?
- What is an appropriate behaviorally modified asset allocation for Mr. R?

Solutions to Mr. Renaldo Case Study

Effect of Biases Mr. Renaldo has emotional biases that provide a clear indication of what allocation he would naturally prefer, which is one dominated by equities. Mr. Renaldo's overconfidence leads him to be more comfortable with equities than may be appropriate. This overconfidence, as well as a potential endowment bias, may explain why he has chosen to hold a substantial part of his portfolio in his employing company's stock. Additionally, Mr. R is likely to experience regret if he misses a major market move. On the other hand, he has a high need for current income that supplements his "spend today" mentality (self-control bias), and he may need the "ballast" of fixed-income investments in the event of a market downturn. Because his level of wealth is high, however, he does have some flexibility with his allocation to favor equity over fixed income.

Moderate or Adapt? When considering level of wealth, Mr. Renaldo clearly does not run a "standard of living" risk, which argues for adapting to his biases. Additionally, his behavioral biases are principally emotional (overconfidence, regret aversion, self-control). Given these facts, and given that he naturally prefers an allocation favoring equity, Moore now has the information with which to make the following graph and the "moderate, adapt, or both moderate *and* adapt" recommendation.

Exhibit 9 Illustration of Mr. Renaldo's Case Study Information

Moore decides that the appropriate recommendation is to *adapt* to Mr. R's biases and create a more aggressive portfolio that Mr. R can adhere to and be comfortable with. Moore also recommends that Mr. R reduce his company stock position by 50 percent and reduce spending, if possible. At the same time, Moore will run a cash flow analysis to ensure that in the event of a market downturn, Mr. R's living expenses will not be at risk. Moore also advises a comfortable cash reserve.

Behaviorally Modified Portfolio Decision The mean–variance optimizer's recommended allocation was **60 percent stocks, 30 percent bonds, and 10 percent cash**. Using guidelines presented earlier in the reading for emotional biases at a high wealth level, in Moore's judgment, an appropriate behaviorally modified asset allocation is an allocation of **70 percent stocks, 20 percent bonds, and 10 percent cash**. When Moore checks his financial planning software to make sure that this allocation will statistically ensure that Mr. R will have adequate living expenses in the event of a market downturn, it shows that the behaviorally modified asset allocation indeed works. Thus, Moore recommends this allocation to Mr. R, explaining how he arrived at that particular allocation recommendation.

5.2.2 *Case Study #2: Mrs. Maradona (Lower Wealth Level, Cognitive Biases)*

Mrs. Maradona ("Mrs. M") is a 75-year-old widow from the United States with a modest lifestyle and no income beyond what her investment portfolio of $1,500,000 generates (about $90,000 per year) and a small government pension of $10,000 annually. Her adviser, Mr. Bobby Moore, has known Mrs. M for about five years. Although Mrs. M did not clearly articulate her investment goals when Moore first started working with her, over time Moore has learned that Mrs. M's primary investment goals are 1) to not lose money and 2) to maintain the purchasing power of her assets after fees and taxes. Her desire to not lose money stems from the fact that she recalls that her parents lost money in the US market crash of 1929; she has a "Depression Era" mentality. One of her tendencies is to spread her money around many different banks, and she speaks regularly about various "pots" of money—such as one for generating her income, one for her grandson's education, and one for paying her bills. Moore has been challenged by the fact that Mrs. M is quite stubborn in her opinions and rarely, if ever, listens to Moore when he recommends that she change her way of thinking about her investment money and portfolio allocation. Her knowledge of financial concepts is limited, but she is willing to meet regularly and discuss issues with Moore over tea.

Moore is concerned that she is too conservative in her approach and will not accomplish one of her key goals, keeping her purchasing power, because she only invests in government bonds and cash. By taking this approach, her portfolio will not keep up with her spending after inflation and taxes in the long run; therefore, she is putting herself at risk to outlive her assets. As Moore reflects one day on his relationship with Mrs. M, he realizes that the only recommendation she has accepted is to buy investment-grade corporate bonds to slightly increase her returns. Moore suspects that behavioral biases are influencing Mrs. M and not permitting her to feel comfortable with changing her portfolio. Moore asks her if she will take a 15-question assessment to examine her investor personality. She agrees. Based on the answers to the assessment, Moore decides to delve further into three biases: *anchoring, mental accounting, and loss aversion*. Moore provides Mrs. M with additional questions on these three biases. Exhibit 10 shows Mrs. M's answers in **bold**.

Exhibit 10 Mrs. Maradona's Bias Diagnostic Tests

Anchoring Bias Diagnostic

Question 1:

Suppose you own a five-bedroom house and have decided it is time to "downsize" to a smaller house. You are not in a rush to sell your house, but taxes and general expenses on your home are significant and you want to sell it as soon as possible. Your real estate agent, who you have known for many years and trust, lists your home for sale at $500,000. You only paid $125,000 for the house 10 years ago, so you are thrilled. The house has been on the market for several months, and you have not had any serious offers. One day, you get a phone call from your agent saying he needs to come over right away. When he arrives, he tells you that Books-Direct, a major employer in town, just declared bankruptcy and 1,000 people are out of work. He has been in meetings all week with his colleagues, and they estimate that real estate prices are down about 10 percent across all types of homes in your area. He says that you must decide at what price you now want to list your home based on this new information. You tell him that you will think it over and get back to him shortly. Please select one of the following that would be your answer:

A You decide to keep your home on the market for $500,000.

B **You decide to lower your price by 5 percent to $475,000.**

C You decide to lower your price by 10 percent to $450,000.

D You decide to lower your price to $425,000 because you want to be sure you get a bid on the house.

Scoring Guidelines:

Mrs. M chose B, and thus she may be susceptible to anchoring bias. It is clear that if she wants to sell her home, she should lower her price by 10 percent. Mrs. M demonstrates that she is "anchored" to $500,000 and will not fully adjust to the updated information.

Mental Accounting Bias Diagnostic Test

Question 1:

How do you tend to think about your money?

A I tend to think about my money as one "pot," and money is spent out of that one pot.

(continued)

Exhibit 10 (Continued)

B **I tend to segregate my money into various accounts, such as money for paying bills, money for traveling, and money for bequeaths.**

C I tend to segregate my money based on its source, such as pension, interest income, or capital gains.

Scoring Guidelines:

Mrs. M selected B. People who select B or C may be susceptible to mental accounting bias.

Loss-Aversion Diagnostic Test

Question 1:

Suppose you are presented with the following investment choices. Please choose between the following two outcomes:

A **An assured gain of $400.**

B A 25 percent chance of gaining $2,000 and a 75 percent chance of gaining nothing.

Question 2:

You are then asked to choose between the following two outcomes:

A An assured loss of $400.

B **A 50 percent chance of losing $1,000, and a 50 percent chance of losing nothing.**

Scoring Guidelines

Question 1:

Loss-averse investors are likely to opt for the assurance of a profit in A, even though the expected value of B is $500.

Question 2:

Loss-averse investors are more likely to select B even though the expected value in B is –$500 and the loss in A is only $400.

By making both these choices, Mrs. M appears to exhibit loss aversion.

Moore's suspicions are confirmed. Mrs. M is subject to the following biases:

- **Loss-aversion bias** (the tendency to feel the pain of losses more acutely than the pleasure of gains).
- **Anchoring and adjustment bias** (the tendency to believe that current market levels are "right"; up or down directional estimates are made from the current level).
- **Mental accounting bias** (the tendency to segregate money into different "accounts.")

As part of the original asset allocation process, Moore also administered a risk tolerance questionnaire to Mrs. M for the purpose of generating a mean–variance optimization portfolio recommendation. When Moore generated the optimization recommendation, Mrs. Maradona's "rational" asset allocation was 70 percent bonds, 20 percent stocks, and 10 percent cash; her actual allocation is 100 percent bonds.

Moore is convinced that Mrs. M needs to have a riskier portfolio than the one she currently has and that the reason she is invested so conservatively is primarily because of behavioral biases. Moore's job is now to answer the following three questions:

- What effect do Mrs. M's biases have on the asset allocation decision?
- Should Moore moderate or adapt to Mrs. M's biases?
- What is an appropriate behaviorally modified asset allocation for Mrs. M?

Solutions to Mrs. Maradona Case Study

Effect of Biases Mrs. Maradona's biases are consistent and demonstrate to Moore a clear allocation preference for bonds. Because Mrs. Maradona does not want to put her principal at risk (which is manifested by loss-aversion bias) and separates her money into mental accounts (mental accounting), she would naturally prefer the safe and secure asset allocation of 100 percent bonds that she now has. Additionally, because the stock market rises and falls regularly, she will likely make irrational conclusions about what the "right" level of the overall stock market should be (anchoring bias); as a result, she will be wary of any exposure to equities. Thus, if Moore as her adviser presented her with an allocation of 100 percent bonds, she would be likely to immediately agree with that recommendation. However, Moore understands that she has a bias toward such an allocation.

Moderate or Adapt? Mrs. Maradona's level of wealth—which, while not low, is not high—puts her at a relatively high standard of living risk (SLR). If Moore *adapts* to her biases and recommends an allocation of 100 percent bonds, Moore's financial planning software tells him that Mrs. Maradona runs the risk of outliving her assets, a clearly unacceptable outcome. Moore needs to help her understand that she would be at risk if she accepted a 100 percent bond portfolio. Because her biases are principally cognitive (mental accounting, anchoring), and these types of biases can be corrected with education and advice, Moore is confident he can help her make changes. Moore now has the information needed to make the following table.

Exhibit 11 Illustration of Mrs. Maradona's Case Study Information

Behaviorally Modified Portfolio Decision Moore decides that an appropriate course of action is to *moderate* Mrs. M's bias preferences, so he recommends that she accept some risk in her portfolio. Moore reasons that an appropriate moderation of Mrs. M's biases will result in the "rational" allocation of **70 percent bonds, 20 percent equity, and 10 percent cash** (the mean–variance recommendation). Moore checks his financial planning software to make sure that this allocation will statistically ensure that Mrs. M will not outlive her money. The software shows that this allocation is acceptable. Moore explains to Mrs. M how an allocation based on her biases may have led to an allocation such that her resources would have likely been depleted before her death. Thus, Moore recommends the **70 percent bonds, 20 percent equity, and 10 percent cash** allocation to Mrs. M. Also, Moore will continue a program of investor education on the risk of outliving one's assets.

SUMMARY

Behavioral biases potentially affect the behaviors and decisions of financial market participants. By understanding behavioral biases, financial market participants may be able to moderate or adapt to the biases and as a result improve upon economic outcomes. These biases may be categorized as either cognitive errors or emotional biases. The type of bias influences whether the impact of the bias is moderated or adapted to.

Among the points made in this reading are the following:

- Individuals do not necessarily act rationally and consider all available information in the decision-making process because they may be influenced by behavioral biases.
- Biases may lead to sub-optimal decisions.
- Behavioral biases may be categorized as either cognitive errors or emotional biases. A single bias may, however, have aspects of both with one type of bias dominating.
- Cognitive errors stem from basic statistical, information-processing, or memory errors; cognitive errors typically result from faulty reasoning.
- Emotional biases stem from impulse or intuition; emotional biases tend to result from reasoning influenced by feelings.
- Cognitive errors are more easily corrected for because they stem from faulty reasoning rather than an emotional predisposition.
- Emotional biases are harder to correct for because they are based on feelings, which can be difficult to change.
- To adapt to a bias is to recognize and accept the bias and to adjust for the bias rather than to attempt to moderate the bias.
- To moderate a bias is to recognize the bias and to attempt to reduce or even eliminate the bias within the individual.
- Cognitive errors can be further classified into two categories: belief perseverance biases and information-processing biases.
- Belief perseverance errors reflect an inclination to maintain beliefs. The belief is maintained by committing statistical, information-processing, or memory errors. Belief perseverance biases are closely related to the psychological concept of cognitive dissonance.

- Belief perseverance biases include conservatism, confirmation, representativeness, illusion of control, and hindsight.
- Information-processing biases result in information being processed and used illogically or irrationally.
- Information-processing biases include anchoring and adjustment, mental accounting, framing, and availability.
- Emotional biases include loss aversion, overconfidence, self-control, status quo, endowment, and regret aversion.
- Understanding and detecting biases is the first step in overcoming the effect of biases on financial decisions. By understanding behavioral biases, financial market participants may be able to moderate or adapt to the biases and as a result improve upon economic outcomes.

REFERENCES

Barber, Brad M., and Terrance Odean. 2001. "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment." *Quarterly Journal of Economics*, vol. 116, no. 1:261–292.

Barras, Laurent, Olivier Scaillet, and Russell Wermers. 2010. "False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas." *Journal of Finance*, vol. 65, no. 1 (February):179–216.

Benartzi, Shlomo, and Richard H. Thaler. 1995. "Myopic Loss Aversion and the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 110, no. 1:73–92.

Bogle, John C. 2005. "The Relentless Rules of Humble Arithmetic." 2005. *Financial Analysts Journal*, vol. 61, no. 6 (November/December):22–35.

Butler, Stephen A. 1986. "Anchoring in the Judgmental Evaluation of Audit Samples." *Accounting Review*, vol. 6, no. 1:101–111.

Clarke, Roger G., and Meir Statman. 2000. "The DJIA Crossed 652,230." *Journal of Portfolio Management*, vol. 26, no. 2 (Winter):89–92.

Fischhoff, Baruch. 1975. "Hindsight Is Not Equal to Foresight: The Effect of Outcome Knowledge on Judgment under Uncertainty." *Journal of Experimental Psychology. Human Perception and Performance*, vol. 1, no. 3 (August):288–299.

Gadarowski, Christopher. 2001. "Financial Press Coverage and Expected Stock Returns." Working paper, Cornell University.

Gilovich, Thomas. 1993. *How We Know What Isn't So: The Fallibility of Human Reason in Everyday Life*. New York: Free Press.

Hirshleifer, David. 2001. "Investor Psychology and Asset Pricing." *Journal of Finance*, vol. 56, no. 4:1533–1597.

Joyce, Edward G., and Gary C. Biddle. 1981. "Anchoring and Adjustment in Probabilistic Inference in Auditing." *Journal of Accounting Research*, vol. 19, no. 1:120–145.

Kahneman, Daniel, and Mark Riepe. 1998. "Aspects of Investor Psychology." *Journal of Portfolio Management*, vol. 24, no. 4:52–65.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica: Journal of the Econometric Society*, vol. 47, no. 2:263–291.

Kahneman, Daniel, Peter P. Wakker, and Rakesh Sarin. 1997. "Back to Bentham? Explorations of Experienced Utility." *Quarterly Journal of Economics*, vol. 112, no. 2:375–405.

Keynes, John Maynard. 1936. *The General Theory of Employment, Interest, and Money*. New York: Harcourt, Brace.

Koening, J. 1999. "Behavioral Finance: Examining Thought Processes for Better Investing." *Trust & Investments*, vol. 60, (May/June):17–23.

Kroll, Yoram, Haim Levy, and Amnon Rapoport. 1988. "Experimental Tests of the Separation Theorem and the Capital Asset Pricing Model." *American Economic Review*, vol. 78, no. 3:500–519.

Langer, Ellen. 1983. *The Psychology of Control*. Beverly, CA: Sage Publications.

Montier, James. 2002a. *Behavioural Finance: Insights into Irrational Minds and Markets*. West Sussex, England: John Wiley & Sons.

Montier, James. 2002b. "Equity Research." Research report, Dresdner Kleinwort Wasserstein.

Pompian, Michael. 2006. *Behavioral Finance and Wealth Management*. Hoboken, NJ: John Wiley & Sons.

Pompian, Michael, and John Longo. 2005. "Incorporating Behavioral Finance into Your Practice." *Journal of Financial Planning*, vol. 18, no. 3:58–63.

Posner, Richard. 1998. "Rational Choice, Behavioral Economics, and the Law." *Stanford Law Review*, vol. 50, no. 5:1551–1575.

Samuelson, Paul A. 1963. "Risk and Uncertainty: A Fallacy of Large Numbers." *Scientia*, 6th Series, 57th year (April–May):108–113.

Samuelson, William, and Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty*, vol. 1, no. 1:7–59.

Shefrin, Hersh, and Meir Statman. 1984. "Explaining Investor Preference for Cash Dividends." *Journal of Financial Economics*, vol. 13, no. 2:253–282.

Shefrin, Hersh, and Meir Statman. 1985. "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence." *Journal of Finance*, vol. 40, no. 3:77–90.

Slovic, Paul, and Sarah Lichtenstein. 1971. "Comparison of Bayesian and Regression Approaches to the Study of Information Processing in Judgment." *Organizational Behavior and Human Performance*, vol. 6, no. 6:649–744.

Slovic, Paul, Baruch Fischhoff, and Sarah Lichtenstein. 1982. "Why Study Risk Perception?" *Risk Analysis*, vol. 2, no. 2:83–93.

Statman, Meir. 1999. "Behavioral Finance: Past battles and Future Engagements." *Financial Analysts Journal*, vol. 55, no. 6 (November/December):18–27.

Statman, Meir. 2008. "What is Behavioral Finance?" In *Handbook of Finance*. Edited by Frank Fabozzi. Hoboken, NJ: John Wiley & Sons.

Thaler, Richard H. 1980. "Toward a Positive Theory of Economic Choice." *Journal of Economic Behavior & Organization*, vol. 1, no. 1:39–60.

Thaler, Richard H., and Eric J. Johnson. 1990. "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice." *Management Science*, vol. 36, no. 6:643–660.

Tversky, Amos, and Daniel Kahneman. 1973. "Availability: A Heuristic for Judging Frequency and Probability." *Cognitive Psychology*, vol. 5, no. 2 (September):207–232.

Vanguard Investments Australia. 2004. "Fund Performance May Be Luck Not Skill New Study Shows." News Release (Sydney) Vanguard Investments LTD/Morningstar (27 April).

PRACTICE PROBLEMS

The following information relates to Questions 1–5

Luca Gerber recently became the chief investment officer for the Ludwigs Family Charity, a mid-size private foundation in Switzerland. Prior to assuming this role, Gerber was a well-known health care industry analyst. The Ludwigs' family fortune is primarily the result of entrepreneurship. Gerhard Ludwigs founded ABC Innovations (ABC), a biotech company dedicated to small cell lung cancer research. The foundation's portfolio is fifteen percent invested in ABC.

Gerber initially feels that fifteen percent investment in ABC is high. However, upon review, he decides it is appropriate based on Ludwigs' involvement and their past success with similar ventures. Gerber makes a mental note to himself to closely monitor the investment in ABC because he is not familiar with small-cap startup companies. The remaining 85 percent of the foundation's portfolio is invested in equity of high quality large-cap pharmaceutical companies. Gerber deems this allocation appropriate and is excited that he is able to continue to use his superior knowledge of the health care industry.

For the past two years, ABC has been dedicated to Project M, an effort directed at developing a drug for the treatment of relapses in small cell lung cancer. Project M has delayed its Phase Two trials twice. Published results from Phase One trials have raised some concerns regarding the drug. In its last two quarterly investors' conference calls, ABC's CEO was very cautious in discussing expectations for Project M. ABC's stock price decreased by over 20 percent during the past six months. Gerber believes that the research setbacks are temporary because of ABC's past success with projects. He expects that ABC will begin Phase Two within a year, and also believes that once Project M goes into Phase Two, ABC's stock price should reach a new 52-week high of CHF 80.

Soon after deciding to hold the stock, Gerber reads an article by ABC's chief scientist in which certain scientific results from Project M are detailed. As a conclusion, the article states: "Although we still have some major obstacles to overcome, the Project M team has seen positive signs that a treatment for small cell lung cancer is achievable." While Gerber has difficulty interpreting the scientific results, he feels reassured after reading the concluding statement.

Today, ABC announces the news that it will no longer pursue Project M, citing early signs of failure of the project. As a result of the announcement, the stock price drops by 50 percent. Gerber is stunned. He reviews the company's history and notes that ABC has been up front about its struggles to solve the Project M issues. Gerber now realizes that he has been ignoring all the signs and feels a tremendous regret for not having sold the foundation's investment in ABC earlier.

1 **Discuss** how Gerber displayed availability bias with *one* example. **Determine** the implications of availability bias for financial decision making and **describe** *one* way Gerber could overcome the bias.

2 **Discuss** how Gerber displayed overconfidence bias and **cite** *one* example to support this statement. **Distinguish** between the availability bias and the overconfidence bias.

© 2011 CFA Institute. All rights reserved.

3 **Discuss** how Gerber displayed conservatism bias. **Cite** three examples from the reading.

4 **Determine** whether Gerber displayed confirmation bias when reviewing the chief scientist's article. **Justify** your answer with one reason.

Answer Question 4 in the template provided below:

Determine whether Gerber displayed confirmation bias when reviewing the chief scientist's article. (circle one)	**Justify** your answer with one reason.
Agree	
Disagree	

5 **Indicate** which bias is illustrated by Gerber's focus on the achievement of a 52-week high of CHF 80. **Discuss** how Gerber could have mitigated its impact.

The following information relates to Questions 6–12

Tiffany Jordan is a hedge fund manager with a history of outstanding performance. For the past 10 years, Jordan's fund has used an equity market neutral strategy (long/short strategy that strives to eliminate market risk; i.e., beta should be zero) which has proved to be effective as a result of Jordan's hard work. An equity market neutral strategy normally generates large daily trading volume and shifts in individual security positions. Jordan's reputation has grown over the years as her fund has consistently beaten its benchmark. Employee turnover on Jordan's team has been high; she has a tendency to be quick to blame, and rarely gives credit to team members for success. During the past twelve months, her fund has been significantly underperforming against its benchmark.

One of Jordan's junior analysts, Jeremy Tang, is concerned about the underperformance and notes the following:

Observation 1	Certain positions are significantly under water, have much higher risk profiles, and have been held for much longer than normal.
Observation 2	The trading volume of the fund has decreased by more than 40 percent during the past year.
Observation 3	The portfolio is more concentrated in a few sectors than in the past.

Tang is worried that the portfolio may be in violation of the fund's Investment Policy Statement (IPS). Tang brings this to Jordan's attention during a regular weekly team meeting. Jordan dismisses Tang's analysis and tells the team not to worry because she knows what she is doing. Jordan indicates that since she believes the pricing misalignment will correct itself, the portfolio will not be able to take advantage of the reversion to the mean if she sells certain losing positions. She reassures the team that this strategy has performed well in the past and that the markets will revert and the fund's returns will return to normal levels.

Tang tactfully suggests that the team review the fund's IPS together, and Jordan interrupts him and reminds the team that she has memorized the IPS by heart. Tang contemplates his next step. He is concerned that Jordan is displaying behavioral biases which are affecting the fund's performance.

6 By taking credit for successes but assigning blame for failures, Jordan is *most likely* demonstrating:

A loss-aversion bias.

B self-attribution bias.

C illusion of knowledge bias.

7 Which of Tang's observations is *least likely* to be the consequence of Jordan demonstrating loss-aversion bias?

A Observation 1.

B Observation 2.

C Observation 3.

8 Which of Jordan's actions *least* supports that she may be affected by the illusion of control bias?

A Her dismissal of Tang's analysis.

B Her routine of holding weekly team meetings.

C Her comment on market turnaround and current holdings.

9 How does Jordan *most likely* demonstrate loss-aversion bias?

A Telling the team not to worry.

B Reducing the portfolio turnover this year.

C Deciding to hold the losing positions until they turn around.

10 Which of the following emotional biases has Jordan *most likely* exhibited?

A Endowment.

B Regret aversion.

C Overconfidence.

11 Which one of the following biases did Jordan *not* demonstrate?

A Self-attribution.

B Representativeness.

C Illusion of knowledge.

12 Which of Tang's findings is *not* a typical consequence of self-control bias?

A Failure to explore other portfolio opportunities.

B Asset allocation imbalance problems in the portfolio.

C A higher risk profile in the portfolio due to pursuit of higher returns.

SOLUTIONS

1 Availability bias, a cognitive error, is an information-processing bias. Individuals exhibiting this bias will assess the likelihood of an outcome based on how easily they can recall the information. Gerber exhibits this bias in two ways:

- Although Gerber felt the foundation's investment in ABC was high, he decided that Ludwigs' involvement and their past success justified the investment in ABC. The information on the past success of Ludwigs' investments came easily to mind.
- Gerber believed 100 percent of the foundation's portfolio in the health care industry was appropriate, most likely because of his past experience as an analyst in the industry. It is easier for Gerber to recall information from his past than to develop a diversified investment portfolio. Investors who exhibit availability bias may limit their investment opportunity set, may choose an investment without doing a thorough analysis of the stock, may fail to diversify, and may not achieve an appropriate asset allocation. Gerber exhibits all of these tendencies when he is evaluating the foundation's portfolio.

The implications of this bias lead the portfolio to be undiversified, and as a result, the portfolio holds assets that may not be appropriate. Gerber is only investing in pharmaceutical companies. The following is a summary of issues with the foundation's portfolio:

- No thorough analysis regarding investment in ABC.
- A limited investment opportunity set; invested only in the health care sector.
- An undiversified portfolio.
- An inappropriate asset allocation; invested only in equity.

Gerber could overcome this bias by developing an appropriate investment policy strategy, with a focus on appropriate goals (short- and long-term), and having a disciplined approach to investment decision making. An investment policy statement would help provide discipline and would alert Gerber and his team that he really has only considered investments that he is familiar with. Further, Gerber and his investment team should consider the asset allocation within the portfolio.

2 Gerber displayed overconfidence bias by having too much faith in his "superior knowledge of the health care industry." Overconfidence bias and the related illusion of knowledge bias result when individuals overestimate their knowledge levels and abilities. Overconfidence bias has aspects of both cognitive and emotional errors but is classified as emotional because the emotional aspect dominates. Emotional biases, which stem from impulse or intuition, may be considered to result from reasoning influenced by feelings. These biases are difficult to correct.

Overconfidence is primarily an emotional bias and is thus different from availability bias which is an information-processing bias and a cognitive error. Cognitive errors result from faulty reasoning and analysis. The individual may be attempting to follow a rational decision-making process but fails to do so because of cognitive errors. Gerber perceives the foundation's investment allocation and stock selection as appropriate, and does not process all of the information available to him. He notes that ABC should be monitored closely because of the fact he is not familiar with startup companies; however, he does

not process information that goes beyond his knowledge base to see that the investment itself is problematic. Although the overconfidence and availability biases are clearly related, Gerber can make better investment decisions by focusing on the cognitive error aspects of his behavior. Cognitive biases are easier to correct for than emotional biases, which are based on how people feel.

3 Conservatism bias, a cognitive error, is a belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information. This cognitive error has aspects of both statistical and information-processing errors. Gerber displayed conservatism bias by maintaining his prior views on ABC without adequately incorporating new information. There are several examples of new information that was either ignored or inadequately considered:

- the delays in initiation of Phase Two trials;
- the discouraging results from Phase One;
- the cautionary language from the CEO; and
- the chief scientist's statement indicating that there were "major obstacles to overcome."

Gerber disregarded all the negative news and cautionary language that was released by ABC. Gerber failed to incorporate the new information into his analysis of ABC. The impact was a loss to the foundation, which could have been reduced had Gerber incorporated the information into his analysis and adjusted the foundation's holdings of ABC.

4

Determine whether Gerber displayed confirmation bias when reviewing the chief scientist's article. (circle one)	**Justify** your answer with one reason.
Agree Disagree	Confirmation bias, a cognitive error, is a belief perseverance bias. Individuals who exhibit this bias look for confirmation of their belief and ignore any information which contradicts their belief. Gerber displayed confirmation bias by selectively placing more weight on the portion of the statement "the Project M team has seen positive signs that treatment for small cell lung cancer is achievable" in the article, even though the positive results mentioned in the article appeared to be a general statement. Gerber ignored the comment on the major obstacles which the team had encountered because it was contrary to his belief in Project M.

5 Gerber demonstrated anchoring bias by placing high hope in ABC stock reaching a new 52-week high of CHF 80. Anchoring is an information-processing bias which influences the way people estimate probabilities. When required to estimate a value with unknown magnitude, people generally begin by envisioning some initial default number—an "anchor"—which they then adjust up or down to reflect subsequent information and analysis. Despite setbacks and new information, Gerber did not adjust his view of CHF 80, but continued to

cling to this anchor or belief even after reviewing the chief scientist's report. He perceived new information through a warped lens; thus, the decision making deviated from rational reasoning.

To overcome anchoring bias, Gerber should consciously ask questions that may reveal an anchoring and adjustment bias: "Am I holding on to this stock based on rational analysis, or am I trying to attain a price that I am anchored to, such as the purchase price or a high water mark?" He should look at the basis for his decision to hold ABC to determine if it is anchored to a price target (a new 52-week high) or based on an objective, rational view of the company's fundamentals. Gerber should have periodically reviewed his decision-making process to determine if his analysis of ABC's prospects was appropriate, focusing more on the company's fundamentals rather than the price target.

6 B is correct. Self-attribution is a bias in which people take credit for successes and assign responsibilities for failure. Jordan attributes successful decisions to herself while poor decisions are attributed to the team. Her self-esteem affects how she looks at success and failure. Self-attribution and illusion of knowledge biases contribute to overconfidence bias, which Jordan clearly demonstrates later when she tells the team that she knows what she is doing.

7 C is correct. Loss aversion by itself may cause a sector concentration; however, a market neutral strategy tends to focus on individual stocks without regard to the sector. The sector exposure would be mitigated with the balancing of the individual long and short positions.

8 B is correct. Holding weekly team meetings, which would indicate a willingness to listen to feedback from others, is not representative of the illusion of control bias. The illusion of control bias is one in which people believe they can control outcomes. Individuals exhibiting this bias display great certainty in their predictions of outcomes of chance events and ignore others' viewpoints. Jordan is sure that the market will turn around even though it is out of her control. She chooses not to listen to Tang who is questioning her viewpoint.

9 C is correct. Jordan's behavior is a classic example of loss aversion: When a loss occurs, she holds on to these positions longer than warranted. By doing so, Jordan has accepted more risk in the portfolio. Loss-aversion bias is one in which people exhibit a strong preference to avoid losses versus achieving gains. One of the consequences of loss aversion bias is that the financial management professional (in this case, Jordan) may hold losing investments in the hope that they will return to break-even or better.

10 C is correct. Jordan exhibits overconfidence in several ways. She ignores the analysis done by Tang. This may be because Jordan believes she is smarter and more informed than her team members, which is typical of an individual with an illusion of knowledge bias. The certainty she demonstrates that the market will revert is evidence of overconfidence. Her overconfidence is intensified by her self-attribution bias, which is demonstrated through her dealings with her team when she blames them for losses while taking credit for the gains. Finally, her portfolio's underperformance against the benchmark is a consequence of overconfidence bias.

11 B is correct. Nowhere in the scenario did it mention that Jordan classified certain information into a personalized category. Representativeness bias is a cognitive bias in which people tend to classify new information based on past

experiences and classifications. Jordan is not relating the certainty about the future or her decision to hold losing positions back to something she has done or experienced in the past.

12 A is correct. Failing to explore other opportunities is a demonstration of status quo bias, not self-control. Self-control bias occurs when individuals deviate from their long-term goals, in this case, the investment policy statement, due to a lack of self-discipline. Jordan is not adhering to the strategy which has been successful in the past. The consequences of self-control bias include accepting too much risk in the portfolio (C) and asset allocation imbalance problems (B) as Jordan attempts to generate higher returns.

CUSTOMER SERVICE

68

READING

7

Behavioral Finance and Investment Processes

by Michael M. Pompian, CFA, Colin McLean, FSIP, and Alistair Byrne, PhD, CFA

Michael M. Pompian, CFA (USA). Colin McLean, FSIP (United Kingdom). Alistair Byrne, PhD, CFA, is at State Street Global Advisors (United Kingdom).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** explain the uses and limitations of classifying investors into personality types;
☐	**b.** discuss how behavioral factors affect adviser–client interactions;
☐	**c.** discuss how behavioral factors influence portfolio construction;
☐	**d.** explain how behavioral finance can be applied to the process of portfolio construction;
☐	**e.** discuss how behavioral factors affect analyst forecasts and recommend remedial actions for analyst biases;
☐	**f.** discuss how behavioral factors affect investment committee decision making and recommend techniques for mitigating their effects;
☐	**g.** describe how behavioral biases of investors can lead to market characteristics that may not be explained by traditional finance.

INTRODUCTION

1

Much of current economic and financial theory is based on the assumptions that individuals act rationally and consider all available information in the decision-making process.[1] Behavioral finance challenges these assumptions. The relaxing of these assumptions has implications at both the individual and market levels. It is important to note that, at the individual level, all market participants, whether they

1 Investors are assumed to be rational; investors make decisions consistent with utility theory and revise expectations (update beliefs) consistent with Bayes' formula. They are further assumed to be self-interested and risk-averse, to have access to perfect information, and to process all available information.

© 2011 CFA Institute. All rights reserved.

are less knowledgeable individual investors or experienced money managers, may act irrationally; in other words, all market participants may deviate from the behavior that is assumed in traditional financial theory. Some of these deviations have been identified and categorized as behavioral biases. In addition, individual behavioral biases may be reinforced in a group setting, which further complicates rational investment processes.

This reading focuses on understanding individual investor behavior and how it affects adviser–client relationships and portfolio construction, as well as on the analyst-, committee-, and market-level impact of behavioral biases. Section 2 discusses how investors may be classified by type based on the biases and other behaviors they display and explains the uses and limitations of classifying investors into types. Section 3 discusses how behavioral factors affect adviser–client relationships. Section 4 examines the potential effects of behavioral biases on portfolio construction. Section 5 discusses how behavioral biases affect the work of analysts, looking specifically at their forecasts, and explores remedial actions for analyst biases. Section 6 examines committee decision making and how behavioral biases may be amplified or mitigated in a group setting, and discusses steps to make committees more effective. Section 7 discusses how behavioral finance influences market behavior by examining market anomalies and observed market behavior. A summary and practice problems conclude the reading.

2 THE USES AND LIMITATIONS OF CLASSIFYING INVESTORS INTO TYPES

2.1 General Discussion of Investor Types

In recent decades, financial service professionals and researchers have been attempting to classify investors by their psychographic characteristics—in other words, by personality, values, attitudes, and interests—rather than classifying simply based on demographic characteristics. Psychographic classifications are particularly relevant with regard to individual strategy and risk tolerance. An investor's background, past experiences, and attitudes can play a significant role in decisions made during the asset allocation process. If investors fitting specific psychographic profiles are more likely to exhibit specific investor biases, then practitioners can attempt to recognize the relevant behavioral tendencies before investment decisions are made. It is important to note that because psychology is involved, no exact diagnosis can be made of any individual or situation. Although there are limitations to this type of analysis, if financial market participants can gain an understanding of their behavioral tendencies, the result is likely to be better investment outcomes.

We will now review two models of investor psychographics from the 1980s. One model was proposed in Barnewall (1987) and the other in Bailard, Biehl, and Kaiser (1986). We will then move to more recent models of investor behavior.

2.1.1 *Barnewall Two-Way Model*

One of the oldest and most prevalent psychographic investor models, based on the work of Marilyn MacGruder Barnewall and intended to help investment advisers interface with clients, distinguishes two relatively simple investor types: passive and active. Barnewall notes that "passive investors" are defined as those investors who have become wealthy passively—for example, by inheritance or by risking the capital of others rather than risking their own capital (managers who benefit when their companies do well are examples of the latter category). Passive investors have a greater need for security than they have tolerance for risk. Occupational groups that tend to

have passive investors include corporate executives, lawyers with large regional firms, certified public accountants (CPAs) with large CPA companies, medical and dental non-surgeons, small business owners who inherited the business, politicians, bankers, and journalists. Further, the smaller the economic resources an investor has, the more likely the person is to be a passive investor. The lack of resources gives individuals a higher security need and a lower tolerance for risk.

"Active investors" are individuals who have been actively involved in wealth creation through investment, and they have risked their own capital in achieving their wealth objectives. Active investors have a higher tolerance for risk than they have need for security. Related to their high risk tolerance is the fact that active investors prefer to maintain control of their own investments. Their tolerance for risk is high because they believe in themselves. When active investors sense a loss of control, their risk tolerance drops quickly. They are involved in their own investments to the point that they gather tremendous amounts of information about the investments. By their involvement and control, they feel that they reduce risk to an acceptable level, which is often fallacious (Barnewall 1987).

Barnewall's work suggests that a simple, non-invasive overview of an investor's personal history and career record could signal potential pitfalls to guard against in establishing an advisory relationship. Her analysis also indicates that a quick, biographic glance at a client could provide important context for portfolio design.

2.1.2 *Bailard, Biehl, and Kaiser Five-Way Model*

The Bailard, Biehl, and Kaiser (BB&K) model features some of the principles of the Barnewall model, but by classifying investor personalities along two axes—level of confidence and method of action—it introduces an additional dimension of analysis. Bailard, Biehl, and Kaiser (1986) provide a graphic representation of their model (Exhibit 1). Kaiser (1990) explains:

> The first (aspect of personality) deals with how confidently the investor approaches life, regardless of whether it is his approach to his career, his health, or his money. These are important emotional choices, and they are dictated by how confident the investor is about some things or how much he tends to worry about them. The second element deals with whether the investor is methodical, careful, and analytical in his approach to life or whether he is emotional, intuitive, and impetuous. These two elements can be thought of as two "axes" of individual psychology; one axis is called the "confident–anxious" axis and the other is called the "careful–impetuous" axis.

Exhibit 1 Bailard, Biehl, and Kaiser Model

Exhibit 2 includes a synopsis of BB&K's descriptions of each of the five investor personality types that the model generates (Kaiser 1990).

Exhibit 2 BB&K Classifications

- The **Adventurer**: Adventurers may hold highly undiversified portfolios because they are confident and willing to take chances. Their confidence leads them to make their own decisions and makes them reluctant to take advice. This presents a challenge for an investment adviser.
- The **Celebrity**: Celebrities like to be the center of attention. They may hold opinions about some things but to a certain extent recognize their limitations and may be willing to seek and take advice about investing.
- The **Individualist**: Individualists are independent and confident, which may be reflected in their choice of employment. They like to make their own decisions but only after careful analysis. They are pleasant to advise because they will listen and process information rationally.
- The **Guardian**: Guardians are cautious and concerned about the future. As people age and approach retirement, they may become guardians. They are concerned about protecting their assets and may seek advice from those they perceive as being more knowledgeable than themselves.
- The **Straight Arrow**: Straight arrows are sensible and secure. They fall near the center of the graph. They are willing to take on some risk in the expectation of earning a commensurate return.

Although this model may be useful, it is possible that investors do not approach all parts of their life with equal confidence or care. It is important to focus on the approach to investing rather than placing undue focus on evidence from other aspects of their life. In addition, a limitation of all categorization schemes is that an individual's behavior patterns may change or lack consistency.

2.1.3 *New Developments in Psychographic Modeling: Behavioral Investor Types*

In recent years, there have been additional developments in the practical application of behavioral finance. Pompian (2008) identifies four behavioral investor types (BITs). The objective of this categorization scheme, similar to BB&K and Barnewall, is to help advisers and investors better understand investor behavior in an effort to make better investment decisions. However, the approach suggested by Pompian differs from some of the earlier approaches. This section will review the basics of developing investment plans that incorporate behavioral finance. It will build on key concepts in Pompian and Longo's article (2005) in the *Journal of Financial Planning*, and Pompian's book, *Behavioral Finance and Wealth Management* (2006).

These early works outline a method of applying behavioral finance to private clients in a way that Pompian refers to as "bottom up." This term means that for an adviser or investor to diagnose and treat behavioral biases, he or she must first test for all behavioral biases in the client. This testing is done to determine which biases a client has before being able to create an appropriate investment policy statement and a behaviorally modified asset allocation like those presented in the reading, "The Behavioral Biases of Individuals." Pompian and Longo (2005) explain how to plot bias type and wealth level information on a chart to create a "best practical allocation" or "best behaviorally modified allocation" for the client. However, some advisers may find this bottom-up approach too time-consuming or complex.

Pompian (2008) introduces a behavioral alpha (BA) approach. It is a "top-down" approach to bias identification that may be simpler and more efficient than a bottom-up approach. The BA approach is essentially a shortcut that may more efficiently identify biases for the purpose of determining which type of bias dominates. Using the BA approach, advisers and investors can test for the behavioral biases they are likely to encounter based on the psychological profile of clients and consider how to correct for or adapt to the biases.

The Behavioral Alpha Process: A Top-Down Approach

Step 1: Interview the client and identify active or passive traits and risk tolerance. Most advisers begin the planning process with a client interview, which consists mainly of a question-and-answer session intended to gain an understanding of the objectives, constraints, tolerance for accepting risk in the portfolio, and past investing practices of a client. Part of this process should also include the adviser determining whether a client is an *active* or *passive* investor, building on the work of Barnewall (1987). Through this process, the adviser is trying to determine whether the client has in the past (or does now) put his or her capital at risk to build wealth.[2] Understanding the characteristics of active and passive investors is important because they have tendencies toward different biases. Following is an example of a test created by Pompian (2008) to probe the risk tolerance and active/passive nature of a client. Predominantly "a" answers indicate higher risk tolerance and/or active investor traits, whereas "b" answers indicate lower risk tolerance and/or passive investor traits. Note that a traditional risk tolerance questionnaire is an appropriate way to evaluate the risk tolerance level of a client, but it may fail to address the active/passive nature of a client.

Test for Risk Tolerance and Active/Passive Traits

1 Have you risked your own capital in the creation of your wealth?

- **A** Yes.
- **B** No.

2 Which is stronger: your tolerance for risk to build wealth or the desire to preserve wealth?

- **A** Tolerance for risk.
- **B** Preserve wealth.

3 Would you prefer to maintain control over your investments or prefer to delegate that responsibility to someone else?

- **A** Maintain control.
- **B** Delegate.

4 Do you have faith in your abilities as an investor?

- **A** Yes.
- **B** No.

5 If you had to pick one of two portfolios, which would it be?

- **A** 80 percent stocks/20 percent bonds.
- **B** 40 percent stocks/60 percent bonds.

6 Is your wealth goal intended to continue your current lifestyle, or are you motivated to build wealth at the expense of current lifestyle?

---

2 It is important to make a distinction between investing in a diversified portfolio and risking capital. Risking capital involves doing such things as building companies (big or small), investing in speculative real estate using leverage, or working for oneself rather than for a large company.

A Build wealth.

B Continue current lifestyle.

7 In your work and personal life, do you generally prefer to take initiative by seeking out what needs to be done and then doing it, or do you prefer to take direction?

A Take initiative.

B Take direction.

8 Are you capital preservation oriented or are you willing to put your capital at risk to build wealth?

A Capital at risk.

B Capital preservation oriented.

9 Do you believe in the concept of borrowing money to make money/operate a business or do you prefer to limit the amount of debt you owe?

A Borrow money.

B Limit debt.

Step 2: Plot the investor on the active/passive and risk tolerance scale. Once the adviser has classified the investor as active or passive and determined risk tolerance, the next step is to begin the process of identifying which one of the four BITs, identified by Pompian (2008) and shown in Exhibit 4, that the client falls into. The adviser's task at this point is to determine where the client falls on the risk scale in relation to how the client falls on the active/passive scale. The expectation is that active investors will rank medium to high on the risk tolerance scale whereas passive investors will rank medium to low on the risk scale. Naturally, this division will not always be the case. If there is an unexpected outcome, then the adviser should defer to the risk tolerance as the guiding factor in determining which biases to test for (see next section for more details on bias testing). Without further analysis, the expected relationship between risk and active/passive responses is shown in Exhibit 3.

Exhibit 3 Risk Tolerance and Active/Passive Scale

Step 3: Test for behavioral biases. The last step in the process is to confirm the expectation that the client has certain behavioral biases associated and consistent with a specific BIT. Exhibit 4 provides an overview of the characteristics of each BIT, and Exhibit 5 illustrates the entire diagnostic process. An expanded description of each BIT and advice for dealing with each BIT follows Exhibit 5.

Exhibit 4 Biases Associated with Each Behavioral Investor Type

General Type	PASSIVE		ACTIVE	
Risk Tolerance	Low ←			→ High
Investment Style	Conservative	Moderate	Growth	Aggressive
Bias Types	Primarily emotional	Primarily cognitive	Primarily cognitive	Primarily emotional
BITs	Passive Preserver (PP)	Friendly Follower (FF)	Independent Individualist (II)	Active Accumulator (AA)
Biases				
Emotional	Endowment Loss aversion Staus quo Regret aversion	Regret aversion	Overconfidence and self-attribution	Overconfidence Self-control
Cognitive	Mental accounting Anchoring and adjustment	Availability Hindsight Framing	Conservatism Availability Confirmation Representativeness	Illusion of control

One of the key observations from Exhibit 4 is that at either end of the passive/active scale are clients who are susceptible to *emotional* biases and in the middle are clients affected mainly by *cognitive* biases or errors.[3] This division makes intuitive sense when the investor types are considered. Passive Preservers are conservative investors with low risk tolerance. They have a high need for security, they are highly emotional about losing money, and they become uneasy during times of stress or change. Similarly, aggressive investors with a high risk tolerance, called Active Accumulators, are also emotionally charged. They typically suffer from a high level of overconfidence and have an illusion of control; they mistakenly believe they can control the outcomes of their investments to a greater extent than they can. In between these two extremes are the Friendly Followers and the Independent Individualists who suffer mainly from cognitive biases and need education and information to make better decisions. Importantly, clients who are emotional about their investing need to be advised differently from those who make mainly cognitive errors. When advising emotionally biased investors, advisers should focus on explaining how the investment program being created affects such issues as financial security, retirement, or future generations rather than focusing on such quantitative details as standard deviations and Sharpe ratios. Quantitative measures work better with cognitively biased investors.

Step 4: Classify investor into a behavioral investor type. Once the adviser finds that the client has certain behavioral biases associated and consistent with a specific behavioral investor type, he or she will classify the client into the appropriate BIT. Exhibit 5 demonstrates the process of classifying investors into a BIT. For example if an investor is passive, the risk tolerance questionnaire reveals a low risk tolerance, and the investor has biases associated with a *Passive Preserver* as shown in Exhibit 4, the investor is then classified as a PP. Note that investors may exhibit some traits similar to the BITs shown beside them in Exhibit 5. Judgment is required in determining which classification best fits an investor.

3 Cognitive biases or cognitive errors are errors resulting from faulty reasoning; cognitive errors stem from basic statistical, information-processing, or memory errors. Emotional biases are biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Exhibit 5 The Behavioral Investor Type Diagnostic Process

Passive Preserver (PP)

Basic type: Passive

Risk tolerance level: Low

Primary biases: Emotional

Passive Preservers, as the name implies, are investors who place a great deal of emphasis on financial security and preserving wealth rather than taking risks to grow wealth. Many have gained wealth through inheritance or by receiving high compensation at work. Because they have gained wealth without risking their own capital, PPs may not be financially sophisticated. Some PPs are "worriers"; they obsess over short-term performance and are slow to make investment decisions because they are not comfortable with change. This behavior is consistent with the way they have approached their professional lives, being careful not to take excessive risks. Many PPs are focused on taking care of their family members and future generations, especially funding life-enhancing experiences such as education and home buying. Because the focus is on family and security, PP biases tend to be emotional rather than cognitive. This BIT becomes more common as investors' age and wealth level increase. The emotional biases most common to PPs are endowment, loss aversion, status quo, and regret aversion. They may also exhibit cognitive errors, such as anchoring and adjustment and mental accounting.

Advising Passive Preservers: Passive Preservers may be difficult to advise because they are driven mainly by emotion. Although this characterization is true, PPs still need good financial advice. Advisers should take the time to consider the implications of the behavioral biases of their PP clients. PPs are more receptive to "big picture" advice that does not dwell on such details as standard deviations and Sharpe ratios. Because PPs are emotionally biased, providing excessive cognitive detail will lose their attention. Advisers should focus on what the money will accomplish, such as family legacy goals, education, and so on. PPs need to be persuaded about the soundness of their adviser's general philosophy first, and then, as trust is gained, PPs will respond to advice and take

action. After a period of time, Passive Preservers are likely to become an adviser's best clients because they value greatly the adviser's professional expertise and objectivity in helping make the right investment decisions.

Friendly Follower (FF)

Basic type: Passive

Risk tolerance level: Low to medium

Primary biases: Cognitive

Friendly Followers are passive investors with a low to medium risk tolerance who tend to follow leads from their friends, colleagues, or advisers when making investment decisions. They often want to be in the latest, most popular investments without regard to current market conditions or the suitability of the investment to the FFs long-term goals. One of the key challenges in working with FFs is that they often *overestimate their risk tolerance.* Advisers need to be careful not to suggest too many "hot" ideas—FFs will likely want to invest in all of them because they may regret it if others make money and they do not. FFs generally comply with professional advice when they get it, and they educate themselves financially. At times, however, FFs can be difficult because they do not enjoy or have an aptitude for the investment process. Biases of FFs tend to be cognitive. Their decisions typically are influenced by availability, hindsight, and framing biases. Resolution of cognitive dissonance is an important factor to FFs. Regret aversion, as it relates to herding behavior, is an emotional bias with a significant impact.

Advising Friendly Followers: Friendly Followers may be difficult to advise because they often overestimate their risk tolerance. Risky trend-following behavior occurs in part because FFs often convince themselves that they "knew it all along" when an investment works out well, which increases future risk-taking behavior. Advisers need to handle FFs with care because they are likely to say yes to advice that makes sense to them without adequately considering the risk involved. Advisers need to guide them to take a hard look at behavioral tendencies that contribute to overestimating risk tolerance. Because FF biases are mainly cognitive, education on the benefits of portfolio diversification is usually the best course of action. Advisers should challenge FF clients to be introspective and provide data-backed support for recommendations. Offering education in clear, unambiguous ways is helpful so that FFs have the opportunity to understand the implications of investment choices. If advisers take the time, this steady, educational approach will generate greater client loyalty and adherence to long-term investment plans from Friendly Followers.

Independent Individualist (II)

Basic type: Active

Risk tolerance: Medium to high

Primary Biases: Cognitive

An Independent Individualist is an active investor with medium to high risk tolerance who is strong-willed and an independent thinker. IIs are self-assured and "trust their gut" when making decisions; however, when they do research on their own, they may be susceptible to acting on information that is available to them rather than getting corroboration from other sources. Sometimes advisers find that an II client made an investment without consulting anyone. This situation can be problematic; because of their independent mindset, these clients maintain the opinion they had when they made the investment, even when market conditions change. They enjoy investing and are comfortable taking risks, but often resist following a financial plan.

Of all behavioral investor types, IIs are the most likely to be contrarian, which can benefit them. II biases are typically cognitive. Conservatism, availability, confirmation, and representativeness biases are common to IIs. Overconfidence and self-attribution biases are the emotional biases that IIs sometimes exhibit.

Advising Independent Individualists: Independent Individualists may be difficult clients to advise because of their independent mindset, but they are usually willing to listen to sound advice when it is presented in a way that respects their intelligence. IIs have faith in themselves and their decisions, but may be unaware of their tendency to take a contrarian position. As with Friendly Followers, education is essential to changing their behavior because their biases are predominantly cognitive. A good approach is to have regular educational discussions during client meetings. In this way, the adviser does not point out unique or recent failures, but rather educates regularly and can incorporate concepts that he or she feels are appropriate for the Independent Individualist client.

Active Accumulator

Basic type: Active

Risk tolerance: High

Primary Biases: Emotional

The Active Accumulator is the most aggressive behavioral investor type. These clients are entrepreneurial and often the first generation to create wealth; and they are even more strong-willed and confident than Independent Individualists. At high wealth levels, AAs often have controlled the outcomes of non-investment activities and believe they can do the same with investing. This behavior can lead to overconfidence in investing activities. AAs often have high portfolio turnover rates, which normally is a drag on investment performance. AAs are quick decision makers but may chase higher risk investments that their friends or associates are suggesting. If successful, they enjoy the excitement of making a good investment. Some AAs do not accept or follow basic investment principles such as diversification and asset allocation. They are often "hands on," wanting to be heavily involved in the investment decision-making process. AA biases are typically overconfidence, self-control, and illusion of control. As a result of these biases, they may be overly optimistic about their investment choices.

Advising Active Accumulators: Active Accumulators may be the most difficult clients to advise. They like to control, or at least get deeply involved in, the details of investment decision making. They tend to be emotional and display overconfidence, which often manifests itself as optimism. They are convinced that their investments will do well, even if that optimistic attitude is irrational. Some AAs need to be monitored for excessive spending, because they may lack self-control. This spending can inhibit performance of a long-term portfolio. The best approach to dealing with these clients is to take control of the situation. If advisers let the AA client dictate the terms of the advisory engagement, the client's emotionally oriented decision making will dominate and the result will likely be an unhappy client and an unhappy adviser. Advisers need to prove to the client that they have the ability to make wise, objective, and long-term decisions and can communicate these results in an effective way. Advisers who take control are more likely to have Active Accumulator clients listen to and accept their advice.

2.2 Limitations of Classifying Investors into Various Types

The challenge that all financial market participants face is that behavior patterns are not consistently demonstrated. An individual may normally behave one way but at times may behave in an unexpected manner. Different and irrational behaviors are exhibited at random times, usually during periods of financial market or personal

stress. Because of inconsistencies in behavior, financial decision making is not always predictable or expectations of financial decision making are not always reliable. Therefore, it is important for readers to understand that whatever system is used to classify or otherwise understand individual investor behavior, there will be limitations to its effectiveness. The limitations of behavioral models include the following:

1. *Individuals may exhibit both cognitive errors and emotional biases.* Unfortunately, the same individual may exhibit both cognitive errors and emotional biases. Either may result in behavior that appears irrational. It may be possible to determine whether cognitive errors or emotional biases dominate, which is the heart of creating a behaviorally modified portfolio, but most people experience both faulty reasoning and feelings. Therefore, it may not be appropriate in most cases to classify a person as either an emotionally biased person or a cognitively biased person.
2. *Individuals may exhibit characteristics of multiple investor types.* Each behavioral investor type has unique characteristics. Unfortunately, people may engage in behaviors that are representative of multiple types. Therefore, users of investor classification models should not look for people to fit neatly into one "box" or type.
3. *Individuals will likely go through behavioral changes as they age.* As people age their behaviors may change. The most widely recognized example is that as people age their tolerance for risk (i.e., losses) generally decreases. They may become more emotional about their investing as well. It is important for BIT users to recognize this limitation and keep a close watch for changes in behavior as their clients age or experience changes in responsibilities or circumstances.
4. *Individuals are likely to require unique treatment even if they are classified as the same investor type because human behavior is so complex.* Even if two people fit the profile of a certain BIT, it is unlikely that one would treat those two people exactly the same. For example, one Passive Preserver may be more emotional or less risk tolerant than another. The classifications should not be taken as absolutes.
5. *Individuals act irrationally at different times and without predictability.* Life would be easier if we knew exactly when we or our clients would act irrationally. Because we do not, it is important to recognize that placing people into classifications may be more challenging at certain points, for example, during periods of market or personal stress compared with times of relative calm or even personal exuberance.

HOW BEHAVIORAL FACTORS AFFECT ADVISER–CLIENT RELATIONS

3

As behavioral finance gains credibility and acceptance by the investment community, advisers and investors are increasingly likely to include behavioral considerations in a client's investment policy statement (IPS). By adding behavioral factors to the IPS, a number of benefits can be realized. There is no doubt that an understanding of investor psychology will generate insights that benefit the advisory relationship. The key result of a behavioral finance–enhanced relationship will be a portfolio to which

the adviser and client can comfortably adhere while fulfilling the client's long-term goals. This result has obvious advantages: advantages that suggest behavioral finance will continue to play an increasingly influential role in portfolio structure.

However, because behavioral finance is a relatively new concept as applied to individual investors, investment advisers may be reluctant to accept its validity. Moreover, advisers may not feel comfortable asking their clients psychological or behavioral questions to ascertain biases, especially at the beginning of the relationship. This reluctance should not deter an adviser from considering behavioral factors. Inclusion of behavioral finance considerations in the client–adviser relationship will likely result in a more satisfactory relationship and in investment decisions that are closer to those of traditional finance while being easier for the client to accept and adhere to.

Wealth management practitioners have different ways of measuring the success of an advisory relationship, but few would dispute that every successful relationship shares a few fundamental characteristics, including the following as outlined by Pompian (2006):

1. The adviser understands the client's financial goals and characteristics. These are considered when developing the investment policy statement.
2. The adviser maintains a systematic (consistent) approach to advising the client.
3. The adviser invests as the client expects. Results are communicated on a regular basis and in an effective manner that takes into account the client's characteristics.
4. The relationship benefits both client and adviser.

Behavioral finance can enhance these areas as shown in the following sections.

3.1 Formulating Financial Goals

Experienced financial advisers know that defining financial goals is critical to creating an investment program appropriate for the client. To best define financial goals, it is helpful to understand the psychology and emotions involved in the decisions underlying the goals. Behavioral finance helps advisers discern why investors set the goals they do. Such insights equip the adviser to deepen the bond with the client, thus producing a better relationship and a better investment outcome.

3.2 Maintaining a Consistent Approach

Most successful advisers maintain a consistent approach to delivering wealth management services. Incorporating behavioral finance can become part of that discipline without requiring large-scale changes in the adviser's methods. Behavioral finance can also add professionalism and structure to the relationship, allowing advisers to better understand the client before delivering any investment advice. Clients will appreciate this step, and it will make the relationship more successful.

3.3 Investing as the Client Expects

Addressing client expectations is essential to a successful relationship; in many unfortunate instances, the adviser does not deliver on the client's expectations because the adviser does not understand them. Perhaps no other aspect of the advisory relationship could benefit more from behavioral finance. Behavioral finance provides a context in which the adviser can "take a step back" and attempt to explore the motivations of the client. With a more thorough understanding of the client's expectations, the adviser is better equipped to help satisfy them.

3.4 Ensuring Mutual Benefits

Measures resulting in happier, more satisfied clients will also improve the adviser's practice and work life. Incorporating insights from behavioral finance into the advisory relationship will enhance that relationship and its results. Those in the individual investor advisory business should be aware that factors other than investment results may be considered when clients seek new advisers. Practitioners may lose clients because clients do not feel as though their advisers understand them and/or their financial objectives. Likewise, practitioners may gain clients because clients feel as though their advisers understand them and/or their financial objectives. The primary benefit that behavioral finance offers is the ability to develop a stronger bond between clients and advisers. By "getting inside the head" of the client and developing a comprehensive grasp of his motives and fears, the adviser can help the client better understand why a portfolio is designed the way it is and why it is an appropriate portfolio for him or her, regardless of what happens day-to-day in the markets.

3.5 Limitations of Traditional Risk Tolerance Questionnaires

Today, a dizzying variety of sources supply financial advice. To standardize processes, financial services firms often administer, and require their advisers to administer, risk tolerance questionnaires to clients and prospects prior to drafting any asset allocation. In the absence of any other diagnostic analysis, this methodology is certainly helpful and can generate important information. However, it is important to recognize the limitations of risk tolerance questionnaires. Aside from ignoring behavioral issues, an aspect we will examine shortly, risk tolerance questionnaires can also generate dramatically different results when administered repeatedly to the same individual, but with slight variations. Such imprecision arises primarily from variations in wording. Additionally, many risk tolerance questionnaires are administered once, and may not be revisited despite the fact that an IPS should be reviewed at least annually to measure not only a client's ability to take risk but also their willingness to take risk. Risk tolerance can vary as a result of changing life stages or events so it is critical to re-evaluate it periodically. Another critical drawback of risk tolerance questionnaires is that many advisers interpret their results too literally. For example, some clients might indicate that the maximum loss they would be willing to tolerate in a single year would equal 20 percent of their total assets. Does that mean that an ideal portfolio would place such a client in a position to lose 20 percent? No! Advisers should set portfolio parameters that preclude a client from incurring the maximum specified tolerable loss in any given period. For these reasons, risk tolerance questionnaires provide only broad guidelines for asset allocation, and should be used in concert with other behavioral assessment tools.

From the behavioral finance perspective, risk tolerance questionnaires may work better as a diagnostic tool for institutional investors compared with individual investors. This difference is because institutional investors are familiar with mean–variance optimization and think about risk. For them, risk analysis is a cognitive process. Individual investors are more likely to have feelings about risk, and for them risk analysis is an emotional process. Thus, risk tolerance questionnaires may fail emotionally biased individuals. An asset allocation generated and executed based on mean–variance optimization may result in a scenario in which a client demands, in response to short-term market fluctuations and to the detriment of the investment plan, that his or her asset allocation be changed. Moving repeatedly in and out of an allocation can have serious long-term negative consequences. Behavioral biases should be identified before the allocation is executed, so that such problems can be avoided. By doing so,

the IPS that includes behavioral factors may result in decisions that the investor can adhere to. The IPS can be re-evaluated on a regular basis and updated for changes in the investor's circumstances and risk tolerance.

4 HOW BEHAVIORAL FACTORS AFFECT PORTFOLIO CONSTRUCTION

Behavioral biases may affect how investors construct portfolios from the securities available to them. One way to consider this issue is to analyze the actual portfolios investors construct and compare them with the portfolios implied by traditional portfolio theory. Some useful evidence on the portfolio selection decisions of individual investors comes from defined-contribution (DC) pension plans. In particular, investment decisions in US 401(k) plans have been investigated in a number of studies.[4]

4.1 Inertia and Default

Consistent with the status quo bias,[5] a key finding is that most DC plan members show inertia and tend not to change their asset allocations through time, even though it might be assumed that their tolerance for risk and other circumstances would be changing. For example, Samuelson and Zeckhauser (1988) and more recently Ameriks and Zeldes (2000) find the majority of investors in their samples made zero fund switches during the sample period in spite of there being no transaction costs associated with altering allocations among funds.[6]

There is also substantial evidence that shows inertia leads plan participants to stick with default options in terms of contribution rates and investment funds. In many cases, the default funds will be cash or money market funds, which are arguably too conservative for long-term savings, with low risk but also low rates of return (for example, see Madrian and Shea 2001).

Some companies have introduced "autopilot" strategies to counteract the inertia that plan participants frequently exhibit. For example, target date funds automatically switch from risky assets to fixed-income assets as the plan member nears the intended retirement date. The member does not need to take any action to achieve the reduction in risk. Although target date funds can be helpful in countering investor inertia, the potential disadvantage is that they are a "one size fits all" solution that may not match the needs of specific investors.

4 A 401(k) plan is a type of pension (retirement savings) plan named after the section of the US Internal Revenue Code in which it appears. A company sponsors the plan but each participant has his or her own account and makes investment decisions for that account.

5 The status quo bias is an emotional bias in which people do nothing or maintain the status quo instead of making a change.

6 The investors sampled held defined-contribution plans through TIAA-CREF in the United States. TIAA-CREF has been helping those in the academic, medical, cultural, and research fields plan for retirement for over 90 years.

EXAMPLE 1

Target Date Fund Glide Path

Target date funds are designed to deal with investor inertia. As the investor approaches the intended retirement date, the fund manager reduces the proportion of risky assets in the fund. The reduction in risky assets is because plan members close to retirement have little time to recover losses or make adjustments to their circumstances if their risky investments incur losses. Investors with longer to retirement are typically more able to bear investment risk.

Although investors could do this kind of risk management for themselves, in practice many would not get around to making the allocation changes. The target date fund manager provides an autopilot solution for them. The diagram below shows the asset allocation "glide path" that T Rowe Price suggests for a 45-year-old investor. As shown, the allocation to stocks will decline (glide down) over time, whereas the allocation to fixed income and short-term income will increase. Similar programs are offered by other investment management companies.

Discuss factors that might make this one-size-fits-all solution inappropriate.

Source: www.troweprice.com.

Solution:

The entire investment portfolio of the investor should always be considered. Where tax treatment differs among types of returns or assets, assets that are expected to generate higher taxable returns may be held in tax-deferred retirement funds. An investor with significant amounts invested in non-retirement funds might prefer to tax shelter some assets in their retirement funds.

An investor with significant wealth and no children may be willing to take more risk. They may be less loss- and risk-averse than another investor of the same age with less wealth and parental responsibilities.

An investor with a preference for active portfolio management might prefer to have different allocations to asset classes based on his or her expectations and market conditions. For example, if interest levels are historically low, the investor might prefer to invest in stocks anticipating that interest rates will rise and the fixed-income portion will decline in value.

These are some of the factors that might be discussed.

4.2 Naïve Diversification

When DC plan members do make active fund choices, some of the decisions appear to be the result of behavioral biases. For example, there is evidence of investors using simple heuristics to allocate among available funds and of framing bias. Benartzi and Thaler (2001) cite evidence of plan members using a "1/n" naïve diversification strategy—dividing contributions equally among available funds irrespective of the underlying composition of the funds. In one experiment conducted by Benartzi and Thaler, one group of subjects is given the choice between a stock (equities) fund and a bond fund and a second group of subjects is given a choice between a stock fund and a balanced (50 percent stock, 50 percent bond) fund. The average asset allocation to equities is higher for the second group because in each group, the mode is to allocate assets evenly between the two funds available for selection. The use of a heuristic and framing bias appear to have impacted the choices. In a real life example studied by Benartzi and Thaler, by comparing allocations of a plan with five stock funds and one bond fund and a second plan with one stock fund and four bond funds, they find average equity allocation is very different. In the first plan, the average equity allocation is 75 percent, and in the second plan, the average equity allocation is only 34 percent. This example demonstrates the impact of framing bias.

Not all researchers support the idea that investors follow a 1/n strategy. Huberman and Jiang (2006) counter that most members choose between three and five funds, and that the number chosen is not sensitive to the number of funds on offer (n). However, they do find evidence of members following a *conditional* 1/n strategy, by allocating equally among their chosen subset of funds. In other words, once they have selected their funds, they allocate the invested amount equally among the chosen funds.

Regret may play a role in explaining naïve diversification strategies. Benartzi and Thaler (2007) cite an interview with Harry Markowitz in which he notes that he selected a 50/50 allocation between stocks and bonds in his TIAA-CREF retirement account. He states that his intention was to minimize future regret from one asset class beating the other, an essentially behavioral explanation, and perhaps an emotional one.

4.3 Company Stock: Investing in the Familiar

A very graphic example of potentially inappropriate portfolio construction approaches in DC plans comes in the form of high levels of investment in the stock of the sponsoring company. Many US 401(k) plans offer the employer's stock as an investment option and many also make employer matching contributions in employer stock, in some cases with restrictions on subsequent sale.

Benartzi (2001) notes that one-third of 401(k) assets are invested in participants' own employer's stock, and in some plans the proportion is more than 90 percent. In many cases, the account balances are comprised in significant part by the employees' *discretionary* allocations. Vanguard (2006) notes that although only 12 percent of plans offer employer's stock as a choice, these are larger plans. As a result, 43 percent of participants have employer's stock as a choice and one-fifth of all participants have more than 20 percent of their account balance in employer's stock. Fifteen percent of participants have more than 80 percent of their account balance in their employer's stock. Balances in employer's stock remain high despite such high profile disasters as WorldCom and Enron.[7]

7 Choi, et al (2005) note that at the end of 2000, 62 percent of the $2 billion of assets in Enron's 401(k) plan accounts was invested in Enron stock.

Explanations given for investment in employer's stock include the following:

- *Familiarity and overconfidence effects*: Employees underestimate risk because of familiarity with the employing company and overconfidence in their estimates of the company's performance. A John Hancock (2003) survey shows investors assigning an average risk score of 3.1 to company stock, in comparison with 3.6 for domestic stock funds and 4.1 for global stock funds. Huberman (2001) argues this enthusiasm for own company investment springs from the same familiarity bias that leads to home bias in geographic allocations. The familiarity bias also led US investors to invest more in their local phone company than in other telephone companies. It could be that employees do have an informational advantage that justifies their high holdings in their employer's stock, but evidence on returns (e.g., Benartzi 2001) casts doubt on this view and points to overconfidence as an explanation.
- *Naïve extrapolation of past returns*: Plan members at companies whose stock has done well in the past may expect this performance to continue and hence wish to hold company stock in their account. Benartzi (2001) sorts companies into quintiles based on 10-year past performance of the employing company's stock. Employees at the worst-performing companies on average allocate 10 percent of contributions to company stock; for the best-performing companies, the figure is 40 percent. Subsequent stock performance does not validate this difference in allocation.
- *Framing and status quo effect of matching contributions*: Benartzi (2001) shows that employees who can choose where the employer match is invested allocate 18 percent of their own funds to employer's stock. Where the match is in employer's stock, employees allocate 29 percent of their *own* contributions. Employees may be taking the company's decision to contribute stock to their plan as *implicit advice.*
- *Loyalty effects*: Employees may be willing to hold employer's stock to assist the company, as they perceive it. For example, employees may be encouraged to hold employer's stock as assistance in a takeover defense. Companies with high levels of employee stock holdings may be harder to take over.
- *Financial incentives*: Employees might rationally invest in employer's stock when there are financial incentives for them to do so. These could include being able to purchase stock at a discount to market price, or beneficial tax treatment. Although these explanations are possibilities, most studies show substantial holdings of employer's stock exist in the absence of such incentives. However, this finding may be the result of inertia and employees continuing to hold employer's stock once any restrictions on selling have lapsed.

4.4 Excessive Trading

The evidence of member inertia in DC plans is in contrast to evidence of individuals with retail investment accounts. Investors with retail accounts appear to be more active traders. Barber and Odean (1999) summarize evidence from their studies of investors with discount brokerage accounts. The main findings are that investors trade too much—damaging returns—and tend to sell winners and hold on to losers—the disposition effect.

A winning position, in which current price is above the purchase price, is 1.5 times more likely to be sold in any month than a corresponding losing position. This behavior may be driven by fear of regret. Winners sold subsequently outperform the losers that remain in the portfolio. Excessive trading appears to be driven by overconfidence. Overconfident investors may falsely think that they have the knowledge and

insight to make profitable trades, and trade actively to benefit from these insights. The researchers' initial expectation that frequent traders would be worse off because of their transaction costs is not confirmed; in fact, the outcome was even worse than expected in that stocks sold do better than stocks bought by about 3.5 percent over the following 12 months. The frequent traders not only had higher transaction costs because of excessive trading but also experienced opportunity losses because of the disposition effect. Performance is negatively related to turnover levels. Young males are found to trade the most and earn the lowest net returns.

The difference between the findings on trading in the discount brokerage and the 401(k) pension plan accounts may stem from self-selection of individuals (keen traders) into brokerage accounts and the differing levels of investment choice (i.e., choice is generally restricted in 401(k) plans).

4.5 Home Bias

Portfolio diversification represents another dimension in which investors must make a choice. Members can diversify internationally as well as across asset classes. A large body of literature exists showing that many investors maintain a high proportion—often 80 percent or more—of their investments in securities listed in their own country (for example, see French and Poterba 1991; Kang and Stulz 1997). There have been attempts to offer rational explanations for this feature, for example, as a result of information costs. However, there are also behavioral explanations, such as availability, confirmation, illusion of control, endowment, and status quo biases. Familiarity with a country may lead investors to own high concentrations of domestic assets. This choice is closely related to the idea that a similar type of familiarity could lead investors to own excessive amounts of employer stock.

4.6 Behavioral Portfolio Theory

Shefrin and Statman have published a number of articles on behavioral portfolio theory (e.g., Shefrin and Statman 2000; Statman 1999, 2004). The theory is intended to reflect how investors actually form portfolios rather than how traditional theory suggests they should. Shefrin and Statman argue that portfolios, affected by behavioral biases, are formed as layered pyramids in which each layer is aligned with an objective. As a result of a mental accounting bias in which people treat one sum of money differently from another sum based on which mental account the money is assigned to, investments are allocated to discrete layers without regard for the correlations among these investments. For example, a base layer of low risk assets may be intended as "protection from poverty," whereas a higher layer of risky assets represents "hopes for riches." Behavioral investors do not consider the correlation between the layers in the way that modern portfolio theory would suggest they should. Clients can have several layers or mental accounts in their portfolios. The layered approach can explain observed features, such as undiversified stock portfolios (hopes for riches), and the reluctance of investors to invest in foreign stocks despite the seemingly obvious diversification benefits. This latter feature reflects failure to consider the diversification benefits of stocks with a low correlation with the domestic portfolio. The failure to consider diversification benefits is an implication of the mental accounting bias.

An important point to note is that investors do not have a single attitude toward risk. They have multiple attitudes toward risk depending on which part of their wealth is being considered. Hence, in a behavioral context it might make sense for investors to say they are prepared to take a lot of risk with some of their money, even though such a statement makes little sense in a conventional mean–variance portfolio theory framework.

Advisers and portfolio managers constructing an investment policy statement for or with a client may wish to consider behavioral portfolio theory. For example, they can clarify which mental accounts the client has and what attitude toward risk prevails for each one. Exhibit 6 compares the structure of a mean–variance portfolio and a behavioral portfolio (Statman 1999).

Exhibit 6 Structures of Mean–Variance and Behavioral Portfolios

Mean–Variance Portfolio
Mean–variance portfolios are constructed as a whole, and only the expected return and the variance of the entire porefolio matter. Covariance between assets is crucial in determination of the variance of the portfolio.

Behavioral Portfolio
Behavioral portfolios are constructed not as a whole but layer by layer, where each layer is associated with a goal and is filed with securities that correspond to that goal. Covariance between assets is overlooked.

Source: Statman (1999).

BEHAVIORAL FINANCE AND ANALYST FORECASTS

5

Sections 2, 3, and 4 focus on understanding individual investor behavior and how it affects the adviser–client relationship and portfolio construction. Sections 5, 6, and 7 focus on how behavioral factors impact security analysts, investment committees, and markets.

Studies have shown that experts in many fields persistently make forecasting errors arising from their behavioral biases. Investment analysts are subject to these biases, and need to be aware of the potential for biases to compromise their professional judgment. When qualified, analysts possess a range of techniques to research companies and securities, yet their superior skills surprisingly place them at greater risk of some types of error. One key issue for all experts is recognizing the occasions when they lack the information or insight to make a good professional judgment. Even possessing good analytical skills, investment professionals' judgment can be limited by human failings and the environment in which they operate. Judgment can be improved if an individual understands the limits to his or her knowledge.

The biases that can adversely impact analysis are not confined to analysts' behavior. The way in which information is presented in company management presentations, reports, and accounts can reflect human biases in corporate executives. To achieve good forecasts or decisions, analysts need to be alert to the potential impact of biases.

Section 5.1 describes the effect of *behavioral biases* on analysts and their work. *Cognitive errors* or failures of reasoning create the potential for errors of judgment, and include memory- and probability-based errors. *Emotional biases* are biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition. *Cognitive dissonance* arises when new information conflicts with previously held

beliefs or cognitions. To resolve the dissonance, people may notice only information of interest, may ignore or modify information that conflicts with existing beliefs, may remember and consider only information that confirms existing beliefs, and/or may modify beliefs. The work of analysts, which includes research, judgment, forecasts, decisions, and conclusions, may be affected by behavioral biases and cognitive dissonance. In other words, analysts are not immune to behavioral biases and exhibiting irrational behavior.

5.1 Overconfidence in Forecasting Skills

Overconfidence is a key behavioral bias relevant to investment analysts. Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities. This overconfidence may be the result of overestimating knowledge levels, abilities, and access to information. For example, people generally do a poor job of estimating probabilities but believe they do it well because they believe that they are smarter and more informed than they actually are. This behavior is sometimes referred to as the *illusion of knowledge bias*. Overconfidence may be intensified when combined with *self-attribution bias*. Self-attribution bias is a bias in which people take credit for successes and assign responsibility for failures. In other words, success is attributed to the individual's skill whereas failures are attributed to external factors. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Analysts frequently show excessive confidence on the likely correctness of their forecasts. Studies have identified that 90 percent *confidence intervals* for forecasts, which should leave only 10 percent error rates, turn out to be wrong as much as 40 percent of the time (Russo and Schoemaker 1992). The actual error rate is the result of a calibration issue about how sure an expert is about his or her judgment.

Overconfidence can be the result of placing too much emphasis on specific characteristics of a company or what is being examined and neglecting to fully consider the impact of the economic environment and other information. Studies have suggested individuals are more confident when making contrarian predictions that counter the consensus. That is, overconfidence can arise when forecasting what others do not expect or predict (Dunning, Griffin, Milojkovic, and Ross 1990). Overconfidence has been shown to be particularly evident for strategists, rather than for individual stock or industry analysts. Stock analysts are typically more confident about earnings forecasts than target prices.

A key bias linked to overconfidence is the illusion of knowledge. Analysts believe that by acquiring information, they can know more than others and obtain an edge. In other words, information will result in analysts being more knowledgeable and thus more accurate in their forecasts compared with others. As a result, they may collect too much information. Although forecasting is driven by information, additional data that is not adding material content tends not to increase the accuracy of a forecast, but instead reinforces an analyst's confidence in that forecast.

Additional information may contribute to the cognitive bias of representativeness, in which analysts judge the probability of a forecast being correct by considering how much the outcome resembles overall available data (Kahneman, Slovic, and Tversky 1982 and more recently, Shefrin 2007). Typically, this simplification combines probabilities incorrectly. Additional information or detail may appear to conform to the overall scenario being forecast, even if it is largely irrelevant, and so add to confidence in the forecast. The **availability bias** is a cognitive bias that involves individuals giving undue weight to more accessible, readily recalled information. Availability and representativeness can each encourage overreaction to rare events.

Attempting to collect more information can also contribute to the cognitive bias of **illusion of control**, which is a tendency of analysts to try to control what cannot be controlled. Inherently, uncertain outcomes relating to business or the economy cannot have all forecasting risk removed. Risk in a model and the modeling process cannot be eliminated by an excess of information. The illusion of control can lead to analysts forecasting complex patterns of business performance or stock price behavior, or being confident about unlikely combinations of short- and long-term recommendations, price targets, and earnings forecasts.

Overconfidence and the illusion of control can be encouraged by *complex models*. Many analytical problems will require modeling and extensive use of data. More complex models usually fit a particular data set better but prove less robust in a range of different environments. The data set used may be more relevant to a particular economic or business environment or may be influenced by some outlying or atypical observations. Mathematical rigor and spurious precision of models can conceal underlying weaknesses in the models and assumptions. Analysts should avoid modeling that overly focuses on a single set of historical data, which risks optimization on that data set rather than achieving robustness of modeling. Robustness reflects a model's ability to perform well out of sample.

Even when analysts are not managing portfolios of securities, **self-attribution bias** can adversely influence their analyses and contribute to overconfidence in their forecasts. Self-attribution bias is a bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control. Self-attribution bias may reflect a desire to preserve self-esteem while people protect themselves psychologically as they attempt to comprehend successes and failures. Self-attribution bias may be evident in *skewed forecasts*, in which the confidence interval is not symmetric around a central forecast. People may appear to exhibit self-attribution bias as a result of misdirected financial incentives. In this case, it is not true self-attribution bias but a deliberate attempt to gain credit for successes and assign responsibility for failures for financial as opposed to psychological reasons.

Experts often use other self-esteem or ego defense mechanisms, such as **hindsight bias**. Hindsight bias is also called the "I knew it all along" effect. Forecasts are evaluated with hindsight, and that additional knowledge can be combined with a human tendency to see past events as having been predictable. Also, people tend to remember their own predictions of the future as more accurate than they actually are because they are biased by the knowledge of what has actually happened. Hindsight bias is more prevalent when forecasts are ambiguous. Individuals tend to misinterpret past data, which can lead to overconfidence and insufficient adjustment in future forecasts. Hindsight bias can make analysts blind to future risks or the full breadth of the range of outcomes.

Hindsight bias can involve both cognitive and emotional bias. It is a result of the process of integrating new information with prior beliefs. A source of error in calibrating earlier forecasts typically arises from selective recall, in which individuals remember showing greater foresight than proved to be the case. Typically, an outcome is viewed as more likely, in the sense of being capable of being repeated, once it has occurred than is expected before that.

EXAMPLE 2

Analyst Case Study

Based on a company's sales and earnings per share growth over the past 10 years, an analyst has concluded that its high rate of growth will continue in the future. Before the report is completed, the analyst reads in a newspaper that the company's chief executive has made an apparently very profitable personal investment

in another unrelated business. The analyst believes that this profitable outcome is evidence of the chief executive's entrepreneurism and dynamism, and that it is additional confirmation of the analyst's assessment of the company in the report. Supported by the additional information, the analyst now feels more confident with the forecasted growth rates and in fact increases the average forecasted earnings growth rate and decreases the dispersion of the forecasted growth rates. He includes the additional information about the chief executive in the report.

Discuss flaws in the analyst's approach and possible biases of the analyst.

Solution:

The value of the additional information is difficult to quantify, and it may not have been collected systematically. The analyst may not have looked as rigorously for evidence of how representative the successful investment was among the chief executive's total portfolio of personal investments; other investments might have shown poor returns but received less publicity. Newspaper coverage can be selective. Thus, the new information might reflect *availability bias*. The chief executive may even have been motivated to diversify his investments by concern about the outlook for the company's stock. The analyst's judgment might have been adversely affected by *overconfidence*, with faulty reasoning contributing to the issue. Further, the analyst might have seen the additional information as being *representative* of a mental picture of the characteristics of a growth business.

5.1.1 *Remedial Actions for Overconfidence and Related Biases*

Dealing with overconfidence is difficult, but *prompt and accurate feedback* combined with a *structure that rewards accuracy* can help analysts to re-evaluate their processes and self-calibrate. Most people calibrate better and reduce overconfidence if they know that the result of their forecast will be known and reflected to them very quickly.

Effective methods of providing incentives need not necessarily be in the form of financial reward. Good motivation can also be achieved if an individual is directly accountable for accuracy to supervisors or clients. An appreciation of stock market history and economic cycles, as well as rigorous self-appraisal, can help improve future forecasts and correct confidence intervals given by analysts. Where resources and organizational structure permit, *appraisal by colleagues, superiors, or systems* can also help calibrate forecasts and control overconfidence.

Well-structured feedback can also reduce hindsight bias. An analyst should document a decision or forecast and the reasons for that judgment. A written record helps make the later evaluation more objective. Documenting the reasons for the judgment not only allows the accuracy to be assessed later, but also why it was right or wrong. The data used should be recorded to allow subsequent assessment. Unambiguous forecasts are less vulnerable to hindsight bias. Where possible, numbers should be included, and it can be helpful to document any consensus or base rates that exist, to compare with the analyst's judgment and for later assessment purposes.

To address hindsight bias and other biases, analysts should make the conclusion as explicit as possible, although this documenting should not be confused with showing greater confidence or adding extraneous detail. What is required is sufficient detail to allow subsequent evaluation of its accuracy. In subsequently evaluating a forecast after the outcome is known, the record of the prediction can be assessed by reviewing the data, assumptions, and model. Feedback or a systematic review process can assist future accuracy and help control overconfidence and reduce hindsight bias.

Some outcomes or sources of forecasting error can be overlooked. Analysts should be thorough in their search for unconsidered outcomes that might have been missed initially and attempt to evaluate those. One method that can help reduce overconfidence is for an analyst to be required to provide at least one counterargument in

the report. If the documentation of the research includes one good reason why the conclusion might turn out to be wrong, forecasting accuracy can be improved and confidence be better calibrated. When listing evidence for and against a conclusion, it is the evidence against that does the most good in countering overconfidence.

To counter the risk of inaccuracy and excess confidence based on specific characteristics of the subject of the analysis, analysts should consider whether the sample size is too small. Ensuring that a search process includes only *comparable data* is also helpful to reducing overconfidence. Additional data that cannot be analyzed in the same way as the comparable data set are more likely to add to confidence than accuracy, via the bias of illusion of knowledge.

Bayes' formula is a mathematical rule that explains how existing probability beliefs should be changed given new information. In other words, Bayes' formula expects people to update old beliefs in a certain manner when given new information. Bayes' formula is essentially an application of conditional probabilities.[8] Ideally, analysts should incorporate additional information with a Bayesian approach to calculate probabilities, recognize underlying base rates, and link probabilities conditionally.

Using Bayes' formula, the initial position (prior probability) typically matters less, and more importance can be given to a sequence of useful evidence. Because the starting assumptions are typically less important than collecting and incorporating new information, Bayes' formula can be a useful tool for analysis, reducing the risk of behavioral biases in incorporating new information.

However, base rates—the underlying averages or background frequencies—should be recognized if the data is available. Indeed, in some cases the base rates can be clear and powerful. In some investment analyses the base rate of likely outcomes may be statistically significant, but there is much less information that allows discrimination between investments. For example, there may be insufficient data to determine accurately stock betas in a model. The analysis may be more robust if calculated assuming all the stock betas are equal to 1 (the overall average or base rate).

In Example 3, the correlations and similarity of previous performance between stocks, which can be high within some sectors, demonstrate the difficulty of discriminating between stocks in the short term. Against this background—where it seems quite likely that short-term performance of the two stocks will be similar—achieving a successful recommendation requires a higher hurdle in terms of further evidence and quality of analysis.

---

8 Bayes' formula shows how one conditional probability is inversely related to the probability of another mutually exclusive outcome. The formula is:

$P(A|B) = [P(B|A) / P(B)]P(A)$

where

$P(A)$ = the prior probability of event A, without new information B. It is the base rate or base probability of event A.

$P(A|B)$ = the conditional probability of event A. It is the updated probability of A given the new information B.

$P(B|A)$ = the conditional probability of B given A. it is the probability of the new information B given event A.

$P(B)$ = the prior (unconditional) probability of information B.

EXAMPLE 3

Analyst Recommendation and Base Rate Case Study

The chief investment officer (CIO) of an investment institution is presented with research by an analyst on his team. The analyst is recommending a switch from the stock of one major integrated oil company, XYZ plc, into another major integrated oil company, ABC plc. Over the previous three years, the stock prices of the two companies had a correlation of 88 percent. On the basis of this high correlation and also the fact that over the period the performance of the two stocks had diverged little, the CIO concludes that the probability of switching costs exceeding the difference in prospective returns over the next 12 months is 80 percent (base rate or prior probability). The CIO estimates the cost of the switch at 4 percent because tax costs are involved. The analyst's judgment is correct 60 percent of the time, in line with the average for the team. How should the CIO evaluate the analyst's recommendation?

Solution:

Exhibit 7 Bayes' Formula Demonstrated Using Natural Frequencies

The information in Exhibit 7 is summarized in Exhibit 8.

Exhibit 8

	Switching Is Worthwhile	Switching Is Not Worthwhile	Total
Analyst recommends a switch	120	320	440
Analyst recommends no change	80	480	560
Total	200	800	1000

P(A) = Probability switching is worthwhile = 1 − 0.8 = 0.2 (given), or 200/1000 = 0.2
P(B) = Probability analyst recommends a switch = 440/1000 = 0.44
P(B|A) = Probability analyst recommends a switch given switching is worthwhile = 0.6 (given), or 120/200 = 0.6

If a population of 1000 outcomes is used, on average in 800 (= 0.8 × 1000) outcomes there will be less than 4 percent annualized difference between the stocks. On the other 200 (= 0.2 × 1000) outcomes, it would be worth switching.

The analyst's 60 percent rate of being correct means on average that he can be expected to identify correctly 120 (= 0.6 × 200) of the useful switching opportunities. But his 40 percent failure rate means that he will not predict the remaining 80 (= 0.4 × 200) outcomes when switching would prove right (false negatives).

Of the 800 outcomes in which switching would not be worthwhile, the analyst will correctly recognize 480 of the outcomes (= 0.6 × 800). But he will wrongly predict a switch on the remaining 320 outcomes in which there is no meaningful difference between the stocks (false positives).

Exhibit 8 indicates that the analyst will make 440 calls to switch (= 120 + 320), of which just 120 can be expected to be correct. The analyst's expected success ratio in calling a profitable switch between two closely correlated stocks is 27 percent (= 120/440) or calculated using Bayes' formula: P(A|B) = [P(B|A)/P(B)]P(A) = [(0.6)/(0.44) × 0.2] = 1.36 × 0.2 = 0.27

The CIO would need more information about time frames and predicted magnitude of performance difference between the stocks before making a decision. However, in these circumstances, the base rate—the similar prior performance of the two stocks—is hard to beat. (Switching costs and the possibility that some outcomes represent an unexpected outperformance of XYZ may even add to the risks.) Where a base rate or prior is very strong, a decision counter to the base rate can only be made with a strong proven ability to discriminate.

Remedial actions include giving prompt, well-structured, and accurate feedback; developing explicit and unambiguous conclusions; having a systematic review process and a structure that rewards accuracy; conducting regular appraisals by colleagues and superiors; providing counterarguments; and documenting comparable data.

5.2 Influence of Company's Management on Analysis

The information that is presented by company management and the way the information is presented can affect external analysts. Analysts should remember that company management is also susceptible to behavioral biases.

Framing, **anchoring and adjustment**, and availability are important cognitive biases. Framing is a cognitive bias in which the same problem is assessed differently depending on how information or a question is presented. Humans assume that the frame or context is providing additional information when it may not be. It can involve anchoring, in which some information is given undue importance in decision making. Anchoring means that the framework for interpreting and analyzing the available information can be influenced disproportionately by an initial, default position or "anchor." This anchor can be chosen in a variety of ways. For example, it may be based on initial information, prominent and vivid data, or recent data. Adjustments from the anchor tend to insufficiently incorporate new information. Availability is a cognitive bias that involves individuals giving undue weight to more accessible, readily recalled information.

For example, a management presentation describing specific successes or selecting favorable comparisons for business performance could anchor an analyst's view of the business results as successful. Subsequent less favorable metrics or explanations might not be given the appropriate consideration or weight. Typically, management presentations and annual reports begin with a summary of results and achievements. Analysts should recognize the risk of this information being given undue importance in the analysis relative to the analyst's own ratios and metrics.

The extent to which company management can be excessively optimistic is shown in Exhibit 9, which analyzes the report of a bank that subsequently moved into significant loss. Analysts reviewing a company report that lacks balance in the language need to consider the potential for their favorable initial impression of reporting language to adversely affect an objective analysis of numbers, via the influence of framing bias.

Exhibit 9 Framing Bias

Consider this text analysis of the chairman's statement and business review in the 2007 annual report of a major European bank published in 2008, a few months before the bank was rescued by the government.

Occurrences of:			
Negative words		**Positive words**	
Disappoint/disappointed	0	Good	55
Bad/badly	0	Excellent	12
Poor	0	Success/successful	35
Weaker/weakening	7	Improvement	23
Slowdown	6	Strong/stronger/strongly	78

Source: Royal Bank of Scotland plc, Annual Report and Accounts 2007, SVM Analysis.

Analysts should also recognize the possibility of a self-attribution bias in company executives that arises from the impact of incentive compensation on company reporting. Incentive compensation for both company management and for analysts can be too large, creating errors of reasoning and judgment because of preoccupation with specific factors. Company management and analysts can be influenced by optimism. This optimism may be influenced by overconfidence and illusion of control biases. As a result, there is a systematic tendency to overestimate the likelihood of favorable outcomes, and underestimate the likelihood of negative events (Lench and Ditto 2008). Optimism can be evident in company reporting.

Framing and setting expectations may be influenced by companies presenting recalculated earnings. This recalculation may happen if management believes earnings are temporarily or artificially depressed; typically, the recalculation does not comply with generally agreed accounting practice presentation. Usually, the recalculated earnings are more favorable and given greater prominence in company reporting. Because these adjustments can affect valuation, apparent growth rates, and the smoothness of earnings progression (earnings quality), analysts need to consider whether the adjustment is unreasonably influencing their perception of the business in terms of profitability, growth, or riskiness.

5.2.1 *Remedial Actions for Influence of Company's Management on Analysis*

Analysts can best deal with cognitive biases in the interpretation of information by maintaining a disciplined and systematic approach. Focusing on metrics and comparable data, rather than what is descriptive or unverifiable, can assist forecast accuracy and consistency of approach across research. Calibration of likely accuracy can be improved by framing the issue appropriately, gathering information, and recognizing underlying base rates.

5.3 Analyst Biases in Conducting Research

Although cognitive biases may be the most significant behavioral problem for analysts, there is usually also an emotional component to judgment. Emotional responses are a significant factor in the real-time processing of financial information. Emotional perception of information is not necessarily rational; emotions can improve or disrupt decision making. However, even before an analysis is complete, the model or judgment can only be as good as the data used. The search process for information is an important element of successful analysis, and the optimal stopping point in that search may not be clear. It is possible to collect too much information.

Specific biases can be more prevalent in company analysis. Collecting too much unstructured information may not only lead to illusions of knowledge and control, contributing to overconfidence, but can also expose analysts to the risk of representativeness. Additional information can feed representativeness.

More detail collected from companies can feed confidence. An indicator that a conclusion has been driven by extraneous detail may be that the conclusion is presented as a *story*. A story involves explaining evidence with a story or scenario that fits, and then making a decision that matches the specific scenario. A story may not be based on a thorough analysis but can be compelling because of how it is presented.

Confirmation bias, a cognitive bias, is the tendency for people to misread evidence as additional support for an initial hypothesis. Confirmation bias is a form of resolving cognitive dissonance that describes the tendency to search for, or interpret, information in a way that confirms the analyst's prior beliefs. The additional information may not be analyzed in a rigorous way, but it can nevertheless appear to make the judgment or forecast more likely by sharing some of its general characteristics. An example is when probabilities of independent events are combined inappropriately, such as additively or some variation of adding, to support a belief. This example highlights the conjunction fallacy. The probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone. In fact, the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

The **gamblers' fallacy**, a misunderstanding of probabilities in which people wrongly project reversal to a long-term mean, is a related cognitive bias (Shefrin 2007). Investment professionals, and strategists in particular, can suffer from this cognitive bias. It reflects a faulty understanding about the behavior of random events, expecting reversals to occur more frequently than actually happens. With the gamblers' fallacy,

the analyst is expecting a pattern that has diverged from the long-term average to reverse within a specific period of time. Another fallacy, common to gamblers and many others, is the hot hand fallacy. People affected by this fallacy wrongly project continuation of a recent trend. Both of these fallacies demonstrate a lack of understanding of statistical independence.

Similar to endowment bias, assets may be endowed with additional value based on an emotional response to them. Analysts can associate financially sound companies with good or safe characteristics, although the external economic environment or high stock price for the company can make it risky. This view can also reflect a confirmation bias. Analysts may look for and notice what confirms their beliefs, and ignore or undervalue what contradicts their beliefs. Studies have suggested that analysts have biases favoring growth over value. Earnings growth records themselves can be seen as representative of a growth business, and naively extrapolated. The tendency of analysts to recommend high-growth and low-yield stocks typically reflects a failure to incorporate the base rate or effect of the environment in which a company operates. This situation may reflect a **representativeness bias**.

EXAMPLE 4

Investment Manager Case Study

It is August. An investment manager has just signed a charitable organization (charity) as a new client. The charity currently holds primarily cash and liquid assets. The directors of the charity would like to move some money not required to fund short- or medium-term activities of the charity into stocks. They expect stocks to earn higher returns than the returns of the assets currently held. They have asked the investment manager to advise them on the timing of entry into the stock market.

The manager advises them that she expects stock to rise over the next 12 months but advises deferring investment in stocks for a month or two. She thinks stocks will decline in the near future because each month for the last six months stocks have risen more than the average monthly increase for the last 25 years. She anticipates a correction that will reduce the increase to the long-term average. She suggests waiting to enter the market until after the anticipated correction.

She states that the probability of a market fall in any September is 0.55 and that the probability of a market increase over a 12-month period is 0.7. She uses these probabilities to support her advice to defer investment for a month or two.

Assume that the probabilities are correct and that the events are independent. What behavioral biases might be evident with this advice? How might the investment manager address these?

Solution:

The expectation of a market reversal—a fall coming after a rising trend—could reflect the gamblers' fallacy. The investment manager is expecting the stocks that have diverged from the long-term average to reverse within a specific period of time. She has not done a thorough analysis but has instead told a compelling story. She may be susceptible to a representativeness bias, in which analysts judge the probability of a forecast being correct by considering how much the outcome resembles overall available data. Frequently, this simplification combines probabilities incorrectly. Additional information or detail may appear to conform to the overall scenario being forecast, even if it is largely irrelevant, and so add to confidence in the forecast. Further, the manager may be anchoring

incorrectly on the long-run average. If she believes in a further gain in the stock market, then phased investment over a period of weeks or months may reduce the impact of volatility on timing investment on any single day or month.

Combining this event—a stock market fall in September—with an expectation of a rise in subsequent months to support the manager's belief inappropriately combines probabilities and reflects the **conjunction fallacy**. The probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone. The probability of a market fall in September is 0.55, the probability of a market rise over the subsequent 12 months is 0.7, and the two events are independent. Therefore, the probability of the two events occurring in the outlined scenario is just 0.385 (= 0.55 × 0.7). This probability is lower than the probability of either individual event. However, the investment manager and the client may suffer from a confirmation bias that makes the additional detail appear supportive of her belief. The information is not being analyzed in a rigorous way. Essentially, the proposal to the client is a sequence of apparently connected events (a story). The added detail in actuality suggests that the assumed scenario is less likely than she asserts, but offers misleading vividness and detail that is being misinterpreted.

5.3.1 *Remedial Actions for Analyst Biases in Conducting Research*

Given the errors and overconfidence in forecasts, analysts should focus on more objective data such as trailing earnings. However, even reported earnings may be affected by operating and accounting choices made by management. In making forecasts, analysts should *evaluate previous forecasts* and be wary of anchoring and adjustment.

Emotional biases are difficult to deal with and can impact the search process, thereby compromising any subsequent analysis. The solution is to *collect information in a systematic way* and, where possible, use metrics and ratios that allow comparability—comparability in both analysis with previous calculations and also, where possible, benchmarked against current similar calculations. Information should be questioned and assessed relative to its context. It is important when gathering information to use a *systematic approach* with prepared questions. Information should be gathered before analysis is done and a conclusion has been made. In conducting analysis, CFA Institute members and candidates are expected to comply with Standard V of the *Standards of Practice Handbook.*

An analyst should attempt to *assign probabilities*, particularly to underlying base rates of prevalence. It is a human failing to assume that some outcomes are either impossible or certain. Once base rates or events are assessed with other than 0 or 100 percent likelihood, a Bayesian approach to combining evidence will force the conclusion away from unlikely scenarios.

Analysts need to *consider the search process*, the limits of information, and the context of the information. A *structured process* for information gathering and processing can help analysts deal with search biases. A search process should involve *seeking contrary facts and opinions*. Online data gathering or news services can be set to provide information that avoids some search biases. Without structure in the search for information, it is possible for analysts simply to collect more confirmatory evidence while overlooking contradictory information. Clear unambiguous forecasts can help address this shortcoming; confirmatory bias may be greater with complex forecasts that can be easier to appear to confirm.

Having a structured search process and a clear way of *incorporating evidence sequentially*, either as decision rules (trees) or using Bayes' formula, can encourage much faster adaptation of forecasts. *Prompt feedback* not only allows re-evaluation but also helps analysts to gain knowledge and experience that can be drawn on in the future, either consciously or unconsciously (intuitively).

Identifying faulty searches or stories (an excess of representative but less relevant information) is difficult. However, experts' arguments should include some contrary evidence. In a report or forecast, this evidence may be introduced by the use of such words as "however" rather than words that simply reinforce a belief or conclusion, such as "moreover." Vivid and specific illustration in support of an argument may indicate representativeness and availability biases, whereas many good analysts' reports will admit to some abstract unknowns and admit some contrary evidence.

Although analysts should *document* their decision making to assist later evaluation, some of the documentation may be best done once the analysis is complete. Studies suggest that the process of providing explanations can diminish an expert's ability to draw on his or her intuition. Stories can also overwrite nuances and actual knowledge, and they may represent less creative solutions. The amount of knowledge that can be conveyed in a written or spoken answer is small compared with the store of knowledge and decision rules stored in one's head. Spoken and written language can encourage linear thinking, whereas actual decision making is a more complex weighting of different unconnected factors. The nuances of judgment can be hard to verbalize.

Remedial actions include using consistent data, evaluating previous forecasts, taking a systematic and structured approach, assigning probabilities, seeking contrary facts and opinions, incorporating evidence sequentially, having prompt feedback, and documenting the process.

6 HOW BEHAVIORAL FACTORS AFFECT COMMITTEE DECISION MAKING

Many investment decisions are made by groups or committees rather than by individuals acting alone. Examples include analyst stock recommendations that need to be approved by research committees and the asset allocation and fund manager selection decisions of a pension plan made by a board of trustees or some other group of fiduciaries. Often, the motivation for using a group decision is the idea that "two heads are better than one." More formally, the application to a task of a number of individuals, each with different skills and experiences, can be expected to allow for more effective decision making.

Individual decision making is affected by behavioral biases, and a variety of behavioral biases are relevant to investment decisions made by individuals whether they are private or professional investors. Individuals can be overconfident in their information and their ability to forecast earnings or pick winning investments. They can be anchored by irrelevant values, such as past stock prices, or too conservative in updating beliefs in the face of new information, such as earnings forecasts. They can be loss averse and reluctant to close out a position at a loss, even if on an objective basis the future prospects of the investment have deteriorated. As we consider investment committee decision making, we need to evaluate the implications of these individual biases for group decision making. The group process may mitigate a bias or it may exacerbate it. We also need to consider whether the group decision-making process creates additional biases.

Analysts will often work with research teams, and the group environment can have an impact on their own research. Although this arrangement can set standards for good professional work, and provide a cultural and analytical framework for that work, individuals are subject to biases that can compromise their research.

Social proof is a bias in which individuals are biased to follow the beliefs of a group. Analysts may wrongly favor the judgment or endorsement of others, often without being fully aware that they are doing so. This behavior can adversely affect analytical work. For example, a buy-side analyst's investment view might be influenced by his or her team's investment position.

Groups may also amplify individual behavioral biases. The process of reaching a consensus will usually narrow the range of views. If a group-decision process does not encourage private information held by individual analysts to be shared fully with others before a decision is made, the decision may fail to combine the collective wisdom of the group. Group judgments are potentially better than individual ones, but biases mean that the group may not perform optimally. Typically, a group will have more confidence in its decisions after discussion that leads to an overconfidence bias.

6.1 Investment Committee Dynamics

All of the biases present in individuals can be present in investment committee decisions. A group environment may increase them. Wood (2006) cites an example in which his investment recommendation to a committee of a purchase of Ford Motor Company shares was rejected because of the chair's own poor experience with the company's products. Other committee members immediately supported and reinforced the chair's view despite it being based on weak anecdotal evidence:

> … the rest of the committee chimed in to support the chair's verdict. Any disagreement with people in power is reflected by the Japanese proverb, "the nail that sticks up gets hammered down." Prior experience with group behavior teaches most members to preserve consensus or face the consequences. (p. 30)

There is little evidence in this instance of two heads being better than one. In essence, the committee merely acted to support the judgment of one head, the chair. In general, decision makers are most likely to learn to control harmful behavioral biases in situations where the decision makers have repeated attempts at the decision and there is good quality feedback on prior outcomes. It follows that investment committee decision making should be improved by carefully analyzing and learning from past decisions. Wood (2006) argues that this rarely happens, and changing committee membership is particularly unhelpful in this regard:

> Committees notoriously do not learn from experience. Feedback is a learning mechanism, but feedback from most decisions, when available, is often slow and generally inaccurate. Committees rarely keep track of decisions well enough or long enough to identify systematic biases that creep into their deliberations. Without feedback, people struggle to understand what works and what does not. (p. 32)

6.2 Techniques for Structuring and Operating Committees to Address Behavioral Factors

We might ask why the logic of "two heads are better than one" often fails to apply in committees in practice. Wood (2006) makes an important distinction between crowds and committees. A crowd is a random collection of individuals. For example, in the TV game show "Who Wants to Be a Millionaire?" contestants can opt to ask the studio audience to help identify the correct multiple choice answer to a question. The majority opinion of the audience (a crowd) has been correct 91 percent of the time (Surowieki 2004). Most investment committees fall well short of a 91 percent hit rate.

The main difference is that crowds are diverse, with individuals having varied backgrounds and experiences. Furthermore, in situations like asking the audience, members of the crowd give their own best opinion without consulting, and thus potentially avoid being influenced by other crowd members. In contrast, committees are often made up of individuals with similar backgrounds who are likely to approach decisions in a similar way. Committee decisions are discussed and debated, and as a result, individuals may moderate their own views to fit in with the consensus or may feel pressure to agree with views expressed by powerful individuals on the committee. It follows that committee decision making is likely to be enhanced when a committee is made up of members from diverse backgrounds who are independent enough to express and support their own views rather than falling into line with the views of others. However, assembling and managing such diverse and opinionated committees is likely to be challenging.

The chair of a committee has an important role in ensuring the effectiveness of the committee's decision making. As noted earlier, this responsibility includes assembling a diverse group of individuals with relevant skills and experiences and creating a culture in which members can express dissenting views. The chair is also responsible for ensuring that the committee sticks to the agenda and making sure a clear decision is reached after the various opinions have been heard. The chair should actively encourage alternative opinions so that all perspectives are covered. In turn, committee members have a responsibility to actively contribute their own information and knowledge and not simply fall into line with the consensus for the sake of harmony.

Teams that are diverse in skills, experience, and culture may be less prone to social proof bias. Different perspectives and contrary views are more likely to emerge in a diverse group. Ensuring professional respect between all members of the group and maintaining analysts' self-esteem can help each member contribute to group judgment, even if the views expressed are contrary to group norms. An individual expressing strong contrarian views within the group can help in avoiding too quick of a move to consensus before all the evidence is discussed. The risk of suppressed privately held information by individuals can be reduced if a group leader collects some of the individual views in advance of a discussion.

7 HOW BEHAVIORAL FINANCE INFLUENCES MARKET BEHAVIOR

Much of the day-to-day work of investment professionals will be within the framework of efficient markets. This framework provides a useful set of tools for investment analysis, portfolio management, and risk management. Over time, academic papers have broadened the understanding of market efficiency. However, this understanding still does not explain some persistent market patterns. Behavioral finance does offer some explanation of these exceptions to market efficiency, and this reading focuses on the biases that contribute to these anomalies. Investment professionals should view an understanding of these biases as complementary to their knowledge of market efficiency, thus allowing a greater range of stock market and investor behavior to be explained.

7.1 Defining Market Anomalies

Efficient markets should not deliver abnormal returns. Research has documented a number of puzzles or persistent features of market behavior that appear to contradict the efficient markets hypothesis. On closer examination, not all necessarily contradict the efficient market hypothesis. Note that the hypothesis does not rule out

small abnormal returns before fees and expenses are taken into account. Closed-end fund discounts, for example, typically do not offer a profitable strategy to trade when transaction costs are allowed for.

Anomalies (apparent deviations from the efficient market hypothesis) are identified by persistent abnormal returns that differ from zero and are predictable in direction. However, calculating what constitutes normal returns relative to the risk incurred depends on the asset pricing model used. Anomalous behavior can be indicative of shortcomings in the underlying asset pricing model. When high returns persist on a particular class of securities, or relative to a specific factor in valuation, it might simply be a compensation for excess risk rather than genuinely anomalous. Fama (1998) states that if a reasonable change in the method of estimating abnormal returns causes an anomaly to disappear, then it is reasonable to suggest that it is an illusion. He includes in this category apparently low returns following initial public offerings (called the "IPO puzzle") and the positive abnormal returns apparent in the 12 months after a stock split.

Some apparent anomalies may be explained by the small samples involved, a statistical bias in selection or survivorship, or data mining that overanalyzes data for patterns and treats spurious correlations as relevant. The magnitude of any over- or underperformance depends critically on the choice of benchmark, which can make it hard to interpret results. The risk with data mining is that the anomaly may not persist out of sample. From 1967 to 1997, the Super Bowl indicator,[9] a spurious correlation, correctly "predicted" the direction of two out of three US market indexes 27 out of 30 times. But it then indicated wrongly 4 times in a row, delivering an accurate result in just 7 out of the next 13 years. Since any correlation between the outcome of a sporting event and stock market performance cannot be rationally explained, it is not surprising that the Super Bowl indicator has turned out to be an inaccurate predictor.

Also, from time to time, markets can present *temporary disequilibrium behavior*, unusual features that may survive for a period of years but ultimately disappear. Publication of the anomaly, which draws attention to the pattern, can start the arbitrage that removes the behavior. For example, the small company January effect, part of the turn-of-the-year effect, does not appear persistent once appropriate adjustment for risk is made. The weekend effect, involving lower stock market returns on Mondays, appears to have reduced in the United States and United Kingdom. However, the market anomalies discussed in this section reflect behavior that has been identified and analyzed in a number of markets around the world and at different time periods. The patterns have been documented in many academic studies, with broadly similar conclusions.

Some of these market features may be attributed to rational behavior that is not captured by accepted pricing models. Investor response to the effect of taxes might be an example of this issue. But for other patterns of questionable rationality, behavioral finance has provided good explanations by identifying persistent cognitive biases or emotional affect. In general, the biases that are harder to rectify are emotional, with cognitive biases typically being easier to correct. However, there is no single unified underlying model of investor psychology. Despite the challenges, the efficient market hypothesis provides a base from which anomalies can be identified, and against which specific cognitive biases can be measured.

9 Supposedly if the winner of the United States' National Football League Super Bowl comes from the NFC division, the stock market will increase for the coming year, and if the winner comes from the AFC division, the stock market will decrease for the coming year.

7.2 Momentum

Studies have documented, in a range of markets globally, *momentum* or *trending effects* in which future price behavior correlates with that of the recent past (Jegadeesh and Titman 1993; Dimson, Marsh, and Staunton 2008). Typically in the short term, up to two years, there is a positive correlation, but for longer periods of two to five years returns are negatively correlated and revert to the mean.

Individual investors may make what they believe is a rational decision to imitate the decisions of others, but the sum of the individual decisions can be irrational behavior. This behavior may not necessarily lead to bubbles or crashes, but it could explain the fat tail distribution of stock market returns, in which extreme moves occur more frequently than a normal statistical distribution would predict. The phenomenon is more common in illiquid asset categories in which trading may not be continuous and investors believe that changes in prices may capture private information.

Herding occurs when a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do. Herding reflects a low dispersion of opinion among investors about the interpretation of the information, and it may involve following the same sources of information. Herding may be a response to cognitive dissonance. It may give reassurance and comfort to investors to be aligned with the consensus opinion.

Exhibit 10 The Momentum Effect: London Business School Study

The study involves buying the top 20 percent of a performance-ranked list of stocks and selling short the bottom 20 percent. In the 52 years to 2007 in the UK market, the stocks that had outperformed the market most in the previous 12 months went on to generate an annualized return of 18.3 percent, whereas the market's worst underperformers rose by 6.8 percent on average. Over that period, the market as a whole rose by 13.5 percent a year. In a subsequent study using data from 2000 to 2007, the momentum effect was also evident in each of the 16 other international markets researched.

The authors noted "The momentum effect, both in the United Kingdom and globally, has been pervasive and persistent. Though costly to implement on a standalone basis, all investors need to be acutely aware of momentum. Even if they do not set out to exploit it, momentum is likely to be an important determinant of their investment performance."

Source: Dimson, Marsh, and Staunton (2008).

Momentum can be partly explained by short-term underreaction to relevant information, and longer-term overreaction. Investors' bias to sell winners reflects *anchoring* on the purchase price. Investors' willingness to sell winners may also be the result of a belief that a price rise has brought increased risk, irrespective of whether intrinsic value has also increased. The belief in mean reversion can cause investors to underreact to positive news, and stock prices to take time to reflect fully more favorable news or earnings upgrades.

Studies have identified faulty learning models within traders, in which reasoning is based on their recent experience. Behaviorally, this is *availability bias*. The availability bias in this context is also called the *recency effect*, which is the tendency to recall recent events more vividly and give them undue weight. In such models, if the price of an asset rises for a period of time, investors may simply extrapolate this rise to the future. Recency bias causes investors to place too much emphasis on samples that are small or that provide an imperfect picture, but they are favored because the

information is recently available. Research points to a tendency for individual private investors to extrapolate trends and to suffer more from recency bias, whereas many investment professionals expect reversion to the mean.

Regret is the feeling that an opportunity has been missed, and is typically an expression of *hindsight bias*. Hindsight bias reflects the human tendency to see past events as having been predictable, and regret can be particularly acute when the market is volatile and investors feel they could have predicted the significant market moves and thereby increased profit or reduced loss. Faced with regret at not owning a mutual fund or stock when it performed in the previous year, investors may be driven emotionally to remedy this regret. These behavioral factors can explain short-term year-on-year trending, and contribute to overtrading.

This response creates a *trend-chasing effect*. In terms of selecting investments, investors have a bias to buy investments they wish they had owned the previous year. This bias reflects the availability bias in projecting a recent trend, and also the innate human focus on searching for patterns, both true and illusory.

However, there is some evidence of price reversals, or a mean reversion, at longer periods of three to five years. The **disposition effect**, which includes an emotional bias to loss aversion, will encourage investors to hold on to losers, causing an inefficient and gradual adjustment to deterioration in fundamental value (Shefrin and Statman 1985). The disposition effect is emotional. Even investors who do not own a poorly performing stock, and are not thus emotionally affected by ownership, may be showing an irrational belief in short-term mean reversion in the form of a price recovery (*gamblers' fallacy*).

The disposition effect has been identified from trading records (Odean 1998). This research identified that investors with US discount brokerage accounts sold winners more readily than losers, a behavior consistent with the emotional bias of loss aversion and the cognitive bias of believing that their winners and losers will revert to the mean. Emotional biases and an irrational belief in mean reversion encourage market trending patterns.

7.3 Bubbles and Crashes

Stock market bubbles and crashes present a challenge to the concept of market efficiency. Periods of significant overvaluation or undervaluation can persist for more than one year, rather than rapidly correcting to fair value. The efficient market hypothesis implies the absence of such bubbles. The frequent emergence of bubbles in history was documented in *Extraordinary Popular Delusions and the Madness of Crowds* (Mackay 1841). The book captures the concept of extremes of sentiment and apparent mass irrationality. Bubbles and crashes appear to be panics of buying and selling. A continuous rise in an asset price is fuelled by investors' expectations of further increase; asset prices become decoupled from economic fundamentals.

A more objective modern definition specifies periods when a price index for an asset class trades more than two standard deviations outside its historic trend. Statistically, if returns are normally distributed, such periods should not represent more than 5 percent of total observations. However, for some stock markets and asset classes, these extremes of valuation account for more than 10 percent.

Exhibit 11 UK House Price Average Multiple of Average Family Income

Source: Datastream.

Bubbles and crashes are, respectively, periods of unusual positive or negative asset returns because of prices varying considerably from or reverting to their intrinsic value. Typically during these periods, price changes are the main component of returns. Bubbles typically develop more slowly relative to crashes, which can be rapid. This asymmetry points to a difference in the behavioral factors involved. A crash would typically be a fall of 30 percent or more in asset prices in a period of several months. Some bubbles and crashes will reflect rapid changes in economic prospects that investors failed to anticipate. The global oil price shock of the 1970s and the Japanese asset price bubble of the late 1980s, in which real estate and stock prices rose dramatically, would be examples. Initially in a bubble, some participants may view the trading and prices as a rational response—for example, to easy monetary conditions or a liquidity squeeze—but this view is typically followed by doubts about whether prices reflect fundamental values.

These bubbles have been observed in most decades and in a wide range of asset classes. Recent examples are the technology bubble of 1999–2000 and the residential property boom of 2005–2007, evident in a range of economies globally including the United States, the United Kingdom, and Australia. They appear to be periods of collective irrationality, but can be analyzed in more detail as representing some specific behavioral characteristics of individuals. Behavioral finance does not yet provide a full explanation for such market behavior, but a number of specific cognitive biases and emotional biases prevalent during such periods can be identified.

First, it should be noted that there can also be rational explanations for some bubbles. Rational investors may expect a future crash but not know its exact timing. For periods of time, there may not be effective arbitrage because of the cost of selling short, unwillingness of investors to bear extended losses, or simply unavailability of suitable instruments. These were considerations in the technology and real estate bubbles. Investment managers incentivized on, or accountable for, short-term performance may even rationalize their participation in the bubble in terms of commercial or career risk.

The extent to which investors may rationalize their behavior during bubbles is evident in Exhibit 12. Both managers appear to have misunderstood risks and exhibited the illusion of control bias. The manager of Fund A believed he could exit a bubble

profitably by selling near the top. The manager of Fund B may not have recognized the potential scale of a bubble, or client perspectives on a period of relative underperformance while not participating in the bubble.

Exhibit 12 Investor Behavior in Bubbles

Consider the differing behavior of two managers of major hedge funds during the technology stock bubble of 1998–2000:

The manager of Hedge Fund A was asked why he did not get out of internet stocks earlier even though he knew by December 1999 that technology stocks were overvalued. "We thought it was the eighth inning, and it was the ninth. I did not think the NASDAQ composite would go down 33 percent in 15 days." Faced with losses, and despite a previous strong 12-year record, he resigned as Hedge Fund A's manager in April 2000.

The manager of Hedge Fund B refused to invest in technology stocks in 1998 and 1999 because he thought they were overvalued. After strong performance over 17 years, Hedge Fund B was dissolved in 2000 because its returns could not keep up with the returns generated by technology stocks.

In bubbles, investors often exhibit symptoms of *overconfidence*; overtrading, underestimation of risks, failure to diversify, and rejection of contradictory information. With overconfidence, investors are more active and trading volume increases, thus lowering their expected profits. For overconfident investors (active traders), studies have shown that returns are less than returns to either less active traders or the market while risk is higher (Barber and Odean 2000). At the market level, volatility also often increases in a market with overconfident traders.

The overconfidence and excessive trading that contribute to a bubble are linked to *confirmation bias* and *self-attribution bias*. In a rising market, sales of stocks from a portfolio will typically be profitable, even if winners are being sold too soon. Investors can have faulty learning models that bias their understanding of this profit to take personal credit for success. This behavior is also related to *hindsight bias*, in which individuals can reconstruct prior beliefs and deceive themselves that they are correct more often than they truly are. This bias creates the feeling of "I knew it all along." Selling for a gain appears to validate a good decision in an original purchase and may confer a sense of pride in locking in the profit. This generates overconfidence that can lead to poor decisions. Regret aversion can also encourage investors to participate in a bubble, believing they are "missing out" on profit opportunities as stocks continue to appreciate.

Overconfidence involves an *illusion of knowledge*. Investors would be better off not trading on all the available information, which includes noise or non-relevant information. Asset prices provide a mix of information, both facts and the mood of the crowd. But in a stock market bubble, noise trading increases and overall trading volumes are high. Noise trading is buying and selling activity conducted in the absence of meaningful new information, and is often based on the flow of irrelevant information. A manager increasing trading activity in a rising stock market can misinterpret the profitability of activity, believing it is trading skill rather than market direction delivering profits.

The disposition effect recognizes that investors are more willing to sell winners, which can encourage excess trading. There can also be a confirmation bias to select news that supports an existing decision or investment. Indeed, search processes may focus almost exclusively on finding additional confirmatory information. Investors may be uncomfortable with contradictory information and reject it. Investors can also have a bias to buy stocks that *attract their attention*, and pay more attention to

the market when it is rising. For short-term traders who may derive entertainment from the market, monitoring rising stock prices is more entertaining and instills more pride. Entertainment and pride are emotional effects.

As a bubble unwinds, there can be underreaction that can be caused by anchoring when investors do not update their beliefs sufficiently. The early stages of unwinding a bubble can involve investors in cognitive dissonance, ignoring losses and attempting to rationalize flawed decisions. As a bubble unwinds, investors may initially be unwilling to accept losses. In crashes, the disposition effect encourages investors to hold on to losers and postpone regret. This response can initially cause an underreaction to bad news, but a later capitulation and acceleration of share price decline. This situation will only apply to stocks already held by investors, with hedge funds that can sell stock short being more inclined to react first to bad news in a downturn. In crashes, there may be belief that short sellers know more and have superior information or analysis.

7.4 Value and Growth

A number of studies have identified outperformance of value stocks relative to growth stocks over long periods of time. Fama and French (1998) note that value stocks (high book-to-market equity) outperformed growth stocks (low book-to-market equity) in 12 of 13 major markets during the 1975–1995 period. Value stocks are typically characterized by low price-to-earnings ratios, high book-to-market equity, and low price-to-dividend ratios. Growth stock characteristics are generally the opposite of value stock characteristics. For example, growth stocks are characterized by low book-to-market equity, high price-to-earnings ratios, and high price-to-dividend ratios. Some subsequent studies have included additional factors, such as low price-to-cash flow and low historic growth, to characteristics of value stocks. Fama and French (1998) also identified that small-capitalization stocks outperformed large-cap stocks in 11 of 16 markets.

Fama and French incorporate additional factors in their asset pricing model to explain this anomaly and other apparent anomalies. The Fama and French (1992) three-factor model claims to explain these effects by incorporating additional factors, size and value, alongside market beta. Fama and French show that earnings and size variables capture much of the cross-sectional variation in US stock returns from 1963 to 1990, and this finding has also been documented for a number of non-US markets. Fama and French claim the value stock anomaly disappears in their three-factor model. They believe that the size and book-to-market effects are not mispricing, but are associated with such risk exposures as the greater potential of companies with these characteristics to suffer distress during economic downturns.

A number of other studies have offered behavioral explanations, presenting the anomalies as mispricing rather than risk. These studies recognize emotional factors involved in appraising stocks. The **halo effect**, for example, extends a favorable evaluation of some characteristics to other characteristics. A company with a good growth record and good previous share price performance might be seen as a good investment, with higher expected returns than its risk characteristics merit. This view is a form of representativeness that can lead investors to extrapolate recent past performance into expected returns. Overconfidence can also be involved in predicting growth rates, potentially leading growth stocks to be overvalued.

Studies have also identified that emotions play a role in estimating risk and expected return of stocks. The impact of emotional biases may be greater with less sophisticated or retail investors, but it has also been identified as a bias in analysts and professional investors. The emotional attraction of a stock can be enhanced by personal experience of products, the value of the brand, marketing expenditures, and the proximity of the headquarters to the analyst or investor. This last issue reflects the **home bias** anomaly, by which portfolios exhibit a strong bias in favor of domestic securities in the context

of global portfolios. The effect has also been noted within geographical boundaries, favoring companies headquartered nearer the investor. This bias may reflect a perceived relative informational advantage, a greater feeling of comfort with the access to company executives that proximity brings (either personal or local brokerage), or a psychological desire to invest in a local community.

To the extent to which less sophisticated investors are influenced by emotions, they may value growth companies more highly. Statman, Fisher, and Anginer (2008) found that stock returns of funds that are rated as popular in a *Fortune* magazine survey are subsequently low. A more positive emotional rating in a company leads investors to perceive the company's stock as less risky. Although the capital asset pricing model assumes risk and expected return are positively correlated, many investors behave as if the correlation is negative, expecting higher returns with lower risk.

One behavioral theory set out by Shefrin (2008) recognizes the tendency of investors to need downside protection to avoid negatively skewed returns. This investor preference displays excessive risk relative to likely outcomes. Securities that embody significant downside risks in an adverse economic environment, therefore, reflect this risk aversion and offer a premium. An optimal portfolio, taking advantage of behavioral biases, would recognize the extent to which stocks reflect this risk aversion premium, and thus offer returns in excess of true risk. Writing (selling) out-of-the-money put options on securities or indexes would be one way to reflect this risk.

Some apparent anomalies disappear over time, possibly being arbitraged away. However, some anomalies persist and may genuinely reflect rational behavior that is not captured by accepted pricing models. The most persistent market anomalies and characteristics that challenge the efficient market hypothesis are the momentum effect and bubbles and crashes. These effects can be created by biases that cause underreactions at times but overreaction on other occasions. Although group behavior can be a factor in these market anomalies, the origins of many anomalies lie in individual biases. The biases that create some of the unusual market behavior include both cognitive biases and emotional effects.

SUMMARY

This reading includes suggestions on how to include behavioral considerations in financial decision making. The effects of including behavioral considerations in adviser–client relationships and portfolio construction are discussed. Finally, the reading considers the effect of behavioral factors on analyst forecasts, committee decision making, and market behavior. It is important to remember that all market participants, regardless of expertise, may exhibit behavior that differs from that assumed in traditional finance. Among the points made in this reading are the following:

- Classifying investors into investor types based on their characteristics, including level of risk tolerance, preferred approach to investing, and behavioral characteristics and biases, is useful for providing insight and financial decision making but should be used with some caution.
- Adviser–client relations and financial decisions will be more effective and satisfying if behavioral factors are taken into account.
- Including behavioral factors in portfolio construction may result in a portfolio that is closer to the efficient portfolio of traditional finance, while being easier for the client to understand and accept as suitable. By considering behavioral biases, it is possible to moderate their effects.

- All market participants, even those with significant knowledge of and experience in finance, may exhibit behavioral biases. Analysts are not immune. Analysts, in general, are prone to overconfidence, representativeness, availability, illusion of control, and hindsight biases. Awareness of their biases and their potential influences can help analysts put in place measures to help moderate the effect of these biases.
- Analysts interpreting information provided by management should consider and adjust for the biases that analysts and management teams are typically susceptible to, including framing, anchoring and adjustment, availability, and overconfidence. Management biases can affect both the choice of information presented and how it is presented. These may have an effect on the analysis.
- Committees often have the responsibility for making investment decisions and are subject to behavioral biases. It is important to implement procedures to alleviate the effect of behavioral biases and improve committee decision making.
- Behavioral finance has the potential to explain some apparent deviations from market efficiency (market anomalies).

REFERENCES

Ameriks, John, and Stephen P. Zeldes. 2000. "How do Household Portfolio Shares Vary with Age?" TIAA-CREF Working Paper.

Bailard, Thomas E., David L. Biehl, and Ronald W. Kaiser. 1986. *Personal Money Management*, 5th ed. Chicago: Science Research Associates.

Barber, Brad M., and Terrance Odean. 1999. "The Courage of Misguided Convictions." *Financial Analysts Journal*, vol. 55, no. 6:41–55.

Barber, Brad M., and Terrance Odean. 2000. "Trading is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors." *Journal of Finance*, vol. 55, no. 2:773–806.

Barnewall, Marilyn. 1987. "Psychological Characteristics of the Individual Investor." in *Asset Allocation for the Individual Investor*. Charlottesville, VA: The Institute of Chartered Financial Analysts.

Benartzi, Shlomo. 2001. "Excessive Extrapolation and the Allocation of 401(k) Accounts to Company Stock." *Journal of Finance*, vol. 56, no. 5:1747–1764.

Benartzi, Shlomo, and Richard H. Thaler. 2001. "Naive Diversification Strategies in Defined Contribution Saving Plans." *American Economic Review*, vol. 91, no. 1:79–98.

Benartzi, Shlomo, and Richard H. Thaler. 2007. "Heuristics and Biases in Retirement Savings Behavior." *Journal of Economic Perspectives*, vol. 21, no. 3:81–104.

Choi, James, David Laibson, and Brigitte Madrian. 2005. "Are Empowerment and Education Enough? Underdiversification in 401(k) Plans." *Brookings Papers on Economic Activity*, vol. 36, no. 2:151–213.

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2008. *Global Investment Returns Yearbook 2008*. London, UK: ABN AMRO Bank NV.

Dunning, David, Dale Griffin, James Milojkovic, and Lee Ross. 1990. "The Overconfidence Effect in Social Prediction." *Journal of Personality and Social Psychology*, vol. 58, no. 4:568–581.

Fama, Eugene. 1998. "Market Efficiency, Long-Term Returns, and Behavioral Finance." *Journal of Financial Economics*, vol. 49, no. 3:283–306.

Fama, Eugene F., and Kenneth R. French. 1992. "The Cross-Section of Expected Stock Returns." *Journal of Finance*, vol. 47, no. 2:427–465.

Fama, Eugene F., and Kenneth R. French. 1998. "Value versus Growth: The International Evidence." *Journal of Finance*, vol. 53, no. 6:1975–1999.

French, Kenneth R., and James M. Poterba. 1991. "Investor Diversification and International Equity Markets." *American Economic Review*, vol. 81, no. 2:222–226.

Huberman, Gur. 2001. "Familiarity Breeds Investment." *Review of Financial Studies*, vol. 14, no. 3:659–680.

Huberman, Gur, and Wei Jiang. 2006. "Offering versus Choice in 401(k) Plans: Equity Exposure and Number of Funds." *Journal of Finance*, vol. 61, no. 2:763–801.

Jegadeesh, Narasimhan, and Sheridan Titman. 1993. "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency." *Journal of Finance*, vol. 48, no. 1:65–91.

John Hancock. 2003. *Eighth Defined Contribution Plan Survey*. Boston, MA: John Hancock Financial Services.

Kahneman, Daniel, Paul Slovic, and Amos Tversky. 1982. *Judgment under Uncertainty: Heuristics and Biases*. Cambridge, UK: Cambridge University Press.

Kaiser, Ronald. 1990. "Individual Investors." In *Managing Investment Portfolios: A Dynamic Process*, 2nd ed. Boston, MA: Warren, Gorham & Lamont.

Kang, Jun-Koo, and Rene Stulz. 1997. "Why Is There a Home Bias? An Analysis of Foreign Portfolio Ownership in Japan." *Journal of Financial Economics*, vol. 46, no. 1:3–28.

Lench, Heather C., and Peter H. Ditto. 2008. "Automatic Optimism: Biased Use of Base Rate Information for Positive and Negative Events." *Journal of Experimental Social Psychology*, vol. 44:631–639.

Mackay, Charles. 1841. *Extraordinary Popular Delusions and the Madness of Crowds*. 1st ed. United Kingdom: Harriman House Publishing. (New edition published September 2003.)

Madrian, Brigitte, and Dennis Shea. 2001. "The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior." *Quarterly Journal of Economics*, vol. 116, no. 4:1149–1187.

Odean, Terrance. 1998. "Are Investors Reluctant to Realise Their Losses?" *Journal of Finance*, vol. 53, no. 5:1775–1798.

Pompian, Michael. 2006. *Behavioral Finance and Wealth Management*. Hoboken, NJ: John Wiley & Sons.

Pompian, Michael. 2008. "Using Behavioral Investor Types to Build Better Relationships with Your Clients." *Journal of Financial Planning*, October:64–76.

Pompian, Michael, and John Longo. 2005. "Incorporating Behavioral Finance into Your Practice." *Journal of Financial Planning*, vol. 18, no. 3:58–63.

Russo, J.E., and P.J.H. Schoemaker. 1992. "Managing Overconfidence." *Sloan Management Review*, vol. 33, no. 2:7–17.

Samuelson, William, and Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty*, vol. 1, no. 1:7–59.

Shefrin, Hersh. 2007. "Behavioral Finance: Biases, Mean–Variance Returns, and Risk Premiums." *CFA Institute Conference Proceedings Quarterly*, vol. 24, no. 2 (June):4–12.

Shefrin, Hersh. 2008. "Risk and Return in Behavioral SDF-Based Asset Pricing Models." *Journal of Investment Management*, vol. 6, no. 3:1–18.

Shefrin, Hersh, and Meir Statman. 1985. "The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence." *Journal of Finance*, vol. 40, no. 3:77–90.

Shefrin, Hersh, and Meir Statman. 2000. "Behavioral Portfolio Theory." *Journal of Financial and Quantitative Analysis*, vol. 35, no. 2:127–151.

Statman, Meir. 1999. "Foreign Stocks in Behavioral Portfolios." *Financial Analysts Journal*, vol. 55, no. 2 (March/April):12–16.

Statman, Meir. 2004. "The Diversification Puzzle." *Financial Analysts Journal*, vol. 60, no. 4 (July/August):44–53.

Statman, Meir, Kenneth Fisher, and Deniz Anginer. 2008. "Affect in a Behavioral Asset Pricing Model." *Financial Analysts Journal*, vol. 64, no. 2 (March/April):20–29.

Surowieki, James. 2004. *The Wisdom of Crowds*. New York: Random House.

Vanguard. 2006. *How America Saves 2006*. Vanguard Group.

Wood, Arnold. 2006. "Behavioral Finance and Investment Committee Decision Making." *CFA Institute Conference Proceedings Quarterly*, vol. 23, no. 4 (December):29–37.

PRACTICE PROBLEMS

The following information relates to Questions 1–7

Ian Wang, CFA, is a financial advisor at Garnier Brothers, a US money management firm. He became a financial advisor several years ago after receiving his CFA charter and currently has three high-net-worth individuals as clients. Wang is conducting his annual review of each client's investment policy statement along with their recently completed risk tolerance questionnaires. He is reflecting on their varying psychographic characteristics:

- Michael Perez is a successful 45-year-old investment banker. Wang describes Perez as a passive investor who is sensible and secure. Perez exhibits low to medium risk tolerance but often overestimates his risk tolerance. His biases include hindsight, framing, and regret aversion. On his questionnaire, Perez indicated a desire for wealth preservation while wanting to invest a significant portion of his assets in his employer's stock.
- Sarah Johnson is an independent-minded 45-year-old real estate developer who has historically utilized significant amounts of financial leverage. Prior to becoming a Garnier client, Johnson managed her own investment portfolio, which was concentrated in just a few stocks. Johnson exhibits a great deal of confidence and high risk tolerance. Johnson's biases include illusion of control and overconfidence. On her questionnaire, Johnson indicated a desire for wealth accumulation and an aversion to investing in non-US equities. In addition, she indicated that her risk tolerance toward a stock investment would increase significantly if she knew that more than one of Garnier's research analysts supported it.
- Neal Patel is a 66-year-old billionaire who accumulated his wealth by starting a successful retail business. Wang describes Patel as cautious and concerned about the future. Patel is concerned about protecting his assets and often seeks advice from those he perceives as being more knowledgeable than himself. Patel exhibits low risk tolerance. Patel's biases include endowment, loss aversion, and status quo. Patel indicated that his risk tolerance would increase significantly if he knew that an investment had the unanimous support of Garnier's Private Wealth Investment Committee.

There was one common observation that Wang noted in all three questionnaires: All three clients indicated that they would perceive a company with a good growth record and good previous share price performance as a good investment.

Once Wang completes his annual review, he revises the investment policy statement for the client's approval. After the client approves the revised policy statement, the portfolio for the client will be reviewed to determine any necessary reallocations. Wang is limited by Garnier as to the specific investment options that can be placed in a client's portfolio; only securities that are covered by Garnier's research analysts and approved by the Private Wealth Investment Committee can be placed in a client's portfolio. Garnier is confident that its analysts provide superior forecasts and ratings

© 2011 CFA Institute. All rights reserved.

because they use a Bayesian approach. Garnier is also proud of its investment approval process. The Private Wealth Investment Committee regularly meets to discuss and debate each security and then votes on which will be approved.

Wang is scheduled to meet with his supervisor next week to discuss the results of his annual review and recommended portfolio reallocations.

1 When advising his clients, Wang is *least likely* to:

A educate Perez on the benefits on portfolio diversification.

B limit Johnson's role in the investment decision-making process.

C provide Patel with details like standard deviations and Sharpe ratios.

2 A traditional risk tolerance questionnaire is *most likely* to be effective as a diagnostic tool for:

A Patel.

B Perez.

C Johnson.

3 Which of the following behavioral biases would be *most* relevant in constructing a portfolio for Johnson?

A Home bias.

B Overconfidence.

C Inertia and default.

4 Which investment portfolio is *least likely* to deviate from the mean–variance portfolio?

A Patel.

B Perez.

C Johnson.

5 With regard to Johnson's comment relating to Garnier's research analysts, which of the following biases is *most likely* to be present in the analysts' data?

A Confirmation bias.

B Availability bias.

C Self-attribution bias.

6 Patel's comment in his risk tolerance questionnaire regarding the Private Wealth Investment Committee fails to recognize which bias?

A Social proof.

B Confirmation bias.

C Gambler's fallacy.

7 The clients' common observation in their risk tolerance questionnaires is *least likely* indicative of:

A herding.

B home bias.

C halo effect.

The following information relates to Questions 8–15

Empire & Associates, an investment management firm, has been in operation since 1974. Empire utilizes a proprietary valuation model based on fundamental analysis to select individual stock and bonds, and also employs technical analysis to help identify market anomalies and momentum effects. They use the output of their fundamental and technical analyses to actively manage clients' accounts. Empire also recognizes the effects of investors' background and past experiences on investors' behaviors and decision making, and uses a behavioral alpha process to classify its clients into behavioral investor types.

Anthony Rodriguez, investment adviser, has been tasked with transitioning three new clients' investment portfolios. Rodriguez has reviewed for each completed new client questionnaire, current portfolio, and some notes on the client. He prepares the following summaries:

- Christine Blake is a 35-year old free-lance writer of several successful children's books. Her primary source of income is royalty payments. She has accumulated a portfolio with a current value of $3.6 million. Blake has always self-managed the portfolio and has confidence in her investment abilities. Blake would like to be able to make independent decisions when opportunities arise. On several occasions, Blake has found herself holding positions with sizable losses and she has been reluctant to sell when a security declines. Because of these losses and the general size of her portfolio, she is seeking professional help. She is willing to consider higher risk investments if her research identifies an attractive opportunity. Her current portfolio consists of 15 equity positions of equal dollar value, diversified across eight industries and four different countries.
- Margaret Neilson is a 59-year-old senior vice president of marketing for a highly successful, plastic injection corporation. Neilson has little investment experience and currently holds an $800,000 investment portfolio. Neilson has come to Empire because 80% of her portfolio is invested in the plastic injection corporation's shares that were obtained through an employee stock ownership plan. Neilson is nearing retirement and is worried about a weakening economy and the potential effect it could have on the plastic injection corporation's share price. Neilson wishes to avoid high risk situations.
- Thomas Williamson is a 47-year-old surgeon; he is considered one of the world's best in his specialty, and earns several million dollars each year. Williamson recognizes that he has limited investment expertise and considers himself a low to moderate risk taker. Williamson established a brokerage account several years ago and funded it with $4 million. He has made no withdrawals from and no additional payments into the account. He selected investments by acting on the advice of other doctors and friends. This advice led him to purchase many popular stocks, and his portfolio is currently worth $3.55 million. Because he was so busy, he felt he mistimed buying and selling stocks. His current portfolio is concentrated in shares of eight US healthcare companies.

Rodriguez is meeting with Ian Carter, portfolio manager and Lila Suzuki, investment strategist, later in the week to establish an investment plan for each client. Rodriguez has worked with Carter and Suzuki on other client accounts. To facilitate discussion at the meeting, Rodriguez has emailed the summary on each client and asked that they provide some preliminary views prior to the meeting.

Carter is a senior portfolio manager with an excellent performance record. He has expressed concern about the use of investor type classification models due to their many limitations. Carter believes that Empire's fundamental approach to analysis provides great value. However, he believes the technical analysis department is compatible with sound investment practices.

Suzuki tends to rigidly adhere to asset selections based on the proprietary valuation model. She has stated, "Sure it's a complex model, but it incorporates hundreds of different pieces of data relevant to a company; therefore, it's more thorough than any other analysis." With respect to Empire's technical analysis, Suzuki believes that the identified opportunities are not 'true' market anomalies but rather they are associated with higher risk exposures.

In establishing the portfolios for these new accounts, Rodriguez would like to address a recent memo from the technical analysis department that recommended overweighting clients' portfolios in the technology and consumer goods sectors. The memo's conclusion stated, "These sectors are depressed below their ten-year average levels. Every time that this has occurred in the past, these sectors have recovered to their mean in a short period of time." Rodriguez believes that technical analysis has the potential to uncover opportunities where there are over- or under-reactions to relevant information.

8 Which new client would most likely be identified as a friendly follower?

A Blake.

B Neilson.

C Williamson.

9 Carter's statement regarding behavioral classifications is *most likely* justified because individual investors generally:

A exhibit characteristics of multiple investor types.

B retain the same emotional biases as they become older.

C exhibit primarily emotional or cognitive biases, but not both.

10 Given Neilson's behavioral investor characteristics, the *most* effective approach in advising her would include providing her with:

A frequent reports of the portfolio return and risk measures.

B information detailing how Empire selects individual securities.

C information about how Empire will help her meet her investment goals.

11 Blake's portfolio would *most likely* indicate which behavioral bias?

A Home bias.

B Loss aversion.

C Investing in the familiar.

12 Suzuki's rigid adherence to the proprietary valuation model *most likely* exhibits overconfidence in Empire's fundamental analysis due to:

A availability bias.

B self-attribution bias.

C an illusion of control.

13 The recent technical analysis department memo is *most likely* evidence of:

A anchoring.

B a confirmation bias.

C the gambler's fallacy.

14 Blake's portfolio *least likely* reflects:

A home bias.

B a disposition effect.

C naïve diversification.

15 Whose statement regarding the technical analysis department is most accurate?

A Carter.

B Suzuki.

C Rodriguez.

SOLUTIONS

1 C is correct. This would not be an effective way to advise Patel. Given Patel's information, he is likely to be more receptive to "big picture" advice that does not dwell on details like standard deviations and Sharpe ratios. He is emotionally biased and providing excessive cognitive detail will lose his attention. He needs to be convinced of his advisor's general philosophy first and then, as trust is gained, he will respond to advice and take action. (Patel is a Passive Preserver.)

2 B is correct. Perez exhibits primarily cognitive rather than emotional biases. Although risk tolerance questionnaires may fail for emotionally biased individuals and work best for institutional investors, they are generally effective for cognitive-based individuals.

3 A is correct. Home bias is evident in Johnson's questionnaire. Johnson has expressed an aversion to investing in non-US equities. Familiarity with their country may lead investors to own high concentrations of domestic assets and ignore the benefits of international diversification.

4 B is correct. Perez has primarily cognitive error biases. Accordingly, it is likely that, with education, the impact of these biases can be reduced or even eliminated. Because cognitive biases dominate, Wang should seek to moderate the effect of these biases and adopt a program to reduce or eliminate the bias rather than accept the bias. The result will be a portfolio that is similar to the mean–variance portfolio.

5 A is correct. Confirmation bias, a cognitive bias, is the tendency for people to misread evidence as additional support for an initial hypothesis. Confirmation bias is a potential bias for analysts conducting research. It is a form of resolving cognitive dissonance that described the tendency to search for, or interpret, information in a way that confirms the analyst's prior beliefs. The additional information may not be analyzed in a rigorous way, but it can nevertheless appear to make the judgment or forecast more likely by sharing some of its general characteristics.

6 A is correct. Social proof is a belief in which individuals are biased to follow the beliefs of a group. The structure of Garnier's Private Wealth Investment Committee indicates that they may be susceptible to a social proof bias. The committee meets to discuss and debate each security and then votes on which will be approved. Committee members may wrongly favor the judgment of others, often without being fully aware that they are doing so. The process of reaching a consensus will usually narrow the range of views. If a group decision process does not encourage private information held by individual committee members to be shared fully with others before a decision is made, the decision may fail to combine the collective wisdom of the group. There is no evidence that this committee encourages private information.

7 B is correct. Home bias occurs when investors exhibit a strong bias in favor of domestic securities in the context of global portfolios. There is no evidence of a home bias in the clients' common observation.

8 C is correct. Friendly followers are passive investors with low to moderate risk tolerance. Friendly followers tend to follow leads from their friends, colleagues, or advisors. They often want to be in the latest, most popular investments without regard to suitability for long-term goals. Rodriguez's notes indicate

Williamson considers himself to be a low to moderate risk taker. In addition, he admits following the advice of colleagues and this advice resulted in purchase of latest, popular stocks without consideration of goals.

9 A is correct. A limitation of behavioral models is that individual investors do frequently exhibit characteristics of multiple investor types. This is a limitation of behavioral models and justifies Carter's concern. Users of these models should not look for people to fit neatly into one "box" or type.

10 C is correct. Neilson would be classified as a guardian or passive-preserver investment type and these investors are more receptive to "big picture" advice. Passive preservers display predominantly emotional biases and the focus of advice should be on addressing these emotions. Describing how the investment relationship will help her to accomplish her retirement goals would seem most appropriate.

11 B is correct. Loss aversion is a bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains. The disposition effect, which includes an emotional bias to loss aversion, will encourage investors to hold on to losers, causing an inefficient and gradual adjustment to deterioration in fundamental value. On several occasions, Blake has found herself holding positions with sizable losses, and she has been reluctant to sell when a security declines. This suggests that Blake may exhibit loss aversion bias.

12 C is correct. An illusion of control is a behavioral bias of someone who believes that he or she can know more than others simply by acquiring information. This may result in collection of too much information. While this data may not add to the accuracy of the forecast, it does reinforce the confidence placed in that forecast. Suzuki's endorsement of the complex valuation model which relies on large amounts of data most likely would give her an illusion of control.

13 C is correct. The gambler's fallacy is a cognitive behavioral bias in which an analyst wrongly projects a reversal to a long-term trend. This reflects a faulty understanding about the behavior of random events. The analyst expects a pattern that has diverged from the long term average to reverse within a specific period of time. The memo's statement that technology and consumer goods sectors should rebound within a short time period demonstrates the gamble's fallacy.

14 A is correct. Home bias occurs when an investor exhibits an emotional attraction to a stock that may be enhanced by the proximity of the headquarters to the investor. This creates portfolios that show strong bias in favor of domestic equities in the context of global portfolios. Blake's portfolio is diversified among four different countries and therefore would not indicate a home bias.

15 C is correct. Momentum can be partly explained by short-term under-reaction to relevant information, and longer term over-reaction and thus supports Rodriguez's view that the technical analysis department has value.

PORTFOLIO MANAGEMENT
STUDY SESSION

4

Private Wealth Management (1)

This study session addresses the process of private wealth management and the construction of an investment policy statement (IPS) for the individual investor. The IPS is a blueprint for investing client assets. The IPS identifies the needs, goals, and risk tolerance of the investor, as well as constraints under which the investment portfolio must operate. The adviser then formulates an investment strategy to tax-efficiently reconcile these potentially conflicting requirements.

Taxes and regulations are important considerations for individual investors. Because taxes and regulations vary from locality to locality, tax-efficient strategies for portfolio construction and wealth transfer are necessarily specific to the locality in which the investor is taxed. The study session focuses on investment strategies applicable across a wide range of localities. Although illustrations of such strategies may be presented from a country-specific perspective, candidates should focus on the underlying investment principles and be able to apply them to other tax settings.

READING ASSIGNMENTS

Reading 8	Managing Individual Investor Portfolios by James W. Bronson, CFA, Matthew H. Scanlan, CFA, and Jan R. Squires, DBA, CFA
Reading 9	Taxes and Private Wealth Management in a Global Context by Stephen M. Horan, PhD, CFA, CIPM, and Thomas R. Robinson, PhD, CFA
Reading 10	Estate Planning in a Global Context by Stephen M. Horan, PhD, CFA, CIPM, and Thomas R. Robinson, PhD, CFA

© 2017 CFA Insitute. All rights reserved.

CUSTOMER SERVICE

68

READING

8

Managing Individual Investor Portfolios

by James W. Bronson, CFA, Matthew H. Scanlan, CFA, and Jan R. Squires, DBA, CFA

James W. Bronson, CFA, is at Northern Trust Company (USA). Matthew H. Scanlan, CFA, is at RS Investments (USA). Jan R. Squires, DBA, CFA (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss how source of wealth, measure of wealth, and stage of life affect an individual investors' risk tolerance;
☐	**b.** explain the role of situational and psychological profiling in understanding an individual investor's attitude toward risk;
☐	**c.** explain the influence of investor psychology on risk tolerance and investment choices;
☐	**d.** explain potential benefits, for both clients and investment advisers, of having a formal investment policy statement;
☐	**e.** explain the process involved in creating an investment policy statement;
☐	**f.** distinguish between required return and desired return and explain how these affect the individual investor's investment policy;
☐	**g.** explain how to set risk and return objectives for individual investor portfolios;
☐	**i.** discuss the effects that ability and willingness to take risk have on risk tolerance;
☐	**i.** discuss the major constraint categories included in an individual investor's investment policy statement;
☐	**j.** prepare and justify an investment policy statement for an individual investor;
☐	**k.** determine the strategic asset allocation that is most appropriate for an individual investor's specific investment objectives and constraints;
☐	**l.** compare Monte Carlo and traditional deterministic approaches to retirement planning and explain the advantages of a Monte Carlo approach.

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

1 INTRODUCTION

In the context of portfolio management, the terms "private client," "high-net-worth investor," and "individual investor" are used virtually interchangeably to reference the unique challenges of managing personal or family assets. Although a more precise definition of the individual investor is elusive, the basic need to properly manage one's financial affairs is self-evident, and the precedent for seeking professional management is well established. Indeed, Anglo-Saxon law has recognized the role of trustee, responsible for managing assets on behalf of others, as far back as the Middle Ages.

Private asset management has only recently begun to receive greater attention from the academic community and financial press. In contrast to large, tax-exempt institutional portfolios that are typically assumed to operate in perpetuity, the universe of private investors is heterogeneous, burdened by taxes, and less well suited to the simplifying assumptions of modern financial theory. Individual investors have diverse investment objectives, time horizons, and perceptions of risk, all subject to tax schedules that have varying degrees of stability and logic.

The increasing attention to private asset management reflects both a rising demand for financial services and an increased interest in empirical investor behavior. Net wealth in individually managed portfolios increased rapidly in the 1990s and beyond, creating a growth market for personalized financial services. At the same time, increased personal responsibility for investing retirement assets, evidenced by the growth in the self-directed segment of defined contribution pensions and savings plans, as well as the portability of fully vested retirement assets, has further increased the need for professional investment management at the individual level.

With the help of a case study, this reading examines the portfolio management process for individual investors. The Ingers are typical of a successful multigenerational family, with most of their wealth generated by a family business. Now that a cash sale of the business is imminent, they must reassess their financial situation and set appropriate guidelines for their soon-to-be large investment portfolio. The Ingers' goal is to create an investment policy statement (IPS) that recognizes their investment goals and constraints and then establishes consistent parameters for investing portfolio assets. The IPS should serve as the fundamental point of reference for both the Inger family and their investment advisors.

2 CASE STUDY

Victoria Jourdan, CFA, works for an investment firm that manages private client accounts. Both Jourdan and the Inger family reside in a politically stable country whose currency trades at a fixed exchange rate of 1:1 with the Euro. Real GDP growth and inflation both average about 3 percent annually, resulting in nominal annual growth of approximately 6 percent.

The country in which the Ingers reside maintains a flat tax of 25 percent on all personal income and a net capital gains tax (based on the sale of price-appreciated assets) of 15 percent, with no distinction between short- and long-term holding periods. Also incorporated into the tax code is a wealth transfer tax. Any asset transfer between two parties, whether as a gift or family inheritance, is taxed at the flat rate of 50 percent.

The country maintains a national pension plan, but that plan's long-term viability has been called into question because of an unfavorable demographic trend toward older, retirement-age recipients. Public debate has grown about how to assure the financial security of future retirees, and among this debate's chief outcomes has been

the creation of self-contributory, tax-advantaged investment accounts for individuals. Taxpayers may annually contribute up to €5,000 of *after-tax* income to a Retirement Saving Account (RSA), which they then control. RSA investment returns are exempt from taxation, and participants may begin making tax-free withdrawals of any amount at age 62.

The Inger Family

Jourdan has been asked to manage the Inger family account, which is a new relationship for her firm. Jourdan observes that the Inger family has no stated investment policy or guidelines, and she arranges for a meeting with Peter and Hilda Inger, who have been married for 37 years, plus their two children, Christa and Hans, aged 25 and 30, respectively. Peter, Hilda, and Hans accept the invitation, but Christa, who currently resides a considerable distance away from her parents, cannot attend.

Peter Inger, 59, is a successful entrepreneur who founded a boat manufacturing business, IngerMarine, when he was 23 years old. He has worked compulsively to build the company into a producer of luxury pleasure boats sold worldwide, but he is now considering a business succession plan and retirement. Peter is eager to "monetize" his equity stake in IngerMarine and believes he will be able to sell his company within the next three months. He is already evaluating three separate bids that indicate probable proceeds, net of taxes on gains, of approximately €55 million to the Inger family in total. The four Inger family members are the sole IngerMarine shareholders, and any sale proceeds will accrue to the four family members in proportion to their percentage ownership in IngerMarine. Peter believes that everyone in his family is financially secure and wishes to preserve that security; he recognizes the family's need for a coherent investment plan.

Hilda Inger, 57, comes from a wealthy family. Since her marriage to Peter, she has been a housewife and mother to Christa and Hans. Hilda is the beneficiary of a trust established by her family. Throughout her lifetime, the trust will distribute to her an inflation-indexed annual payment (currently €75,000), which is taxed as personal income. At her death, payments will stop, and the trust's remaining assets will be transferred to a local charity.

Both Hans and Christa are unmarried. Hans currently works as a senior vice president at IngerMarine and specializes in boat design. Peter has tried to involve Christa in the family business but she has resisted, instead achieving moderate recognition and financial success as an artist. Christa has a 5-year-old son, Jürgen, whom she has chosen to raise alone.

The meeting with Peter, Hilda, and Hans and several telephone discussions with Christa result in the following financial and personal details for the Inger family:

Table 1 Inger Family Data

Income (Annual)	
Peter salary[a]	€500,000
Hans salary	100,000
Hilda trust payout	75,000
Christa (art sales)	50,000
Peter Personal Assets	
Home (fully paid for, held jointly with Hilda)	€1,200,000
IngerMarine company equity[b]	60,000,000
Diversified equity securities	750,000

(continued)

Table 1 (Continued)

Income (Annual)	
Fixed income securities	1,000,000
Cash (money market fund)	1,000,000
Gold bullion	500,000
RSA[c]	50,000
Hilda Personal Assets	
IngerMarine company equity[b]	€1,200,000
Hans Personal Assets	
Home (net of mortgage)	€200,000
IngerMarine company equity[b]	2,400,000
Diversified equity securities	200,000
Cash (money market fund)	100,000
Christa Personal Assets	
IngerMarine company equity[b]	€1,200,000
Balanced mutual funds	75,000
Cash (money market fund)	25,000

[a] Peter expects to receive a fixed annual payment of €100,000 (taxable as income) from the IngerMarine pension plan, beginning five years from now.
[b] IngerMarine equity values are pretax market values; the equity has a zero cost basis for purposes of taxation on capital gains. The company stock pays no dividend.
[c] Beginning at age 62, Peter plans to take a fixed annual distribution of approximately €5,000 (tax exempt).

BOX 1 JOURDAN'S FINDINGS AND PERSONAL OBSERVATIONS

Peter

Personality

Peter is a perfectionist and likes to maintain control. Now that he has attained financial success, he seems intent on preserving his wealth. He has consistently been averse to risk, leverage, and change, both in his company and in his personal life. IngerMarine has followed policies of low debt and slow growth, focusing on earnings stability. Like many of his countrymen, Peter holds a portion of his liquid assets in gold bullion. He believes that gold provides a viable hedge against catastrophic economic surprises and plans to maintain his current holding (€500,000) for the foreseeable future. By his own admission, Peter has been slow to adopt a succession plan—he has always believed that he was the best person to run IngerMarine. Although he now wants to sell IngerMarine and retire, in the past he resisted various purchase offers for the company.

Goals

Peter wants to maintain the standard of living that he and Hilda currently enjoy. In fact, he is actively investigating real estate for a second home, and he desires that the new home "make a statement." Hilda hopes the home will ultimately be featured in a magazine and anticipates that it will cost approximately €7 million.

Peter also wants to get to know his grandson better. Since Jürgen's birth, Peter has been estranged from his daughter and he wants to restore the relationship. He would like to provide financial support for Jürgen's health- and education-related expenses, and he plans to begin a gifting program for Jürgen next year; the gifts will be €15,000 per year, increasing with inflation.

Peter has a passion for photography and anticipates purchasing a minority interest (€5 million) in *Exteriors*, a noted photography magazine. The purchase would reflect his desire to support the magazine's high-quality work and might also lead to a post-retirement consulting opportunity. Because the investment is unlikely to produce meaningful current income, Peter does not intend to make any additional investment in *Exteriors*. Finally, Peter also has a strong desire to ensure his family's financial security and feels he will have accumulated enough wealth through the sale of IngerMarine to realize this goal. He does not, however, have a formal estate plan for transferring assets to his children and grandchildren.

Hilda

Personality

Hilda has intentionally removed herself from the family business. She has been a major factor, however, in Peter's decision to retire and have a second home closer to their daughter and grandson. In light of the major changes about to take place, Hilda wants to become more knowledgeable and active in managing the family's wealth.

Goals

Hilda has a strong interest in interior design and two years ago founded a small, sole-proprietorship design company. She is eager to apply her talents to designing and building the Ingers' new home and desires complete freedom in determining the home's interior design. Her company currently operates on a breakeven basis, with revenues approximately matching expenses.

Hans

Personality

Hans appears to be somewhat of a gambler. He has always felt financially secure, and is much more willing than his father Peter to engage in riskier investment opportunities. He sees his father as overly conservative and believes that IngerMarine would be in a more commanding position if Peter had only leveraged the company to expand production and marketing efforts. He drives a very expensive sports car.

Goals

Hans does not want to stay in the boat business and would prefer a career that allows him more free time. He has wanted to participate with college friends in various real estate projects, but his father has steadfastly refused to underwrite the investments. Consistent with his attitudes about risk, Hans prefers high-return investments, believing that he has enough time in his life to recover from any occasional losses. Although Hans is in no hurry to marry and have children, he believes he will ultimately do so and has been looking for a new, larger home, in the €500,000 to €700,000 price range. Finally, Hans is considering a minority investment (estimated to be €550,000, with no further investment planned) in a nightclub scheduled to open in his city.

Christa

Personality

Christa has been estranged from the family for several years. She has resisted pressure to enter the family business, deciding instead to pursue a career in art. She has also elected to raise her son Jürgen without family support, which has created tension within the family. She is very self-reliant but admits to having limited financial expertise. Her relations with the family have recently improved, and she is looking forward to increased contact with her parents.

Goals

Christa is hoping to take a more proactive role in her financial affairs. She recognizes the need for a coordinated family financial plan, yet she does not wish to rely solely on the family's wealth to provide for her son's future. She would like to move into a larger apartment that would afford her the opportunity to create a painting studio. Rents are expensive, however, and she needs an assured source of income so that she may focus on her art career.

3 INVESTOR CHARACTERISTICS

A distinguishing characteristic of private asset management is the wide range of personal concerns and preferences that influence the decision-making process. Often unaccounted for in traditional models of "rational investor" behavior, such factors as personality, life experiences, and personal circumstances can play an important role in determining the framework for addressing financial decisions. An investment approach that begins with consideration of the Ingers' biases, preferences, and perceptions of risk paves the way for a meaningful discussion of portfolio objectives and may result in a stronger, more enduring client relationship than if such consideration were not given.

3.1 Situational Profiling

Many useful attempts have been made to categorize individual investors by stage of life or by economic circumstance. Such "situational" profiling runs the risk of oversimplifying complex behavior and should be used with a measure of caution—individual investors are unique and likely to exhibit characteristics that cut across arbitrary lines of categorization. Nonetheless, situational profiling can serve as a useful first step in considering an investor's basic philosophy and preferences, facilitating the discussion of investment risk by anticipating areas of potential concern or special importance to the investor. Examples of situational profiling include approaches based on source of wealth, measure of wealth, and stage of life.

3.1.1 *Source of Wealth*

Some classification schemes presume that the manner in which an individual investor has acquired wealth offers insight into that investor's probable attitude toward risk. Successful entrepreneurs, such as Peter Inger, who have created their wealth by personally taking business or market risks, are assumed to exhibit a higher level of risk tolerance than those who have been more passive recipients of wealth. "Self-made" investors may have greater familiarity with risk-taking and a higher degree of confidence in their ability to recover from setbacks. Such self-made investors, however, often have a strong sense of personal control over the risks that they assume. Despite their demonstrated willingness to take entrepreneurial risk, they can be very reluctant to cede control to a third party or to accept investment volatility over which they have no influence. Peter's slowness to adopt a succession plan and his largely conservative investment decisions typify such behavior.

In contrast, more-passive recipients of wealth may be associated with reduced willingness to assume risk. Such investors may have inherited their wealth; received a large, one-time payment; or simply accumulated savings during a period of secure employment. Because of the relatively passive nature of their wealth accumulation, these investors are assumed to have less experience with risk-taking, less understanding of what taking risk means, and less confidence that they can rebuild their wealth should it be lost. Christa Inger may be an example of such an investor.

3.1.2 *Measure of Wealth*

Given the subjective nature of financial well-being, it is difficult to categorize investors based on portfolio size (net worth). A portfolio that one individual considers large and ample to meet future needs may be insufficient in the eyes of another individual. All the same, it is not unreasonable to consider that investors who *perceive* their holdings as small may demonstrate lower tolerance for portfolio volatility than investors who perceive their holdings as large. A portfolio whose returns do not easily support the investor's lifestyle might be considered small. If the investor's ongoing needs are so well covered that succession and estate planning issues have become important, the portfolio might be considered "large."

3.1.3 *Stage of Life*

In life-stage classifications, investment policy, and particularly risk tolerance, are determined by one's progress on the journey from childhood to youth, adulthood, maturity, retirement, and death. Theoretically, a person's ability to accept risk should begin at a high level and gradually decline through his lifetime, while willingness to assume risk should be driven largely by cash flow considerations (income versus expenses). The human financial condition is driven by additional factors, however, such as life experiences, living conditions, starting point on the scale of wealth, and personal abilities and ambitions. For the sake of illustration, an individual's investment policy can be viewed as passing through four general phases: foundation, accumulation, maintenance, and distribution.

During the *foundation* phase of life, the individual is establishing the base from which wealth will be created. This base might be a marketable skill, the establishment of a business, or the acquisition of educational degrees and certifications. During the foundation phase, the individual is usually young, with a long time horizon, which normally would be associated with an above-average tolerance for risk. Risk tolerance should certainly be above-average in the foundation stage if the individual has inherited wealth. Lacking such wealth, the foundation phase may be the period when an individual's investable assets are at their lowest and financial uncertainty is at its highest. A young entrepreneur may have substantial expenses in establishing a business, resulting in a liquidity need that overrides all other considerations. Marriage and the arrival of children may create a desire for more-rapid wealth accumulation that is not yet matched by either ability or willingness to assume risk.

Ironically, at the point in life when individuals should theoretically be ready to assume risk, many are either unwilling or unable to do so. Christa, because of her desired independence, has many of the financial stresses associated with the foundation phase and may still be building the foundation of her ultimate career as an artist. Her son Jürgen is in the earliest days of this phase as he begins his childhood education.

In the *accumulation* phase, earnings accelerate as returns accrue from the marketable skills and abilities acquired during the foundation period and gradually reach their peak. In the early years of the accumulation phase, income rises and investable assets begin to accumulate. Expenses also rise during this period, through the establishment of family, purchase of homes, and care and education of children. In the middle and later years of wealth accumulation, expenses typically begin to decline as children reach adulthood, educational needs are fulfilled, and home purchases are completed. Income generally continues to rise as the individual reaches peak productivity. If an individual's personal spending habits do not change, the gap between income and expenses may widen throughout the accumulation phase, allowing for an increase in savings.

Some individuals may forgo investing their growing wealth and instead increase spending on luxury items or perhaps make gifts to relatives or charities. For investors, however, the accumulation phase is characterized by increased risk tolerance, driven

by their increasing wealth and a still long-term time horizon. Hans is in the early years of this phase and is clearly willing to assume high risk to achieve his wealth and lifestyle goals.

During the *maintenance phase*, the individual has moved into the later years of life and usually has retired from daily employment or the pressures of owning a business. This phase focuses on maintaining the desired lifestyle and financial security. Preserving accumulated wealth begins to increase in importance, while the growth of wealth may begin to decline in importance. Risk tolerance will begin to decline; not only is the individual's time horizon shortening but his confidence in the ability to replace capital or recover from losses is often diminished.

In the maintenance phase, investors will typically reduce exposure to higher-volatility asset classes, such as common stocks, and increase exposure to lower-volatility investments, such as intermediate-term bonds. Because the individual now has less time to recover from poor investment results, portfolio stability becomes increasingly important. In this phase, the challenge is to achieve a desired level of portfolio stability and maintain an exposure to risky assets sufficient to preserve the portfolio's purchasing power. Investors who become too conservative too soon after retirement may reach an elderly age with assets that have suffered significant declines in purchasing power. With the imminent sale of IngerMarine, Peter is about to enter the maintenance phase.

In the *distribution phase*, accumulated wealth is transferred to other persons or entities. For many, this phase begins when the individual is still reaping the benefits of the maintenance phase and retirement. For most, the phase involves a conscious decision to begin transferring wealth. Dealing with tax constraints often becomes an important consideration in investment planning, as investors seek to maximize the after-tax value of assets transferred to others. Although asset distribution may take place in the later stages of life, planning for such transfers can begin much earlier.

For individuals with substantial wealth, the distribution phase should be a well-planned program executed during the course of several years. Efficient wealth transfers take advantage of market conditions, tax laws, and various transfer mechanisms. An individual may consider various transfer strategies: He might establish trusts or foundations for heirs or charities, make outright gifts of cash or assets, modify the legal ownership structure of certain assets, and make advance provisions for care in the event of health problems and to pay wealth transfer taxes.

Although the progression from accumulation to distribution may be linear, it is not necessarily so. Individuals in the accumulation phase may become dissatisfied with a career choice and return to the foundation phase. Some may be forced to make such a move as demand for their skills diminishes. A sudden illness or accident may move an individual unexpectedly to the distribution phase.

In each of the above phases, personal circumstances are a driving force in how an individual responds to each cycle of life. The foundation phase will be different for those who enter life with a base of inherited wealth than it will for those who come from families of modest means. The distribution phase can become increasingly complicated for the very wealthy but remain quite basic for those with little wealth. Because of obligations and lifestyle, some investors never leave the accumulation phase. For others, the stress of an adverse life experience, such as living through an economic calamity or war, may override all phases and never allow them to properly match their willingness and ability to assume risk in a suitable investment program.

Situational assessments allow investment advisors to quickly categorize potential clients and explore investment issues likely to be of greatest importance to them. We must note, however, that investors seldom fall easily into just one category, and clearly a dynamic relationship exists among the above considerations. Peter and Hilda, for example, have a multigenerational planning perspective and a portfolio sufficiently large to maintain a long-term investment time horizon—their risk tolerance is not

necessarily diminished because of their age. Although Hans may be moving into the accumulation phase, he clearly retains elements associated with the foundation phase (e.g., above-average risk tolerance). Similarly, Christa's circumstances most directly mirror the accumulation phase, although she has the financial ability to develop a long-term investment plan. Source of wealth considerations play an obvious role in the Inger family situation and are colored by stage-of-life issues. One recipient of inherited wealth (e.g., Hans) in a later life stage may view his or her portfolio as sufficiently large to assume additional risk, but a second recipient in an earlier stage (e.g., Christa), with less experience and lower confidence, may exhibit less willingness to take risk. The value of situational paradigms, therefore, lies more in their general insights into human behavior and less in their ability to fully interpret individual circumstances. Investment advisors should emphasize the *process* of gathering and assessing relevant situational information rather than the specific category in which an individual investor may fall. The advisor who recognizes familiar patterns is better able to anticipate areas of potential concern and to structure a discussion of portfolio policy in terms relevant to the client.

3.2 Psychological Profiling

A determinant of individual investing that has generally received less focus than other, more objective influences is the psychological process by which an individual establishes his or her investment preferences. Clearly, every individual brings to the investment decision-making process an objective set of financial circumstances, goals, and constraints that will strongly influence the set of investment alternatives from which he chooses. Yet underlying behavioral patterns and personality characteristics often also play an important role in setting individual risk tolerance and return objectives. Psychological profiling, sometimes referred to as personality typing, bridges the differences between "traditional finance" (economic analysis of objective financial circumstances) and what has come to be defined as "behavioral finance."

3.2.1 *Traditional Finance*

Much of the standard history of economic and financial theory rests on the philosophy that financial market participants are rational, information-based investors with dispassionate objectives that maximize the expected utility of wealth.

In models of traditional, or standard, investment decision making, investors are assumed to:

- exhibit risk aversion;
- hold rational expectations; and
- practice asset integration.

Risk aversion implies that investors with otherwise equivalent investment options will prefer the investment with the lowest volatility. They will choose an investment with a certain outcome over an investment with an uncertain outcome that has the same expected value.

Rational expectations assume that investors are coherent, accurate, and unbiased forecasters. Their forecasts will reflect all relevant information, and they will learn from their past mistakes.

Asset integration refers to the process by which investors choose among risky investments. Investors practice asset integration by comparing the portfolio return/risk distributions that result from combining various investment opportunities with their existing holdings. Assets are evaluated in the context of their impact on the aggregate investment portfolio, not as stand-alone investments.

As a consequence of the traditional assumptions about individual economic behavior, traditional models of the portfolio building process have historically relied on the following tenets:

- Asset pricing is driven by economic considerations such as production costs and prices of substitutes.
- Portfolios are constructed holistically, reflecting covariances between assets and overall objectives and constraints.

3.2.2 *Behavioral Finance*

A growing body of research points to differences in behavior caused by differences in how individuals approach uncertain situations. In these studies, psychological considerations appear to play an important role in guiding investor behavior, especially during periods of stress. Work done by Daniel Kahneman, Meir Statman, Richard Thaler, Robert Shiller, Amos Tversky, and others has firmly established the field of "behavioral finance," and several investment firms currently incorporate behavioral finance as a cornerstone of their investment philosophy. These decision-making models attempt to incorporate the principles of behavioral finance, in which individual investors are recognized to:

- exhibit loss aversion;
- hold biased expectations; and
- practice asset segregation.

Loss aversion is demonstrated when investors evaluate opportunities in terms of gain or loss rather than in terms of uncertainty with respect to terminal wealth. Faced with the choice between a) a certain loss or b) an uncertain outcome that might produce a smaller loss but whose expected value is a larger loss, investors are likely to exhibit loss aversion by choosing the uncertain alternative. Choosing the uncertain outcome actually demonstrates risk-seeking behavior—traditional finance predicts that investors, being risk averse, should choose the certain loss over an alternative whose expected loss is larger.

In their discussion of "prospect theory," Kahneman and Tversky (1979) found that individuals place different weights on gains and losses. Their studies yielded evidence that most people are more distressed by prospective losses than they are pleased by the prospect of equivalent gains. Further, individuals responded differently to equivalent probabilistic scenarios, depending on whether the outcomes resulted in gains or losses. Kahneman and Tversky found that when subjects were presented with a choice between a sure gain of $500 or a 50/50 chance to either gain $1,000 or receive nothing at all, respondents overwhelmingly chose the "sure gain." Correspondingly, when another group was asked to choose between a sure loss of $500 or a 50/50 chance to lose either $1,000 or nothing at all, a majority gravitated to the uncertain alternative. It appears to be human nature to prefer an uncertain loss to a certain loss but to prefer a certain gain to an uncertain gain.

Biased expectations result from cognitive errors and misplaced confidence in one's ability to assess the future. Examples of cognitive errors include mistaking the skills of the average manager for those of a particular manager; overestimating the significance of low-probability events; and overestimating the representativeness of one asset compared with another asset.

Asset segregation is the evaluation of investment choices individually, rather than in aggregate. Related behavior includes reference dependence, in which economic behavior is shaped by the frame of reference or the context in which choices are presented, and mental accounting (organizing investments into separate psychological accounts depending on purpose or preference).

According to behavioral models of individual decision making, portfolio construction takes place under a more complex set of assumptions than those given previously:

- Asset pricing reflects both economic considerations, such as production costs and prices of substitutes, and subjective individual considerations, such as tastes and fears.
- Portfolios are constructed as "pyramids" of assets, layer by layer, in which each layer reflects certain goals and constraints.

Within this behavioral framework, individuals also have characteristics that either sharpen or blunt the human tendencies for risk avoidance. The process of "personality typing" seeks to identify and categorize these characteristics to facilitate the discussion of risk and risk tolerance. We emphasize, however, that the primary value of any personality typing approach is to provide both the investor and the manager with a framework for thinking about the influence of personality on investment decision-making, not to neatly categorize investors into arbitrarily defined personality types.

3.2.3 *Personality Typing*

Generally, all investors have unique, complex personality dimensions shaped by socioeconomic background, personal experience, and current wealth status. These diverse factors make it difficult to precisely categorize investors into types. Yet by combining studies of historical behavior with surveys and scenario analysis, we can broadly classify investors into types. Through "personality typing," investment advisors can better understand the behavioral drivers that lead to an individual's goal setting, asset allocation, and risk-taking decisions, and thus advisors can better manage client expectations and behavior.

Personality typing can assist investment advisors in determining an individual investor's propensity for risk taking and his decision-making style in seeking returns. By assigning values to the factors that successfully identify an individual's propensity to assume risk in the investment process, the advisor can obtain very useful information on the client's risk tolerance.

Generally, two approaches to personality classification exist. Often the default option within investment firms is an ad hoc evaluation by the investment advisor, who categorizes the investor based on personal interviews and a review of past investment activity. Although experienced managers may claim proficiency in their ability to profile investor personalities, subjective assessments are difficult to standardize, and their terms often mean different things to different people. Even when the assessment is generally correct, the degree of an individual investor's risk tolerance is difficult to gauge.

Reflecting a discomfort with this ad hoc approach, a growing number of investment firms now employ short client questionnaires to gain insight into the investor's propensity to accept risk and the decision-making style used in pursuing investment returns. These questionnaires address investment topics but may also include self-evaluative statements that have no direct investment context. A hypothetical example of such a questionnaire is presented in Exhibit 1. The classification scheme blends the Bailard, Biehl, and Kaiser approach[1] with the analytical psychology of Carl Jung.[2] The questionnaire is representative but certainly not definitive or exhaustive; it is intended to reflect the process and content typically employed by investment firms and consultants engaged in more or less formal personality typing of clients.

1 See Bailard, Biehl, and Kaiser (1986).
2 See, for example, Berens (2000).

Exhibit 1 Decision-Making Style and Risk Tolerance Questionnaire

	Decision-Making Style Questions	Does Not Apply	Somewhat Applies	Generally Applies	Always Applies
1	I keep all my mail. I never throw anything out.	0	1	2	3
2	My favorite subject in school was mathematics.	0	1	2	3
3	I would rather sit in front of the television than organize one of my closets.	0	1	2	3
4	I would rather work by myself than in groups.	0	1	2	3
5	I consider myself to be independent.	0	1	2	3
6	When asked out to dinner or a movie, I generally organize the event.	0	1	2	3
7	I am bothered by people who don't work hard.	0	1	2	3
8	I never leave anything unfinished.	0	1	2	3
9	I generally drive very fast.	0	1	2	3
10	I enjoy competitive sports.	0	1	2	3
11	I rarely worry about finances.	0	1	2	3
12	I like seeing scary movies.	0	1	2	3
13	I am always eager to meet new people.	0	1	2	3
14	I sometimes become impatient waiting for an elevator.	0	1	2	3
15	People accuse me of having a "quick temper."	0	1	2	3

	Risk Tolerance Questions	Does Not Apply	Somewhat Applies	Generally Applies	Always Applies
16	I become nervous when flying.	0	1	2	3
17	I don't like contact sports like football.	0	1	2	3
18	When arguing with friends, I am usually the one who concedes.	0	1	2	3
19	I never had a strong bond with my parents.	0	1	2	3
20	I wish I could be more expressive with my feelings.	0	1	2	3
21	I never raise my voice.	0	1	2	3
22	I don't like to discuss personal items with friends.	0	1	2	3
23	I like art.	0	1	2	3
24	I would classify my political beliefs as liberal.	0	1	2	3
25	I am not easily excitable.	0	1	2	3
26	I don't swim in the ocean.	0	1	2	3
27	I am afraid of public speaking.	0	1	2	3
28	If offered a bigger house, I would pass because I don't like the hassle of moving.	0	1	2	3
29	I have had many relationships with the opposite sex.	0	1	2	3
30	I often wear cutting-edge new fashions.	0	1	2	3
31	I will always take the initiative when others do not.	0	1	2	3

The critical question that must be answered with respect to client questionnaires is whether the results consistently assign respondents to risk-taking and decision-making styles that explain the respondents' actual behavior. In addition, there must be a meaningful link between the survey results and the ultimate personality typing. To obtain the appropriate linkage between investor survey responses and ultimate investment behavior, a stratified sample can be drawn to replicate the overall demographic characteristics of investors. A stratified random sample involves independent sampling from subgroups that, when combined, represent a population's overall characteristics. Results from the sample questions (each question addresses a specific category of investor risk tolerance and decision-making style) are tabulated and used to identify systematic differences in decision-making style and risk tolerance. Continuing with the example from Exhibit 1, raw scores are portrayed across the two dimensions of decision-making style and risk tolerance. Based on these measures, four investment personality types are established. The types are consistent with distinct style/risk tradeoffs and may provide predictive insight into an individual's ultimate investment behavior.

Cautious Investors Cautious investors are generally averse to potential losses. This aversion may be a consequence of their current financial situation or of various life experiences, but most exhibit a strong need for financial security. Cautious investors usually desire low-volatility investments with little potential for loss of principal. Although these individuals generally do not like making their own decisions, they are not easily persuaded by others and often choose not to seek professional advice. Cautious investors dislike losing even small amounts of money and seldom rush into investments. They often miss opportunities because of overanalysis or fear of taking action. Their investment portfolios generally exhibit low turnover and low volatility.

Methodical Investors This group relies on "hard facts." Methodical investors may intently follow market analysts or undertake research on trading strategies. Even when their hard work is rewarded, they typically remain on a quest for new and better information. Their reliance on analysis and database histories generally keeps them from developing emotional attachments to investment positions, and their discipline makes them relatively conservative investors.

Spontaneous Investors Spontaneous investors are constantly readjusting their portfolio allocations and holdings. With every new development in the marketplace, they fear a negative consequence. Although spontaneous investors generally acknowledge that they are not investment experts, they doubt all investment advice and external management decisions. They are over-managers; their portfolio turnover ratios are the highest of any personality type. Although some investors in this group are successful, most experience below-average returns. Their investment profits are often offset by the commission and trading charges generated by second-guessing and frequent adjustment of portfolio positions. Spontaneous investors are quick to make decisions on investment trades and generally are more concerned with missing an investment trend than with their portfolio's level of risk.

Individualist Investors This group has a self-assured approach to investing. Individualists gain information from a variety of sources and are not averse to devoting the time needed to reconcile conflicting data from their trusted sources. They are also not afraid to exhibit investment independence in taking a course of action. Individualist investors place a great deal of faith in hard work and insight, and have confidence that their long-term investment objectives will be achieved.

An advisor can use questionnaire results to plot an investor's risk/style score, as Exhibit 2 illustrates. Clearly, the more extreme investor personality types will plot farther away from the center of the graph.

Exhibit 2 Personality Types

	Decisions based primarily on thinking	*Decisions based primarily on feeling*
More risk averse	Methodical	Cautious
Less risk averse	Individualist	Spontaneous

As mentioned earlier, a predictive link must exist from the questionnaire responses to the resulting personality typing that is derived, and to the subsequent investment behavior that occurs. If the correlation is high between the personality dimensions outlined in the questionnaire and the individual's ultimate portfolio selections, then the exercise has predictive value. If the results are uncorrelated, then the questionnaire must be revised. In the example above, a stratified sample of clients would complete the questionnaire, and the raw scores would be used to identify subgroups. Each subgroup would then be associated with a specific investment style. A "Methodical" subgroup might be expected to maintain a "value" equity portfolio of very stable stocks, along with a substantial commitment to highly rated fixed income securities.

Correlation analysis can be used to assess a questionnaire's usefulness. By assigning ranks to personality types (1 = Methodical, 2 = Cautious, 3 = Individualistic, 4 = Spontaneous) and to the riskiness of respondents' existing portfolios, standard statistical methods can be used to evaluate whether personality types are correlated with investor behavior, especially risk-taking. If a significant positive correlation exists, the questionnaire may have predictive value and be of practical use to advisors. Note that because questionnaire design and analysis is a specialized area, advisors would be wise to have their classification scheme validated by a psychometrician; the style/risk personality typing example presented here should be viewed as only suggestive of those actually used in practice.

The Inger Family In trying to classify the Inger family using the above approach, Jourdan asks each family member to complete the investor style/risk survey. Based on their responses, Jourdan classifies the family members as shown in Exhibit 3.

Exhibit 3 Inger Family Personality Types

The symbols represent the family member's composite survey score. The position of the symbol relative to the box represents the strength or polarization of the personality type. For example, Hilda scored fairly evenly in all categories with a slight bias toward an "individualist" personality, while Hans' score demonstrates a strong bias toward a "spontaneous" investor.

After reviewing the results of the Inger family's questionnaires, Jourdan notes that their scores are generally consistent with her initial observations. Her only mild surprise is that Christa was positioned as a "cautious" investor, which does not fully coincide with what some would see as a relatively aggressive or adventurous decision to ignore the family business and support her child through a career in art.

The survey scores reflect each family member's appetite for risk in his or her individual portfolio, but the challenge remains of integrating these diverse personalities and goals into a coordinated family investment program.

INVESTMENT POLICY STATEMENT

4

The investment policy statement is a client-specific summation of the circumstances, objectives, constraints, and policies that govern the relationship between advisor and investor. A well-constructed IPS presents the investor's financial objectives, the degree of risk he or she is willing to take, and any relevant investment constraints that the advisor must consider. It also sets operational guidelines for constructing a portfolio that can be expected to best meet these objectives while remaining in compliance with any constraints. Finally, the IPS establishes a mutually agreed-upon basis for portfolio monitoring and review.

Constructing an IPS is a dynamic process in which an individual and his investment advisor must identify and then reconcile investment objectives, portfolio constraints, and risk tolerance. The exercise should produce realistic investment goals and, equally important, a common vocabulary for advisor and investor to discuss risk and return.

The process of writing a thorough policy statement ultimately gives the individual investor greater control over her financial destiny. To the extent that drafting the IPS has been an educational process, the investor emerges better able to recognize appropriate investment strategies and no longer needs to blindly trust the investment advisor. Further, an IPS is portable and easily understood by other advisors. If a second opinion is needed, or if a new investment advisor must be introduced, the IPS facilitates a thorough review and ensures investment continuity.

Finally, the IPS serves as a document of understanding that protects both the advisor and the individual investor. If management practices or investor directions are subsequently questioned, both parties can refer to the policy statement for clarification or support. Ideally, the review process set forth in the IPS will identify such issues before they become serious.

4.1 Setting Return and Risk Objectives

Establishing portfolio objectives for return and risk is a systematic process applicable for institutional as well as individual investor portfolios. As one reconciles investment goals with risk tolerance, however, client-specific investment parameters emerge. Both the general process and client-specific results are illustrated as Jourdan continues to work with the Inger family.

4.1.1 *Return Objective*

The process of identifying an investor's desired and required returns should take place concurrently with the discussion of risk tolerance. In the end, the IPS must present a return objective that is attainable given the portfolio's risk constraints.

It is important at the outset to distinguish between a return requirement and a return desire. The former refers to a return level necessary to achieve the investor's primary or critical long-term financial objectives; the latter denotes a return level associated with the investor's secondary goals. In the case of Peter and Hilda, it appears that their current needs are mostly being met by Peter's salary of €500,000. If IngerMarine is sold, they may *require* a return that replaces Peter's salary (a critical objective) and *desire* a return that will accommodate their major acquisitions and still leave their children financially secure (important but less critical objectives).

Return requirements are generally driven by annual spending and relatively long-term saving goals. Historically, these goals have often been classified as *income* requirements and *growth* requirements, with the presumption that portfolio income (dividends, interest, and rent) is used for current spending, and portfolio gains (from price appreciation) are reinvested for growth. Income needs, therefore, are met with income-producing securities, primarily bonds, and growth objectives are pursued with stocks and other equity-oriented investments.

"Growth" and "income" are intuitively appealing descriptors, and the terms remain in use. The terms are flawed, however, in that they blur the distinction between an investor's return requirements and risk tolerance. Portfolios classified as income-oriented are typically biased toward a lower-risk, heavily fixed-income asset allocation. Conversely, growth-oriented portfolios are biased toward equities, with little direct consideration of risk tolerance.

Return requirements are often first presented in real terms, without adjustment for inflation. When an investor's current spending and long-term savings goals are expressed in terms of purchasing power, however, it becomes clear that even income-oriented portfolios require a considerable element of nominal growth.

As an alternative to "growth" and "income," a "total return" approach to setting return requirements looks first at the individual's investment goals and then identifies the annual after-tax portfolio return necessary to meet those goals. That required return must then be reconciled with the individual's separately determined risk tolerance

and investment constraints. With the notable exception of tax considerations, it is typically less important whether the total investment return stems from income or price appreciation.

When an investor's return objectives are inconsistent with his risk tolerance, a resolution must be found. If the investor's return objectives cannot be met without violating the portfolio's parameters for risk tolerance, he may need to modify his low- and intermediate-priority goals. Alternatively, he may have to accept a slightly less comfortable level of risk, assuming that he has the "ability" to take additional risk. An individual, for example, who discovers that his retirement goals are inconsistent with current assets and risk tolerance may have to defer the planned date of retirement, accept a reduced standard of living in retirement, or increase current savings (a reduction in the current standard of living).

If the investment portfolio is expected to generate a return that exceeds the investor's return objectives, there is the luxury of dealing with a surplus. The investor must decide whether to a) protect that surplus by assuming less risk than she is able and willing to accept or b) to use the surplus as the basis for assuming greater risk than needed to meet the original return goals, with the expectation of achieving a higher return.

To calculate the required return and to fully understand the cumulative effects of anticipated changes in income, living expenses, and various stage-of-life events, an advisor may wish to incorporate a cash flow analysis. The statement of cash flows in Exhibit 4 simplistically highlights a five-year horizon for Peter and Hilda Inger based on information gleaned by Jourdan from interviews and background examination.

Exhibit 4 Peter and Hilda Inger Five-Year Statement of Cash Flows

	Current	1	2	3	4	5
Inflows	€	€	€	€	€	€
Salary: Peter (taxed as income)	500,000					
Trust payment: Hilda[a] (taxed as income)	75,000	77,250	79,568	81,955	84,413	86,946
Pension: Peter[b] (taxed as income)	—	—	—	—	—	100,000
RSA: Peter[b] (tax-free)	—	—	—	5,000	5,000	5,000
Sale of company (taxed as gain)	—	61,200,000	—	—	—	—
Total inflows	575,000	61,277,250	79,568	86,955	89,413	191,946
Outflows						
Income tax (25%)	(143,750)	(19,313)	(19,892)	(20,489)	(21,103)	(46,737)
Gains tax (15%)		(9,180,000)				
Second home	—	(7,000,000)	—	—	—	—
Investment in magazine	—	(5,000,000)	—	—	—	—
Support for Jürgen[a]	—	(15,000)	(15,450)	(15,914)	(16,391)	(16,883)
Transfer tax on support payment (50%)		(7,500)	(7,725)	(7,957)	(8,196)	(8,442)
Living and miscellaneous expenses[a]	(500,000)	(515,000)	(530,450)	(546,364)	(562,754)	(579,637)
Total expenses	(643,750)	(21,736,813)	(573,517)	(590,724)	(608,444)	(651,699)
Net additions/withdrawals	(68,750)	39,540,437	(493,949)	(503,769)	(519,031)	(459,753)

[a] Assumed to increase with inflation at 3% annually.
[b] Fixed annual payments.

Net cash flows for Peter and Hilda conveniently stabilize in Year 2 and decline in Year 5. Consequently, we can estimate their after-tax return objective in Exhibit 5 by dividing projected needs in Year 2 (€493,949) by their net investable assets at the end of Year 1 (€42.3 million). We find that €493,949/€42,300,000 = 1.17 percent. Adding the current annual inflation rate of 3.00 percent to 1.17 percent results in an approximate after-tax nominal return objective of 4.17 percent. [Note: Strictly speaking, the inflation rate should be adjusted upward by the portfolio's average tax rate. For ease of presentation, we have simply added 3 percent inflation.]

Exhibit 5 Peter and Hilda Inger Investable Assets, Net Worth, and Required Return

Investable Assets	Amount	Percent of Net Worth
Year 1 cash flow	€39,540,437	77
Stock holdings	750,000	1
Fixed-income holdings	1,000,000	2
Cash equivalents	1,000,000	2
RSA account	50,000	0
Total	€42,340,437	83
Real Estate		
First home	€1,200,000	2
Second home	7,000,000	14
Total	€8,200,000	16
Gold	€500,000	1
Net Worth	€51,040,437	100
Return Objective		
Distributions in Year 2	€ 493,949	= 1.17
Divided by investable assets	€42,340,437	
Plus expected inflation	3%	= 4.17

4.1.2 *Risk Objective*

An individual's risk objective, or overall risk tolerance, is a function of both ability to take risk and willingness to take risk.

Ability to Take Risk Assessing an individual's ability to take risk is suited to quantitative measurement. It is generally the investment advisor who defines the terms of the analysis and then must explain the results. Although approaches to the analysis will vary, all must address the following questions:

1 What are the investor's financial needs and goals, both long term and short term?

   An investor's ability to take risk is determined by his financial goals relative to resources and the time frame within which these goals must be met. If the investor's financial goals are modest relative to the investment portfolio, clearly he has greater ability, all else equal, to accommodate volatility and negative short-term returns.

As the investment portfolio grows or as its time horizon lengthens, the ability to recover from intermediate investment shortfalls also increases. All else equal, longer-term objectives allow the investor greater opportunity to consider more-volatile investments, with correspondingly higher expected returns.

Peter and Hilda Ingers' investment objectives are primarily short to intermediate term in nature:

- support for current lifestyle;
- construction of second home;
- investment in *Exteriors*;
- support for Jürgen's education;
- expansion of Hilda's design company.

Longer term, Peter and Hilda wish to preserve the financial security that their family currently enjoys. Preserving purchasing power is apparently more important to them than creating further wealth.

2 How important are these goals? How serious are the consequences if they are not met?

Critical goals allow lower margin for error and reduce the portfolio's ability to accommodate volatile investments. Financial security and the ability to maintain current lifestyle are generally among the investor's highest priorities; luxury spending, however defined, is least critical.

Beyond assuring their financial security, the Ingers' investment goals appear *important* but perhaps not *critical*. The second home is important to both Peter and Hilda and will play a major role in defining their future lifestyle. Similarly, Peter's investment in *Exteriors* is not driven by economic need, but it will play an important role in his life after the sale of IngerMarine.

3 How large an investment shortfall can the investor's portfolio bear before jeopardizing its ability to meet major short-term and long-term investment goals?

The limit of a portfolio's ability to accept risk is reached when the probability of failing to meet a high-priority objective becomes unacceptably high. The investment advisor can provide guidance with probability estimates and identify clearly unrealistic expectations, but the ultimate determination of "acceptable" will also depend on the investor's general willingness to accept risk.

Willingness to Take Risk In contrast to ability to take risk, investor willingness involves a more subjective assessment. No absolute measure of willingness exists, nor does any assurance that willingness will remain constant through time. Psychological profiling provides estimates of an individual's willingness to take risk, but final determination remains an imprecise science. It may, in fact, be necessary that investors have personal experience with significant losses as well as gains before a productive discussion of risk tolerance with them is possible.

Peter Inger's case illustrates both nuances in his willingness to take risk and a tension between willingness and ability. Peter's risk-taking has clearly centered on the business risk of IngerMarine. He has retained ownership of the company for many years, demonstrating tolerance for business risks that he may feel he controls. In other areas, including company debt policy and expansion plans, Peter has shown less willingness to take risk. His personal debt policy and low-volatility investment portfolio also indicate a conservative approach to finances. When asked what he would consider to be bad portfolio performance, Peter at first answered "any loss greater than 5 percent is unacceptable." After being reminded of his ability to take risk, however, he revised his answer to no loss greater than 10 percent.

4.2 Constraints

The IPS should identify all economic and operational constraints on the investment portfolio. Portfolio constraints generally fall into one of five categories:

- liquidity;
- time horizon;
- taxes;
- legal and regulatory environment;
- unique circumstances.

4.2.1 *Liquidity*

Liquidity refers generally to the investment portfolio's ability to efficiently meet an investor's anticipated and unanticipated demands for cash distributions. Two trading characteristics of its holdings determine a portfolio's liquidity:

- **Transaction Costs**

  Transaction costs may include brokerage fees, bid–ask spread, price impact (resulting, for example, from a large sale in a thinly traded asset), or simply the time and opportunity cost of finding a buyer. As transaction costs increase, assets become less "liquid" and less appropriate as a funding source for cash flows.

- **Price Volatility**

  An asset that can be bought or sold at fair value with minimal transaction costs is said to trade in a highly liquid market. If the market itself is inherently volatile, however, the asset's contribution to portfolio liquidity (the ability to meet cash flow needs) is limited. Price volatility compromises portfolio liquidity by lowering the certainty with which cash can be realized.

Significant liquidity requirements constrain the investor's ability to bear risk. Liquidity requirements can arise for any number of reasons but generally fall into one of the following categories:

- **Ongoing Expenses**

  The ongoing costs of daily living create a predictable need for cash and constitute one of the investment portfolio's highest priorities. Because of their high predictability and short time horizon, anticipated expenses must be met using a high degree of liquidity in some portion of the investment portfolio.

- **Emergency Reserves**

  As a precaution against unanticipated events such as sudden unemployment or uninsured losses, keeping an emergency reserve is highly advisable. The reserve's size should be client specific and might cover a range from three months to more than one year of the client's anticipated expenses. Individuals working in a cyclical or litigious environment may require a larger reserve than those in more stable settings. Although the timing of emergencies is by definition uncertain, the need for cash when such events do occur is immediate.

- **Negative Liquidity Events**

  Liquidity events involve discrete future cash flows or major changes in ongoing expenses. Examples might include a significant charitable gift, anticipated home repairs, or a change in cash needs brought on by retirement. As the time horizon to a major liquidity event decreases, the need for portfolio liquidity rises.

For the sake of completeness, positive liquidity events and external support should also be noted in the policy statement. In the case of a multigenerational family plan, positive liquidity events might include anticipated gifts and inheritance; the advisor should note, however, that inheritance planning is a sensitive and potentially divisive topic among family members.

Significant liquidity events facing the Ingers include the sale of IngerMarine and subsequent loss of Peter's salary, the purchase of a second home, and the investment in *Exteriors*. As the potential need for cash distributions increases, so too must the investment portfolio's commitment to assets that can be easily sold at predictable prices. Peter and Hilda have agreed on a normal liquidity reserve equal to two years of Peter's current salary (2 × €500,000) but will maintain an above-average reserve during their transition into retirement.

Illiquid Holdings To ensure that all parties have a complete understanding of portfolio liquidity, the IPS should specifically identify significant holdings of illiquid assets and describe their role in the investment portfolio. Examples might include real estate, limited partnerships, common stock with trading restrictions, and assets burdened by pending litigation.

The home or primary residence, often an individual investor's largest and most illiquid asset, presents difficult diversification and asset allocation issues. Unfortunately, this asset defies easy classification, having investment returns in the form of psychological and lifestyle benefits as well as the economic benefits of shelter and potential price appreciation.

The emotions attached to the primary residence will vary from individual to individual, and investment advisors must be sensitive to their clients' long-term view of the "home." Some investors may view their residence as part of their overall investment portfolio; others may view it as a "homestead" or sanctuary where life is lived, children are raised, and retirements are planned. Whether the primary residence is viewed objectively or with emotional attachment, the fact remains that it generally represents a significant percentage of an individual investor's total net worth. As such, the IPS should address the investment role of the primary residence.

It is not uncommon to exclude the residence from the asset allocation decision, under the premise that the home is a "sunk cost," a "legacy" or "private use" asset that is not actively managed as an investment. A similar approach treats the home as a long-term investment that will be used to meet equally long-term housing needs or estate planning goals. Somewhat analogous to cash-flow matching or bond defeasance, the home and the investment goals that it offsets are removed from consideration in building the actively managed investment portfolio. Parents may, for example, wish to pass on to their children the wealth necessary to purchase a house and meet this goal through their own home ownership. Other investors may view the residence as a source of funding to meet future healthcare and housing costs.

Lifestyle changes often dictate selling a large, primary family residence and moving into a more manageable property or living arrangement (e.g., as an individual or couple matures, or as children move away to start their own lives and families). An increasingly popular option for older individuals in Western Europe and the United States is to use the value of the primary residence to fund the costs of living in a managed care facility. Generally, these facilities provide members with progressive levels of healthcare and personal assistance, making it possible to continue living independently.

Alternatively, many individuals plan to retire in their primary residence. The IPS should recognize and discuss financial risks and liquidity issues created by a concentration of net worth in the investor's residence. Although the residence is typically considered to be a long-term, illiquid holding, it can also be the source of significant short-term losses and cash flow problems. Financial engineers continue to develop products and techniques that allow individuals better access to their home equity

(current market value, less any debt associated with the home) and better control over their exposure to fluctuations in property values. Some products, such as "reverse mortgages" and other annuity plans, have initially proven to be costly and illiquid. Newer financial vehicles are on the horizon, however, that may efficiently allow homeowners to "lock in" the current equity value of their home. In one such product (Robert Shiller's "macro securities"), hedges are built on the notion of swaps, in which two parties can exchange the returns of home appreciation for a static interest rate return.[3] Any decline in home value would be paid by the counterparty in exchange for the static rate of return.

Factoring the primary residence into a formal retirement plan is an uncertain proposition. Real estate returns vary with location, and the investor's holding period can be difficult to predict. Nonetheless, if the primary residence is treated as part of the investment portfolio, the advisor can use models for forecasting regional real estate inflation rates to approximate future values. Such models can be useful but will not capture the short-term dynamics of real estate markets.

The Inger Family It appears that Peter and Hilda can afford to build their second residence. Nonetheless, they should bear in mind that the two homes will constitute 16 percent of their net worth. Peter and Hilda's primary residence has a current market value of approximately €1,200,000 and could serve in the future as a source of funds.

4.2.2 *Time Horizon*

The investment time horizon has already been seen to play an important role in setting return objectives and defining liquidity constraints. No universal definition of "long-term" or "short-term" exists, however, and discussion is often left in relative rather than absolute terms. In many planning contexts, time horizons greater than 15 to 20 years can be viewed as relatively long term, and horizons of less than 3 years as relatively short term. Between 3 years and 15 years, there is a transition from intermediate to long term that different investors may perceive differently.

A second issue relating to the investment time horizon is whether the investor faces a single- or multistage horizon. Certain investor circumstances, such as an elderly investor with limited financial resources, are consistent with a single-stage time horizon. Given the unique nature and complexity of most individual investors' circumstances, however, the time horizon constraint most often takes a multistage form.

"Stage-of-life" classifications, as discussed earlier, often assume that the investment time horizon shortens gradually as investors move through the various stages of life. Although this assumption may often be true, it is not always. Once the primary investors' needs and financial security are secure, the process of setting risk and return objectives may take place in the context of multigenerational estate planning. The advisor's clients may be advanced in years yet be planning for their grandchildren; it may be the grandchildren's personal circumstances that determine the investment portfolio's goals and time horizon.

Peter and Hilda are extremely secure, assuming that the sale of IngerMarine is successful. They have expressed a desire to provide financial security for three generations and clearly have a long-term and probably multistage time horizon.

3 See Shiller (2003).

4.2.3 *Taxes*

The issue of taxes is perhaps the most universal and complex investment constraint to be found in private portfolio management. Taxation of income or property is a global reality and poses a significant challenge to wealth accumulation and transfer. Although tax codes are necessarily country specific, the following general categories are widely recognized:

- **Income Tax**

  Income tax is calculated as a percentage of total income, often with different rates applied to various levels of income. Wages, rent, dividends, and interest earned are commonly treated as taxable income.

- **Gains Tax**

  Capital gains (profits based on price appreciation) resulting from the sale of property, including financial securities, are often distinguished from income and taxed separately. In many countries, the tax rate for capital gains is lower than the corresponding income tax; a minimum holding period between purchase and sale is sometimes required.

- **Wealth Transfer Tax**

  A wealth transfer tax is assessed as assets are transferred, without sale, from one owner to another. Examples of wealth transfer taxes include "estate" or "inheritance" taxes paid at the investor's death and "gift" taxes paid on transfers made during the investor's lifetime.

- **Property Tax**

  Property tax most often refers to the taxation of real property (real estate) but may also apply to financial assets. Such taxes are generally assessed annually, as a percentage of reported value. Although straightforward in concept, property taxes present challenges with regard to valuation and compliance.

Taxation varies greatly across regions and continents, but marginal tax rates of 50 percent are not uncommon. With tax burdens of such magnitude, clearly the individual investor must approach investments and financial planning from an after-tax perspective. Exhibit 6 illustrates the degree of variation in top marginal tax rates that can exist internationally at a given point in time.

Exhibit 6 Top Marginal Tax Rates

Country	Income Tax (%)	Gains Tax (%)	Wealth Transfer Tax (%)
Brazil	27.5	15.0	8.0
Canada (Ontario)	46.4	23.2	0.0
Chile	40.0	17.0	25.0
China (PRC)	45.0	20.0	0.0
Egypt	32.0	0.0	0.0
France	48.1	27.0	60.0
Germany	42.0	50.0	50.0
India	30.0	20.0	0.0
Israel	49.0	25.0	0.0
Italy	43.0	12.5	0.0
Japan	37.0	26.0	70.0
Jordan	25.0	0.0	0.0
Korea	35.0	70.0	50.0

(continued)

Exhibit 6 (Continued)

Country	Income Tax (%)	Gains Tax (%)	Wealth Transfer Tax (%)
Mexico	30.0	30.0	0.0
New Zealand	39.0	0.0	25.0
Pakistan	35.0	35.0	0.0
Philippines	32.0	32.0	20.0
Russian Federation	35.0	30.0	40.0
South Africa	40.0	10.0	20.0
Taiwan	40.0	0.0	50.0
United Kingdom	40.0	40.0	40.0
United States	35.0	35.0	47.0

Note: Rates shown are subject to periodic change and do not fully reflect the complexity of the tax codes from which they were taken; additional regional taxes may also apply. This exhibit should not be used for tax planning purposes.
Source: "The Global Executive," Ernst & Young, 2005.

Taxes affect portfolio performance in two ways. When taxes are paid at the end of a given measurement period, portfolio growth is simply reduced by the amount of tax. When the same tax is assessed periodically throughout the measurement period, growth is further reduced: Funds that would otherwise compound at the portfolio growth rate are no longer available for investment. Exhibit 7 illustrates the effect of taxes on portfolio performance. In Example A, a periodic tax of 25 percent, similar to an annual income tax, is applied against investment returns over five years. In Example B, a tax of 25 percent is applied against the cumulative investment return at the end of a five-year holding period, similar to a capital gains tax. The difference in ending portfolio values demonstrates the benefit of deferring tax payments.

Tax strategies are ultimately unique to the individual investor and the prevailing tax code. Although the details of tax planning often involve complex legal and political considerations, all strategies share some basic principles.

Exhibit 7 Effect of Taxes on Portfolio Performance

Example A: *Periodic 25% Tax*

Year	Beginning Value	Returns[a]	Tax (25%)	Ending Value	Cumulative Gain
1	100,000	10,000	(2,500)	107,500	7,500
2	107,500	10,750	(2,688)	115,563	15,563
3	115,563	11,556	(2,889)	124,230	24,230
4	124,230	12,423	(3,106)	133,547	33,547
5	133,547	13,355	(3,339)	143,563	**43,563**

Example B: *Cumulative 25% Tax*

Year	Beginning Value	Returns[a]	Tax	Ending Value	Cumulative Gain
1	100,000	10,000	n/a	110,000	10,000
2	110,000	11,000	n/a	121,000	21,000
3	121,000	12,100	n/a	133,100	33,100

Exhibit 7 (Continued)

Example B: *Cumulative 25% Tax*					
Year	Beginning Value	Returns[a]	Tax	Ending Value	Cumulative Gain
4	133,100	13,310	n/a	146,410	46,410
5	146,410	14,641	n/a	161,051	61,051
		Less 25% Tax	(15,263)	(15,263)	(15,263)
				145,788	**45,788**

[a] Annual return: 10%.

Tax Deferral For the long-term investor, periodic tax payments severely diminish the benefit of compounding portfolio returns. Many tax strategies, therefore, seek to defer taxes and maximize the time during which investment returns can be reinvested. (Exhibit 7 demonstrated the value of tax deferral in general.) A portfolio strategy focusing on low turnover, for example, extends the average investment holding period and postpones gains taxes.

Loss harvesting, another tax reduction strategy, focuses on realizing capital losses to offset otherwise taxable gains without impairing investment performance. Low turnover and loss harvesting strategies are representative of a general portfolio policy that strives for a low rate of capital gains realization, resulting in deferred tax payments.

Tax Avoidance The ideal solution is to avoid taxes when legally possible.[4] A number of countries have introduced special purpose savings accounts, such as Peter Inger's RSA account, that may be exempt or deferred from taxation. Tax-exempt bonds may be available as alternative investment vehicles. Estate planning and gifting strategies may allow the investor to reduce future estate taxes by taking advantage of specific tax laws.

Tax-advantaged investment alternatives typically come at a price, however, paid in some combination of lower returns, reduced liquidity, and diminished control.

- Tax-exempt securities typically offer lower returns or involve higher expenses (including higher transaction costs) relative to taxable alternatives, and they are attractive only when the following relationship holds (ignoring differential transaction costs): $R_{\text{Tax-free}} > [R_{\text{Taxable}} \times (1 - \text{Tax rate})]$.
- Liquidity is reduced in tax-sheltered savings accounts when a minimum holding period is required or when withdrawals are limited to specific purposes.
- The investor must often relinquish or share the direct ownership of assets placed in tax-advantaged partnerships or trusts.

Tax Reduction If taxes cannot be avoided entirely, opportunities may remain to reduce their impact. When income tax rates exceed the capital gains tax rate, as they do in a number of countries (see Exhibit 6), a portfolio manager may emphasize securities and investment strategies whose investment returns are recognized as gains rather than income (a portfolio "tilt," for example, toward low-dividend-paying stocks). Because the gains tax is assessed only at the time of sale, such strategies may also benefit from tax deferral as well as the lower tax rate. If only *net* gains are taxed, a policy to actively

4 The term "tax avoidance" is typically used in reference to the legal pursuit of tax efficient investment strategies; the term "tax evasion" typically describes an illegal attempt to circumvent tax liability.

realize offsetting losses ("loss harvesting") will reduce reported gains. To achieve portfolio tax efficiency, a manager may use a variety of additional strategies, an increasing number of which are made possible through the use of derivatives.[5]

Wealth Transfer Taxes Wealth transfer strategies belong perhaps more to the world of tax- and estate-planning attorneys than to the realm of portfolio management. As a practical matter, however, investment advisors should have a working knowledge of estate planning principles, as it is often the advisor who first recognizes the investor's need for estate planning and makes the necessary recommendation to seek legal counsel.

Multiple variables potentially influence the timing of personal wealth transfers, including the investor's net worth, time horizon, and charitable intentions, as well as the age, maturity, and tax status of the beneficiaries. Generally speaking, strategies for addressing wealth transfers focus on either the timing or the legal structure (partnerships, trusts, etc.) of the transfer. The possible legal structures for a wealth transfer are necessarily country specific. Timing of wealth transfers, however, involves the more universal principles of tax avoidance, tax deferral, and maximized compound returns.

Transfer at Death. If the investor pursues no other strategy, a wealth transfer tax may be assessed at death (often referred to as an estate tax or death tax). In this scenario, the transfer tax has been deferred for as long as possible, retaining maximum financial flexibility for the individual and maximizing the final value of the investment portfolio. In a multigeneration estate plan, however, this strategy may not minimize transfer taxes.

Early Transfers. Accelerated wealth transfers and philanthropic gifting may be desirable when the investor wishes to maximize the amount of his or her estate, after taxes, that is passed on to individuals or organizations. Early gifting of higher-growth assets into the hands of a younger generation may shelter the subsequent growth of those assets from transfer taxes when the investor ultimately dies. Logically, earlier transfers to younger beneficiaries offer the greatest tax deferral. Because assets transferred to children will quite possibly be taxed again when the children die, it may be advantageous to make gifts directly to grandchildren, effectively skipping a generation of transfer taxes. Note that some tax regimes may differentiate among recipients, taxing gifts made to family members, for example, at lower rates than gifts made to other parties.

The benefit of early wealth transfers is largely determined by tax codes and life expectancies. Additional issues to consider before making a permanent transfer include 1) the amount of retained wealth needed to ensure the financial security of the primary investor; 2) possible unintended consequences of transferring large amounts of wealth to younger, potentially less mature beneficiaries; and 3) the probable stability or volatility of the tax code. Early transfers implicitly assume that the current tax structure will remain relatively constant through time. If an early gift is made and the transfer tax is later abolished, refunds are unlikely.

4.2.4 *Legal and Regulatory Environment*

In the context of portfolio management for individual investors, legal and regulatory constraints most frequently involve taxation and the transfer of personal property ownership. Legal and regulatory constraints vary greatly from country to country and change frequently. Achieving investment objectives within the constraints of a given jurisdiction frequently requires consultation with local experts, including tax accountants and estate planning attorneys. Whatever a portfolio manager's level of legal and regulatory understanding, she must be careful to avoid giving advice that

5 See Brunel (2002).

would constitute the practice of law (the role of a licensed attorney). To the extent that the manager is acting in a fiduciary capacity (e.g., employed as trustee of a trust), prudent investor rules may apply, depending on the legal jurisdiction.

The Personal Trust The use of trusts to implement investment and estate planning strategies is well established in English and American law, and a basic familiarity with the vocabulary of trusts is often useful in other jurisdictions as well. Typically, a trust is a legal entity established to hold and manage assets in accordance with specific instructions.

The term "personal trust" refers to trusts established by an individual, who is called the "grantor." The trust is a recognized owner of assets and can be subject to taxation in much the same manner that individuals are taxed. To form a trust, the creator (grantor) drafts a trust document defining the trust's purpose and naming a trustee who will be responsible for oversight and administration of the trust's assets. The trustee may or may not be the same person as the grantor. Many banks have "trust departments" that provide trustee services, including trust administration, investment management, and custody of assets. "Trust companies" are non-bank providers of trust services that have been granted trust powers by a government or regulatory body; these companies may or may not be owned by a bank.

The trust is funded when the grantor transfers legal ownership of designated assets to the trust. The assets of the trust can include a wide variety of items that the grantor owns, such as investment securities, residential or commercial real estate, farm or timber land, notes, precious metals, oil and gas leases, and collectibles. The valuation, marketability, and restrictions on sale of such assets can present challenges for the trustee trying to prudently manage the trust's holdings.

Personal trusts are not in and of themselves an investment strategy but rather an important tool for implementing certain aspects of an investment strategy (e.g., gifting). The appeal of personal trusts lies in the flexibility and control with which the grantor can specify how trust assets are to be managed and distributed, both before and after the grantor's demise. The two basic types of personal trusts, revocable and irrevocable, differ largely with respect to the issue of control. In a revocable trust, any term of the trust can be revoked or amended by the grantor at any time, including those terms dealing with beneficiaries, trustees, shares or interests, investment provisions, and distribution provisions. Revocable trusts are often used in place of a will or in combination with a will, because of their tax planning efficiency and the generally lower legal expenses associated with transferring ownership of personal property at the time of the grantor's death. Because the grantor retains control over the trust's terms and assets, she also remains responsible for any tax liabilities, such as income and gains taxes, generated by the trust's assets; trust assets remain subject to any wealth transfer tax due after the grantor's demise (often referred to as estate taxes or death taxes). Upon the grantor's death, the trust can typically no longer be amended; in accordance with the terms of the trust, trust assets either continue under management by a trustee or are distributed outright to the trust's beneficiaries.

In an irrevocable trust, the terms of management during the grantor's life and the disposition of assets upon the grantor's death are fixed and cannot be revoked or amended. The creation of an irrevocable trust is generally considered to be an immediate and irreversible transfer of property ownership, and a wealth transfer tax, sometimes called a gift tax, may have to be paid when the trust is funded. US tax treatment of irrevocable trusts is similar to the tax treatment of individuals. The trust, not the grantor, is responsible for tax liabilities generated by trust assets and for filing its own tax return. The grantor retains no control or ownership interest in the trust, and the trust's assets are no longer considered part of the grantor's estate.

The framework for investment decision-making within a trust can vary significantly, but ultimate responsibility for investment oversight resides with the trustee (or co-trustees, if the trust document names multiple trustees). In revocable trusts, the trustee is often the grantor, who may or may not wish to personally manage the investment portfolio. As trustee of a revocable trust, the grantor may 1) appoint an investment manager, who then acts as an "agent" for the trustee; 2) amend the trust document to include a co-trustee with investment responsibility; or 3) manage the investment process directly. In the first two scenarios, the grantor may require that the agent or co-trustee obtain prior approval from the grantor before executing individual transactions. Requiring such prior approval can present difficulties from an investment management perspective, as no party has full authority to act. Upon the death of the grantor/ trustee, the trust passes authority on to the successor trustee or co-trustees (named in the trust document), who then have responsibility for managing the assets according to the terms of the trust.

The Family Foundation Civil law countries, as found in continental Europe, are characterized by the existence of family foundations. Similar to an irrevocable trust, the foundation is an independent entity, often governed by family members. Such foundations can be part of a multigeneration estate plan and often serve as a vehicle for introducing younger family members to the process of managing family assets.

There are many examples of trusts and foundations with customized terms of distribution. It is important to keep in mind, however, that trusts, foundations, and similar structures are only instruments with which to implement an underlying investment, estate-planning, or tax-saving strategy. Following are examples of how the Ingers might use such instruments:

- **Gifting to Grandchildren**

  Jürgen is currently too young to receive large, direct gifts, but an irrevocable trust might be established for his benefit. The trustee would disburse funds from the trust, in accordance with conditions specified in the trust document by the Ingers. The terms for distribution might limit early access, or allow funding only for specific purposes, such as education expenses. As previously mentioned, generation-skipping gifts may reduce wealth-transfer taxes.

- **Gifting to Children**

  Although the Ingers are eager to provide for the financial security of their children, they may be reluctant to entrust Hans and Christa with the management of large, unconditional transfers of family wealth. Christa does not seem to have the necessary investment skills or experience, and Hans' appetite for risk-taking may leave his parents uneasy. As an alternative to direct transfers, the Ingers could create a trust or foundation and structure the terms of distribution such that lifetime support is assured. The trust or foundation might be instructed to distribute funds based on reasonable need, as defined by the Ingers, or as the children reach specific ages and stages of life.

- **Gifting with Retained Interest**

  Various options exist for creating hybrid structures that provide immediate support for one party but ultimately distribute their assets to a second party. The Ingers might consider a trust in which they retain an ownership interest in any income generated by the trust but give up control over the trust's assets. All income would be distributed to Peter and Hilda, making them the income beneficiaries of the trust. When the income beneficiaries die or have no further claim on income, the trust's remaining assets will be distributed to remaindermen, which might be charities, foundations, or other individuals, including the Ingers' children. Such trusts are generally irrevocable and treated as a deferred gift to the remaindermen. Transfer taxes on the gift's present value may have to

be paid at the time the trust is created. When the remainder beneficiaries are charities or foundations, such arrangements may be referred to as a "charitable remainder trust."

The conflicting needs and interests of income beneficiaries and remaindermen may present the trustee of an irrevocable trust with portfolio management challenges. Trust beneficiaries will often pressure the trustee to favor either current income or long-term growth, depending on their beneficial interest. Income beneficiaries will typically desire that the trustee seek to maximize current income through the selection of higher income-producing assets. Remainderman beneficiaries will favor investments with long-term growth potential, even if this reduces current income. The trustee has the responsibility to consider the needs of both groups, under guidelines and criteria provided by the trust document. Although many older trust documents commonly define income as "interest, dividends and rents," the trend is to adopt a total return approach, consistent with modern portfolio management, that allows distributions from realized capital gains as well as traditional "income" sources.

Jurisdiction Individual investors may enjoy a limited degree of flexibility in determining the jurisdiction in which their income and assets will be taxed. Some countries have both national and regional tax codes. By choosing to live in a region with low tax rates, the investor may be able to reduce his tax liability. Generally speaking, however, all investment returns (including "offshore" investments) are subject to taxation in the investor's country of citizenship or residence. The same is true for trusts, which are taxed in accordance with their "situs" (locality under whose laws the trust operates).

"Offshore" investments and trusts in "tax friendly" countries typically offer some measure of enhanced privacy, asset protection, and estate planning advantages, as well as possible opportunities to reduce tax liabilities. If tax reduction is the investor's only concern, however, an alternative domestic tax strategy may prove more efficient. Again, investors are generally required to declare and pay taxes on returns received from offshore investments, regardless of whether return data are disclosed by the host country.

4.2.5 *Unique Circumstances*

Not surprisingly, individual investors often present their investment advisors with a wide range of unique circumstances that act to constrain portfolio choices. Such constraints might include guidelines for social or special purpose investing, assets legally restricted from sale, directed brokerage arrangements, and privacy concerns. It is also appropriate to list here any assets held outside the investment portfolio and not otherwise discussed in the IPS.

In the Ingers' case, a unique circumstance exists in the self-imposed limitation on acceptable investments. In the 1960s, Peter and several of his friends lost money in equity investment schemes. Since that time, he has had a bias against putting his money in the stock market. Peter does feel quite comfortable with investments in real estate, however, and mentions that he has always been quite successful and comfortable investing in real estate projects. After several "educational" discussions, Peter still insists that he wants only a limited exposure to common stock investments.

4.2.6 *Peter and Hilda Inger's Investment Policy Statement*

Using all of the information she has gathered about Peter and Hilda Inger, Jourdan formulates an investment policy statement for them. Exhibit 8 displays the IPS.

Exhibit 8 Investment Policy Statement Prepared for Peter and Hilda Inger

I. Background

Peter and Hilda Inger own and operate IngerMarine, a producer of luxury pleasure boats sold worldwide. The Ingers are eager to convert their equity stake in IngerMarine to cash and have received bids indicating probable proceeds to Peter and Hilda of €52 million, net of taxes. They consider everyone in their family to be financially secure and wish to preserve that security.

The Ingers' family consists of their son Hans, daughter Christa, and grandson Jürgen. Hans is a senior vice president at IngerMarine, specializing in design. Christa is an artist and a single mother to Jürgen.

II. Return Objectives

Longer term, the Ingers wish to assure not only their own financial security and standard of living but that of their children as well. The investment portfolio must replace Peter's salary, which currently covers the couple's annual expenses and gifting. It should also provide a return sufficient to offset the effect of inflation (assumed to approximate 3 percent annually) on what will ultimately be their children's inheritance.

Required return[a]	1.17%
Expected inflation	3.00%
Return objective	4.17%

[a] Expected cash flow requirement in Year 2 divided by investable assets (€493,949/€42,340,438).

III. Risk Tolerance

Ability

Following the sale of IngerMarine, the Ingers' investment portfolio will be able to accommodate considerable volatility without endangering its ability to meet their financial objectives. Given Peter and Hilda's cash flow circumstances, their likely wealth position after the IngerMarine sale, and their postretirement objectives, their ability to take risk appears to be "above average."

Willingness

The Ingers are relatively conservative by nature. Personality typing of the Ingers identifies Peter as "methodical" and Hilda as "individualist." Peter seems to have managed IngerMarine with a bias toward low debt and stable earnings rather than rapid expansion. The Ingers have historically held a large portion of their liquid assets in money market accounts. Furthermore, the Ingers do not want a portfolio value decline of more than 10 percent in nominal terms in any given 12-month period. Their willingness to take risk is generally "below average."

To reconcile the portfolio's considerable ability to accommodate risk and the Ingers' apparent preference for lower risk, their overall risk tolerance is described in this policy statement as "moderate" or "average."

IV. Constraints

Liquidity

The Ingers have multiple short- to intermediate-term liquidity constraints:

- Construction of a second home (next one to three years) € 7,000,000
- Probable investment in the magazine *Exteriors* (within one year) € 5,000,000
- Emergency reserve € 1,000,000
- Annual expenses (estimated to rise with inflation) € 500,000
- Annual support for grandson (estimated to rise with inflation) € 15,000
- Illiquid holding: IngerMarine currently represents a disproportionately large and illiquid part of the Ingers' net worth.
- Illiquid holding: After the sale of IngerMarine and the construction of their second home, the Ingers will have approximately 16 percent of their net worth committed to personal residences.

Time Horizon

Aside from the liquidity events listed above, the Ingers have a long-term, multistage time horizon.

Taxes

The Ingers are subject to their country's tax code and wish to pursue strategies that maximize the wealth passed on to their children.

Legal and Regulatory Environment

Any Retirement Savings Accounts created by the Ingers must be managed in compliance with prevalent fiduciary standards for diversification and prudence.

Unique Circumstances

- The critical component of Peter and Hilda's retirement plan is the disposition of IngerMarine stock to a willing buyer. This situation should be continually monitored to ensure that the assumptions made in any plan remain valid.
- The Ingers' second home will represent an illiquid portion of their total net worth. They have discussed the possible risks and have decided to not consider the home as part of their actively managed investment portfolio. The second home will not carry a mortgage.
- Estate Planning Considerations: 1) *Gifts to children.* The Ingers will consider various means of tax-efficiently securing their children's financial security, including outright gifts and the creation of special purpose trusts or foundations. 2) *Charitable gifts.* In addition to outright gifts, the Ingers will consider special purpose trusts or foundations, naming selected charities as remaindermen and family members as income beneficiaries.
- The complex family changes that are about to occur suggest the need for increased flexibility in whatever investment strategy is adopted, to accommodate potentially frequent and abrupt shifts in attitudes and circumstances.
- The Ingers want only limited exposure to common stock investments.
- The Ingers want to maintain a fixed long-term holding of €500,000 in gold bullion.

5 AN INTRODUCTION TO ASSET ALLOCATION

In establishing a strategic asset allocation policy, the advisor's challenge is to find a set of asset-class weights that produce a portfolio consistent with the individual investor's return objective, risk tolerance, and constraints. This task must be completed from a taxable perspective, taking into consideration 1) after-tax returns, 2) the tax consequences of any shift from current portfolio allocations, 3) the impact of future rebalancing, and 4) asset "location." The issue of asset location results from the individual investor's ownership of both taxable and tax-deferred investment accounts—clearly, nontaxable investments should not be "located" in tax-exempt accounts.

In the balance of the reading, we will illustrate the basic concepts of asset allocation for individual investors with a new case study, followed by a continuation of the Inger case. The reading concludes with a discussion of probabilistic analysis, as applied to individual investor asset allocation and retirement planning.

5.1 Asset Allocation Concepts

This section illustrates how to arrive at an appropriate strategic asset allocation (or set of approximately equivalent allocations) through a process of elimination. Investment objectives and constraints must be formulated prior to addressing asset allocation.

Example 1 introduces a new case study and provides the background information needed to establish asset allocation guidelines for a new private client, Susan Fairfax. The discussion then returns to Peter and Hilda Inger, formulating a strategic asset allocation appropriate to the Ingers' IPS.

EXAMPLE 1

Asset Allocation Concepts (1)

Susan Fairfax is president of Reston Industries, a US-based company whose sales are entirely domestic and whose shares are listed on the New York Stock Exchange. The following additional facts reflect her current situation:

- Fairfax is single and 58 years old. She has no immediate family, no debts, and does not own a residence. She is in excellent health and covered by Reston-paid health insurance that continues after her expected retirement at age 65.
- Her base salary of $500,000 a year, inflation-protected, is sufficient to support her present lifestyle but can no longer generate any excess for savings.
- She has $2,000,000 of savings from prior years held in the form of short-term instruments.
- Reston rewards key employees through a generous stock-bonus incentive plan, but the company provides no pension plan and pays no dividend.
- Fairfax's incentive plan participation has resulted in her ownership of Reston stock worth $10 million (current market value). The stock was received tax-free but is subject to tax at a 35 percent rate (on entire proceeds) if sold. She expects to hold the Reston stock at least until her retirement.

- Her present level of spending and the current annual inflation rate of 4 percent are expected to continue after her retirement.
- Fairfax is taxed at 35 percent on all salary, investment income, and realized capital gains. Her composite tax rate is assumed to continue at this level indefinitely.

Fairfax's orientation is patient, careful, and conservative in all things. She has stated that an annual after-tax real total return of 3 percent would be completely acceptable to her, if it were achieved in a context whereby an investment portfolio created from her accumulated savings was unlikely to decline by more than 10 percent in nominal terms in any given 12-month period.

Working with Fairfax, HH Advisors (HH) created the following draft version of an investment policy statement.

Investment Policy Statement for Susan Fairfax

Overview

Ms. Fairfax is 58 years old and has seven years until her planned retirement. She has a fairly lavish lifestyle but few financial worries: Her salary pays all current expenses, and she has accumulated $2 million in cash equivalents from savings in previous years (the "Savings Portfolio"). Her health is excellent, and her employer-paid health insurance coverage will continue after retirement. She has sought professional advice to begin planning for her investment future, a future that is complicated by ownership of a $10 million block of company stock. The stock is listed on the NYSE, pays no dividends, and has a zero-cost basis for tax purposes. All salary, investment income (except interest on municipal bonds), and realized capital gains are taxed to Ms. Fairfax at a 35 percent rate. This tax rate and a 4 percent annual inflation rate are expected to continue into the future. Ms. Fairfax would accept a 3 percent real, after-tax return from the investment portfolio to be formed from her Savings Portfolio, if that return could be obtained with only modest downside risk (i.e., less than a 10 percent annual decline). She describes herself as being conservative in all things.

Objectives

- **Return Requirement**

  Ms. Fairfax's need for portfolio income begins seven years from now, when her salary stops on the day she retires. The interim return focus for her investment portfolio (to be created from the Savings Portfolio) should be on growing the portfolio's value in a way that provides protection against loss of purchasing power. Her 3 percent real, after-tax return preference implies a gross total return requirement of at least 10.8 percent, assuming her investments are fully taxable (as is the case now) and assuming 4 percent inflation and a 35 percent tax rate. For Ms. Fairfax to maintain her current lifestyle, she must generate $\$500{,}000 \times (1.04)^7$, or $658,000, in annual, inflation-adjusted income when she retires. If the market value of Reston's stock does not change, and if she has been able to earn a 10.8 percent return on the investment portfolio (or 7 percent nominal after-tax return = $\$2{,}000{,}000 \times (1.07)^7 = \$3{,}211{,}500$), she should accumulate $13,211,500 by retirement age. To generate $658,000, a return on $13,211,500 of approximately 5.0 percent is needed. If she sells her position in Reston Industries leaving $(1 - 0.35)(\$10{,}000{,}000) + \$3{,}211{,}500 = \$9{,}711{,}500$ to invest, a return of $\$658{,}000/\$9{,}711{,}500 =$ 6.8 percent is needed.
- **Risk Tolerance**

Ms. Fairfax has a below-average *willingness* to take risk, as evidenced by her statement that in any given year, she does not want to experience a decline of more than 10 percent in the value of the investment portfolio. This desire indicates that her portfolio should have below-average risk exposure to minimize its downside volatility. A below-average willingness is also suggested by her generally careful and conservative orientation. Her overall wealth position, however, suggests an above-average *ability* to take risk. Because of her preferences and the nondiversified nature of the total portfolio, an average to below-average risk tolerance objective is appropriate for the portfolio.

It should be noted that truly meaningful statements about the risk of Ms. Fairfax's total portfolio are tied to assumptions about the volatility of Reston's stock (if it is retained) and about when and at what price the Reston stock will be sold. Because the Reston holding constitutes 83 percent of Ms. Fairfax's total portfolio, it will largely determine the large risk she is likely to experience as long as the holding remains intact.

Constraints

- **Time Horizon**

  Ms. Fairfax has a multistage time horizon. The first stage is the intermediate-term period, seven years, until her retirement. The second stage is relatively long term, representing Ms. Fairfax's life expectancy of perhaps 30 years or more. During the first stage, Ms. Fairfax should arrange her financial affairs in preparation for the balance of the second stage, a retirement period of indefinite length. Of the two horizons, the second horizon is the dominant one because it is during this period that her assets must fulfill their primary function of funding her expenses, in an annuity sense, in retirement.

- **Liquidity**

  With liquidity defined either as income needs or as cash reserves to meet emergency needs, Ms. Fairfax's immediate liquidity requirement is minimal. She has $500,000 of salary available annually, healthcare costs are not a concern, and she has no planned needs for cash from the portfolio.

- **Taxes**

  Ms. Fairfax's taxable income (salary, taxable investment income, and realized capital gains on securities) is taxed at a 35 percent rate. Careful tax planning and coordination of tax policy with investment planning is required. All else equal, investment strategies should seek to maximize after-tax income and defer the realization of taxable gains. Sale of the Reston stock will have sizeable tax consequences because Ms. Fairfax's cost basis is zero; special planning will be needed for this sale. Ms. Fairfax may want to consider some form of charitable giving, either during her lifetime or at death. She has no immediate family, and no other potential gift or bequest recipients are known.

- **Laws and Regulations**

  Ms. Fairfax should be aware of and abide by all laws and regulations relating to her "insider" status at Reston and her holding of Reston stock. Although no trust instrument is in place, if Ms. Fairfax's future investing is handled by an investment advisor, the responsibilities associated with the Prudent Person Rule will come into play, including the responsibility for investing in a diversified portfolio.

- **Unique Circumstances and/or Preferences**

  Clearly, the value of the Reston stock dominates Ms. Fairfax's portfolio value. A well-defined exit strategy must be developed for the stock as soon as is practical and appropriate. If the stock's value increases, or at least does not decline before the holding is liquidated, Ms. Fairfax's present lifestyle can be sustained after retirement. A significant and prolonged setback for Reston Industries, however, could have disastrous consequences for the portfolio. Such circumstances would require a dramatic downscaling of Ms. Fairfax's lifestyle or generation of alternate sources of income to maintain her current lifestyle. A worst-case scenario might be characterized by a 50 percent drop in the market value of Reston's stock and a subsequent sale of the stock, with proceeds subject to a 35 percent tax. The net proceeds from such a sale would be $10,000,000 × 0.5 × (1 – 0.35) = $3,250,000. When added to the Savings Portfolio, Ms. Fairfax's total portfolio value would be $5,250,000. For this portfolio to generate $658,000 in income, a 12.5 percent return would be required.

  Ms. Fairfax will need to seek legal estate planning assistance, especially if she wishes to establish a gifting program.

Synopsis

The policy governing investments in Ms. Fairfax's Savings Portfolio shall emphasize realizing a 3 percent real, after-tax return from a mix of high-quality assets representing, in aggregate, no more than average, and preferably below average, risk. Ongoing attention shall be given to Ms. Fairfax's tax planning and legal needs, her progress toward retirement, and the value of her Reston stock. The Reston stock holding is a unique circumstance of decisive significance; corporate developments should be monitored closely, and protection against the effects of a worst-case scenario should be implemented as soon as possible.

In setting asset allocation guidelines for Ms. Fairfax, one of the constraints that HH Advisors must address is her concern regarding negative portfolio returns. So-called "safety-first" rules[6] provide a means of reasonably approximating and controlling downside risk; HH uses the following safety-first guideline in establishing an asset allocation policy for Ms. Fairfax.

If:

- the portfolio has an important or dominant equity component,
- the portfolio does not make significant use of options, and
- the investment horizon for the shortfall risk concern is not short term;

Then:

the normal distribution may reasonably be used as an approximate model of portfolio returns.

Fama (1976) and Campbell, Lo, and MacKinlay (1997), for example, provide evidence about the normal distribution as applied to US common stocks. A 2.5 percent probability of failing to meet a return threshold may be acceptable for many clients.

6 Elton, Gruber, Brown, and Goetzmann (2003) and DeFusco et al. (2004) discuss safety-first rules.

For a normal distribution of returns, the probability of a return that is more than two standard deviations below the mean or expected return is approximately 2.5 percent. If the client is more (less) risk averse, the advisor can choose a larger (smaller) number for standard deviation. Therefore, if we subtract two standard deviations from a portfolio's expected return and the resulting number is above the client's return threshold, the client may find the resulting portfolio acceptable. If the resulting number is below the client's threshold, the portfolio may be unsatisfactory. Of course, the client may have other or different downside risk objectives than the two-standard-deviation approach we have used to illustrate this concept.

Once return and risk objectives and constraints have been established, an advisor sometimes will include a statement of the client's strategic asset allocation as part of the IPS. HH now turns to the task of establishing an appropriate strategic asset allocation for the investment portfolio to be created from Ms. Fairfax's existing savings (the "Savings Portfolio"). An HH analyst has developed the five potential asset allocations presented in Exhibit 9 and Exhibit 10. The analyst has commented that there is more uncertainty in the expectational data for REITs than for small- or large-cap US stocks.

Exhibit 9 Proposed Asset Allocation Alternatives

Asset Class	Projected Total Return (%)	Expected Standard Deviation (%)	Allocation				
			A (%)	B (%)	C (%)	D (%)	E (%)
Cash equivalents	4.5	2.5	10	20	25	5	10
Corporate bonds	6.0	11.0	0	25	0	0	0
Municipal bonds	7.2	10.8	40	0	30	0	30
Large-cap US stocks	13.0	17.0	20	15	35	25	5
Small-cap US stocks	15.0	21.0	10	10	0	15	5
International stocks (EAFE)	15.0	21.0	10	10	0	15	10
Real estate investment trusts (REITs)	10.0	15.0	10	10	10	25	35
Venture capital	26.0	64.0	0	10	0	15	5
Total			100	100	100	100	100

Summary Data	Allocation				
	A	B	C	D	E
Expected total return	9.9%	11.0%	8.8%	14.4%	10.3%
Expected after-tax total return	7.4%	7.2%	6.5%	9.4%	7.5%
Expected standard deviation	9.4%	12.4%	8.5%	18.1%	10.1%
Sharpe ratio	0.574	0.524	0.506	0.547	0.574

Exhibit 10 Asset Allocation Alternatives: Nominal and Real Expected Returns

	Allocation				
Return Measure	**A (%)**	**B (%)**	**C (%)**	**D (%)**	**E (%)**
Nominal expected return	9.9	11.0	8.8	14.4	10.3
Expected real after-tax return	3.4	3.2	2.5	5.4	3.5

The process of selecting the most satisfactory from among several potential strategic asset allocations, both in the case of Susan Fairfax and for individual investors generally, consists of the following steps:

1. Determine the asset allocations that meet the investor's return requirements. In carrying out this step, the investment advisor should compare expected returns for the different asset allocations on a basis consistent with the IPS. The policy statement might, for example, set return requirements in real, after-tax terms. In that case, the advisor would adjust for the effects of taxes and expected inflation before deciding which allocations meet the investor's return requirement.
2. Eliminate asset allocations that fail to meet quantitative risk objectives or are otherwise inconsistent with the investor's risk tolerance. For example, an investor may have risk objectives related to the expected standard deviation of return, worst-case return, or any of several other downside risk concepts (as is true for Fairfax). On a long-term basis, an individual investor will be unable to apply an asset allocation that violates a risk objective.
3. Eliminate asset allocations that fail to satisfy the investor's stated constraints. For example, an investor may have a liquidity requirement that is appropriately met by holding a certain level of cash equivalents, and allocations must satisfy that constraint. Unique circumstances may also make certain allocations unacceptable to the investor.
4. Evaluate the expected risk-adjusted performance and diversification attributes of the asset allocations that remain after Steps 1 through 3 to select the allocation that is expected to be most rewarding for the investor.

Example 2 applies these four steps to the Fairfax case.

EXAMPLE 2

Asset Allocation Concepts (2)

- **Step 1: Return Requirement**

  Fairfax has stated that she is seeking a 3 percent real, after-tax return. Exhibit 9 provides nominal, pretax figures, which HH must adjust for both taxes and inflation to determine which portfolios meet Fairfax's return guideline. A simple approach is to subtract the municipal bond return component from the stated return, then subject the resulting figure to a 35 percent tax rate and add back tax-exempt municipal bond income. This calculation produces a nominal, after-tax return, from which the expected 4 percent per year inflation rate is subtracted to arrive at the real, after-tax return. For example, Allocation A has an expected real after-tax return of 3.4 percent, calculated by $[0.099 - (0.072 \times 0.4)] \times (1 - 0.35) + (0.072 \times 0.4) - 0.04 = 0.034 = 3.4$ percent.

Alternately, the return can be calculated by multiplying the taxable returns by their allocations, summing these products, adjusting for the tax rate, adding the result to the product of the nontaxable (municipal bond) return and its allocation, and deducting the inflation rate from this sum. For Allocation A, [(0.045 × 0.10) + (0.13 × 0.2) + (0.15 × 0.1) + (0.15 × 0.1) + (0.1 × 0.1)] × (1 − 0.35) + (0.072 × 0.4) − (0.04) = 0.035 = 3.5 percent.

Exhibit 10 presents the allocations' expected nominal returns—without adjustment for either inflation or taxes—and their expected real after-tax returns calculated by the first of the above approaches. From Exhibit 10, the HH analyst notes that Allocations A, B, D, and E meet Fairfax's real, after-tax return objective of 3 percent a year.

- **Step 2: Risk Tolerance**

  Fairfax has stated that a worst-case nominal return of −10 percent in any 12-month period would be acceptable. As discussed above, the expected return less two times the portfolio risk (expected standard deviation) is a reasonable baseline measure of shortfall risk. If the resulting number is above the client's threshold return level, the criterion is met. Two of the remaining four allocations—A and E—meet the risk tolerance criterion.

	Allocation				
Parameter	**A (%)**	**B (%)**	**C (%)**	**D (%)**	**E (%)**
Expected return	9.9	11.0	8.8	14.4	10.3
Exp. standard deviation	9.4	12.4	8.5	18.1	10.1
Worst-case return	−8.9	−13.8	−8.2	−21.8	−9.9

- **Step 3: Constraints**

  Portfolios A and E both meet the stated constraints of Fairfax and neither is eliminated in this step.

- **Step 4: Risk-Adjusted Performance and Diversification Evaluation**

  The recommended allocation is A. The allocations that are expected to meet both the minimum real, after-tax objective and the maximum risk tolerance objective are A and E. Both allocations have similar Sharpe ratios and expected real after-tax returns. Both A and E have large exposures to municipal bonds; Allocation E, however, has a large position in REIT stocks, whereas Allocation A's counterpart large equity allocation is to a diversified portfolio of large- and small-cap domestic stocks. Allocation A provides greater diversification through its large and small stock representation, as opposed to the specialized nature of REIT stocks. Furthermore, because of the great uncertainty in the expectational data for REIT stocks compared with small- and large-cap stocks, we can be more confident in selecting Allocation A that Fairfax's return and risk objectives will be met. Therefore, HH Advisors specifies Allocation A as Fairfax's strategic asset allocation.

The Susan Fairfax case in Examples 1 and 2 presented a process for selecting the strategic asset allocation most appropriate to her objectives and constraints. Example 3 contrasts the asset allocation problem of Peter and Hilda Inger to that of Fairfax.

EXAMPLE 3

Asset Allocation for Peter and Hilda Inger

To recap some important facts presented in the family's IPS, the Ingers have average risk tolerance in general but are relatively averse to common stock investments as a result of Peter's prior negative experience. Peter, however, has always been successful and comfortable investing in real estate projects (even those constituting greater overall risk than corresponding equity investments). Also, the Ingers do not wish to experience a loss greater than 10 percent, in nominal terms, in any given 12-month period. The Ingers' required return was calculated as their estimated disbursements, including taxes, beginning in Year 2, divided by their investable assets at the end of Year 1 (€493,949/€42,340,438 = 1.17 percent). Adding expected annual inflation of 3 percent, the Ingers' stated return objective is 4.17 percent.

The critical component of Peter and Hilda's retirement plan is the disposition of IngerMarine stock to a willing buyer. If the sale is not realized, their investment objectives and the associated strategic asset allocation will both require review. We have discussed certain principles of asset allocation for individual investors and illustrated their application in previous examples. In terms of the IPS and asset allocation, what similarities and contrasts would an investment advisor observe in applying the methods used for Fairfax in Examples 1 and 2 to the Ingers? Among the key observations are the following:

- **Risk Tolerance and Return Objective**

  In consultation with the client, the investment advisor needs to develop an IPS prior to embarking on asset allocation. The client's risk tolerance and return objective are important parts of an IPS, and any asset allocation must be appropriate for these objectives. The Ingers want a chosen asset allocation to satisfy a downside risk constraint of –10 percent, just as in the Fairfax case. Yet because the Ingers' objective of a 1.17 percent real, after-tax return is less than one half of Fairfax's in magnitude, all else being equal we would expect a wider variety of asset allocations to satisfy the Ingers' requirements.

- **Asset Class Selection**

  As with Fairfax, the Ingers' investment advisor must establish an appropriate set of asset classes. The asset classes in Exhibit 9 have a US bias. Eurozone equities and fixed-income asset classes for the Ingers would play a similar role to US equities and US fixed income classes for Fairfax, because the Ingers' consumption is in euros. US equities represent a substantial proportion of the market value of world equities, and one might expect them to play a meaningful role in the Ingers' portfolio. The advisor would need to respect Peter's aversion to holding equities, however. On the other hand, because of Peter's prior experience and success with real estate projects, the Ingers might include more than one real estate investment asset type among those permissible for investment. The inclusion of a wide array of asset classes brings diversification benefits, as long as portfolio risk and expected return characteristics remain consistent with the investment policy statement. Emerging Markets, Commodities, and Private Capital Ventures are examples of asset classes that may be strong diversifiers but that also have higher volatility and less liquidity than traditional equity and fixed-income investments. Like Fairfax, the Ingers are taxable investors; if possible in their domestic market, the Ingers should probably also include tax-exempt investments as a permissible asset class.

- **Taxation and Asset Allocation Simulation**

  As in the Fairfax case, the Ingers' advisor should make an asset allocation decision in real, after-tax terms. This observation raises the point that expected after-tax returns for the Ingers will be computed using a tax rate different from Fairfax's, and such returns would incorporate their own expectations concerning future inflation rates.

  Taxes present one of the more vexing challenges in asset allocation for private wealth clients, because taxes depend heavily on the regulatory environment and the investor's unique set of financial circumstances. In modeling asset allocation scenarios, the advisor must address the question of whether to use after-tax return assumptions for individual asset classes or to instead use pretax assumptions and apply taxes to the resulting investment outcomes. Running simulations using after-tax return assumptions can be a daunting task—listed below are some of the hurdles in configuring asset allocation scenarios using after-tax estimates.

  - **Location**

    After-tax risk and return assumptions will be influenced by an investment's "location." After-tax returns on common stocks located in a tax-sheltered retirement account, for example, may differ distinctly from the return on common stocks located in an unsheltered account. Consequently, an advisor may need to break down the traditional asset classes into multiple, location-specific subclasses, each with its own risk and return profile.

  - **Tax Conventions**

    Differing tax treatment of investment returns, depending for example on holding period or method of dissolution, may again create multiple risk and return characteristics for a given asset class. Securities held for a required minimum time period may be taxed at different, often more favorable rates. Assets ultimately gifted to charity or family members may be taxed favorably or not at all.

  - **Investment Instruments**

    Investment securities whose tax characteristics are easily recognizable and predictable today may change dramatically over time, through legislative initiative or tax authority interpretations.

5.2 Monte Carlo Simulation in Personal Retirement Planning

Monte Carlo simulation is described in detail in the reading on asset allocation. Here we focus on its applicability to personal retirement planning. With the introduction of Monte Carlo simulation methodologies, the technology of retirement planning for individuals now rivals that of corporate pension planning. Monte Carlo analysis is computer and data intensive, so its availability for personal retirement planning at affordable cost is a direct result of the availability of inexpensive computing power. Such methodologies are now readily available to individual investors and their investment managers, from a variety of vendors.[7]

7 Wei Hu and Robert L. Young, CFA, of Financial Engines Inc. made important contributions to our presentation of Monte Carlo simulation for retirement planning in this section.

Monte Carlo simulation is the process by which probability "distributions" are arrayed to create path-dependent scenarios to predict end-stage results.[8] The methodology is useful when trying to forecast future results that depend on multiple variables with various degrees of volatility. Its use in projecting retirement wealth is valuable because the prediction of future wealth depends on multiple factors (e.g., investment returns, inflation, etc.), each with a unique distribution of probable outcomes. Monte Carlo simulation is generally superior to steadystate, or deterministic, forecasting because it incorporates the consequences of variability across long-term assumptions and the resulting path dependency effect on wealth accumulation. Merely using long-term averages for capital market returns or inflation assumptions oversimplifies their variability and leads to the clearly unrealistic implication of linear wealth accumulation. There is also an inherent assumption when using deterministic forecasting that performance in future periods will more or less replicate historical performance. Monte Carlo estimation, in contrast, allows for the input of probability estimates over multiperiod time frames and generates a probability distribution of final values rather than a single point estimate. This approach allows the investment advisor to view projections of possible best- and worst-case scenarios and leads to better financial planning over long time frames.

The ultimate objective of probabilistic approaches, such as Monte Carlo simulation, for investment planning is to improve the quality of managers' recommendations and investors' decisions. A brief look at the distinction between traditional deterministic analysis and probabilistic analysis reveals how the latter approach seeks to achieve that objective. In both approaches, the individual supplies a similar set of personal information, including age, desired retirement age, current income, savings, and assets in taxable, tax deferred, and tax-exempt vehicles. In a deterministic analysis, single numbers are specified for interest rates, asset returns, inflation, and similar economic variables. In a Monte Carlo or probabilistic analysis, a probability distribution of possible values is specified for economic variables, reflecting the real-life uncertainty about those variables' future values.

Suppose an individual investor is 25 years away from her desired retirement age. A deterministic retirement analysis produces single number estimates of outcomes for stated objectives, such as retirement assets and retirement income at the end of 25 years. Using the same inputs, a Monte Carlo analysis produces probability distributions for those objective variables by tabulating the outcomes of a large number (often 10,000) of simulation trials, each trial representing a possible 25-year experience. Each simulation trial incorporates a potential blend of economic factors (interest rates, inflation, etc.), in which the blending reflects the economic variables' probability distributions.

Consequently, whereas deterministic analysis provides a yes/no answer concerning whether the individual will reach a particular goal for retirement income, or perhaps retirement wealth, mirroring a single set of economic assumptions, a Monte Carlo analysis provides a probability estimate, as well as other detailed information, that allows the investor to better assess risk (for example, percentiles for the distribution of retirement income). Thus Monte Carlo analysis is far more informative about the risk associated with meeting objectives than deterministic analysis. The investor can then respond to such risk information by changing variables under her control. An advisory module may present a range of alternative asset allocations and the associated probabilities for reaching goals and objectives.

8 Path dependency exists when the outcome in a given period is influenced or constrained by the outcomes of prior events.

A probabilistic approach conveys several advantages to both investors and their investment advisors. First, a probabilistic forecast more accurately portrays the risk–return tradeoff than a deterministic approach. Until recently, advisors nearly exclusively used deterministic projections to inform their recommendations and communicate with their clients. Unfortunately, such projections cannot realistically model how markets actually behave. The probability of observing a scenario in which the market return is constant each year is effectively zero. Fundamentally, deterministic models answer the wrong question. The relevant question is not "How much money will I have if I earn 10 percent a year?" but rather "Given a particular investment strategy, what is the likelihood of achieving 10 percent a year?" By focusing on the wrong question, deterministic models can fail to illustrate the consequences of investment risk, producing, in effect, a misleading "return–return" tradeoff in investors' minds whereby riskier strategies are always expected to produce superior long-term rewards.

In contrast, a probabilistic forecast vividly portrays the actual risk–return tradeoff. For example, an investor considering placing a higher percentage of his portfolio in equities might be told that the average forecast return of the S&P 500 Index is 13 percent. Given an average forecast money market return of 5 percent, it may seem obvious that more equity exposure is desirable. This choice, however, should take into account the risk that the S&P 500 will not achieve its average return every year. Moreover, the median simulation outcome of the S&P 500, using the average return of 13 percent, is likely to be substantially lower because of return volatility. For example, a 20-year forecast of $1,000 invested in the S&P 500, using a riskless average return of 13 percent, yields ending wealth of $11,500. If a simulation is performed assuming normally distributed returns with an annual standard deviation of 20 percent, the median wealth after 20 years is only $8,400. In addition, a simulation-based forecast shows that there is substantial downside risk: The fifth percentile of wealth after 20 years is only approximately $2,000, even before adjusting for inflation.

A second benefit of a probabilistic approach is that a simulation can give information on the possible tradeoff between short-term risk and the risk of not meeting a long-term goal. This tradeoff arises when an investor must choose between lowering short-term volatility on one hand and lowering the portfolio's long-term growth because of lower expected returns on the other hand.

Third, as already discussed, taxes complicate investment planning considerably by creating a sequential problem in which buy and sell decisions during this period affect next-period decisions through the tax implications of portfolio changes. Through its ability to model a nearly limitless range of scenarios, Monte Carlo analysis can capture the variety of portfolio changes that can potentially result from tax effects.

Finally, an expected value of future returns is more complicated than an expected value of concurrent returns, even in the simplest case of independent and normally distributed returns. For concurrent returns, the expected portfolio return is simply the weighted sum of the individual expected returns, and the variance depends on the individual variances and covariances, leading to the benefits of diversification with lower covariances. In this case, the $1 invested is simply divided among several investment alternatives. The future return case, however, involves a multiplicative situation; for example, the expected two-period return is the product of one plus the expected values of the one-period returns, leading to the importance of considering expected geometric return. As Michaud (1981) demonstrates, the expected geometric return depends on the horizon of the investment. The stochastic nature of the problem can be summarized by recognizing that the $1 invested now will then be reinvested in the next period and possibly joined by an additional $1 investment. This scenario clearly differs from the simple one-period case of spreading the dollar among several asset classes. Again, Monte Carlo analysis is well suited to model this stochastic process and its resulting alternative outcomes.

Monte Carlo simulation can be a useful tool for investment analysis but like any investment tool it can be used either appropriately or inappropriately. What should investors and managers know about a particular Monte Carlo product in order to be confident that it provides reliable information? Unfortunately, not all commercially available Monte Carlo products generate equally reliable results, so users should be aware of product differences that affect the quality of results.

First, any user of Monte Carlo should be wary of a simulation tool that relies only on historical data. History provides a view of only one possible path among the many that might occur in the future. As previously mentioned, it is difficult to estimate the expected return on an equity series using historical data, because the volatility of equity returns is large in relation to the mean. For example, suppose we are willing to assume that the expected return of the S&P 500 is equal to the average historical return. Annual data from 1926 through 1994 would yield an average return of 12.16 percent. Adding just five more years of data, however, would produce an average return of 13.28 percent. For a 20-year horizon, this relatively small adjustment in the input data would lead to a difference of more than 20 percent in ending wealth, given returns every year that were equal to the assumed average.

Second, a manager who wants to evaluate the likely performance of a client's portfolio should choose a Monte Carlo simulation that simulates the performance of specific investments, not just asset classes. Although asset class movements can explain a large proportion of, for example, mutual fund returns, individual funds can differ greatly in terms of their performance, fees, fund-specific risk, and tax efficiency. Failing to recognize these factors can yield a forecast that is far too optimistic. As an example of how much fees can affect performance, consider the case of a hypothetical S&P 500 index fund that charges an annual fee of 60 basis points; expected return is 13 percent with annual standard deviation of 20 percent and normally distributed returns, and capital gains are taxed at 20 percent. A Monte Carlo simulation shows that a $1,000 investment will grow to a median after-tax wealth of $6,200 after 20 years, if that fund pays no short-term distributions. In contrast, an investor with access to an institutional fund that charges only 6 basis points will see her after-tax wealth grow to a median of $6,800 after 20 years.

Third, any Monte Carlo simulation used for advising real-world investors must take into account the tax consequences of their investments. Monte Carlo simulation must and can be flexible enough to account for specific factors such as individual-specific tax rates, the different treatment of tax-deferred versus taxable accounts, and taxes on short-term mutual fund distributions. To understand the importance of short-term income distributions, take the previous example of the institutionally priced index fund. If the same fund were to pay half of its annual return as a short-term distribution taxed at a rate of 35 percent, the $6,800 median wealth after 20 years would shrink to just $5,600.

Certainly, no forecasting tool is perfect, and Monte Carlo simulation has drawbacks that create challenges in relying on it solely as a window to the future. Inputting distributions in determining probability outcomes for the simulations can be biased by historical perspective and the perceptions of the analyst. The process can be quite rigorous and still produce estimates that vary widely from actual results.

SUMMARY

This reading has presented an overview of portfolio management for individual investors, including the information-gathering process, situational and psychological profiling of clients, formulation of an investment policy statement, strategic asset allocation, and the use of Monte Carlo simulation in personal retirement planning.

- Situational profiling seeks to anticipate individual investors' concerns and risk tolerance by specifying the investor's source of wealth, measure or adequacy of wealth in relationship to needs, and stage of life.
- Psychological profiling addresses human behavioral patterns and personality characteristics and their effect on investment choices. It is particularly important in assessing risk tolerance.
- Underlying behavioral patterns often play an important role in setting individual risk tolerance and return objectives.
- Based on their responses to a questionnaire, individual investors may be classified into descriptive personality types, such as *cautious*, *methodical*, *spontaneous*, or *individualist*.
- Using the results of situational and psychological profiling, and the financial information gathered in the interviewing process, an advisor can formulate an investment policy statement.
- A carefully formulated IPS serves as the keystone to the relationship between investor and investment advisor. The process of creating an IPS mirrors the process of portfolio management. The policy statement reconciles investment goals with the realities of risk tolerance and investment constraints, resulting in operational guidelines for portfolio construction and a mutually agreed-upon basis for portfolio monitoring and review. By necessity, the investor and advisor must discuss the construction of an IPS in a linear fashion. In practice, the process is dynamic, similar to solving simultaneously for multiple variables.
- The return objective for an investment portfolio must ultimately be made consistent with the investor's risk tolerance and the portfolio's ability to generate returns. The traditional division of return requirements between "income" and "growth" objectives may seem intuitive, but these terms blur the distinction between return goals and risk tolerance. The "total return" approach seeks to identify a portfolio return that will meet the investor's objectives without exceeding the portfolio's risk tolerance or violating its investment constraints.
- Risk tolerance reflects both an investor's ability and willingness to accept risk. Ability to accept risk is a probabilistic assessment of the investment portfolio's ability to withstand negative investment outcomes and still meet the investor's objectives. Willingness to accept risk is a more subjective assessment of the investor's propensity for risk taking. Because many individuals are unfamiliar with the quantitative terminology of risk tolerance, the investment advisor may use psychological or situational profiling to anticipate client attitudes toward risk.
- Investment constraints include the following:
  1. *Liquidity*. Liquidity needs may be categorized as ongoing expenses, emergency reserves, and negative liquidity events. Liquidity is the ease and price certainty with which assets can be converted into cash. Because assets with stable prices and low transaction costs are generally low-risk investments, an increasing need for liquidity will constrain the investment portfolio's ability to accept risk. Significant illiquid holdings and their associated

risks should be documented. For many investors, the home or residence represents a large percentage of total net worth and is relatively illiquid. Although the primary residence may be viewed as offsetting long-term needs for care and housing, it should be discussed as a source of investment risk and as a source of funding for future cash flow needs. The investor and advisor should together thoroughly review the risks associated with any concentration of net worth. Large "positive" liquidity events should also be documented, even though they will not act as a constraint.

2. *Time horizon*. The investor's time horizon also constrains his ability to accept risk; shorter investment horizons allow less time to make up portfolio losses. The time horizon constraint may be categorized as short term, intermediate term, or long term and as single stage or multistage. With sufficient assets and multigenerational estate planning, even older investors may retain a long-term investment perspective.
3. *Taxes*. The basic principles of tax deferral, avoidance, and reduction underlie all tax-driven portfolio strategies, but individual solutions are highly country specific and client specific. Taxes relevant to portfolio management generally fall into four major categories: income, gains, wealth transfer, and property.
4. *Legal and regulatory environment*. The investment portfolio's legal and regulatory environment is ultimately country and client specific. A basic knowledge of English and American trust law is often valuable, however, as the terminology is widely recognized and the framework widely applied.
5. *Unique circumstances*. The IPS should capture all unique investment considerations affecting the portfolio. Unique circumstances might include guidelines for social investing, trading restrictions, and privacy concerns.

- As a general rule, only certain asset allocations will be consistent with the client's return objectives, risk tolerance, and investment constraints. The advisor can use a process of elimination to arrive at an appropriate long-term strategic allocation.
- For individual investors, investment decisions, including asset allocation, are made on an after-tax basis. This is a key distinction in contrast to tax-exempt institutions.
- Monte Carlo simulation has certain advantages over deterministic approaches: It more accurately portrays risk–return trade-offs, can illustrate the trade-offs between the attainment of short-term and long-term goals, provides more realistic modeling of taxes, and is better suited to assessing multiperiod effects.

PRACTICE PROBLEMS

The following information relates to Questions 1–8

Father (Peter), mother (Hilda), son (Hans), and daughter (Christa) and her child (Jürgen). Peter is the founder and majority owner of IngerMarine. To answer the questions, additional relevant information on the Ingers may be found in the reading.

Christa estimates that her revised annual living expenses, including a new studio and apartment, will average €132,500 (excluding Jürgen's educational costs). If necessary, she could combine her apartment and studio to reduce spending by €32,500. She does not want her financial security to be dependent on further gifting from her parents and is pleased that, after the sale of IngerMarine, she will be able to meet her new living expenses with proceeds from art sales (€50,000) and the expected total return of the proposed investment portfolio (€82,500). Because of the uncertainty of art sales, Christa plans to establish an emergency reserve equal to one year's living expenses. Her after-tax proceeds from the sale of IngerMarine are expected to be €1,200,000 × (1 – 0.15) = €1,020,000. She also holds €75,000 in balanced mutual funds and €25,000 in a money market fund. Christa intends to reevaluate her policy statement and asset allocation guidelines every three years.

1. Discuss Christa's liquidity requirements.
2. Determine Christa's return requirement and evaluate whether her portfolio can be expected to satisfy that requirement if inflation averages 3 percent annually and she reduces her annual living expenses to €100,000 by combining her apartment and studio.
3. Explain why an analysis of Christa's investment policy statement might become necessary before the next three-year review.

Hans' increasingly irresponsible lifestyle has become a burden to his parents. Hans was recently arrested for reckless driving—he crashed his car into a restaurant, causing considerable damage and injuring a patron. As a result of Hans' behavior, Peter has placed him on probationary leave of absence from IngerMarine but will allow him to retain his annual salary of €100,000. The restaurant patron is suing Hans for €700,000 in damages, and the restaurant owner estimates that it will take €500,000 to repair damages to his building. Hans' insurance will cover costs to a maximum of only €200,000.

4. Assess the impact of these events on Hans' liquidity and his personal financial statement. What course of action should he pursue?
5. Assess Hans' probable future ability to assume risk, based on information about his background and current living situation.

Peter and Hilda are considering an investment of €1,000,000 in one of the following investment funds. Their tax rates on income and capital gains are 25 percent and 15 percent, respectively.

Practice Problems and Solutions: *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

Investment	Projected Income (%)	Projected Price Appreciation (%)	Projected Turnover (%)
High-growth stock fund	2.0	12	75
Equity value fund	2.5	10	25
Municipal bond fund	5.0 (tax free)	2	15

6 Evaluate each investment fund based only on its after-tax return.

Note: Capital gains tax = Price appreciation × 15% × Turnover rate.

Since the original evaluation described in the reading, IngerMarine has experienced a catastrophic event from which it cannot recover. Damage claims resulting from a design flaw are expected to leave IngerMarine bankrupt and its stock worthless. Peter's pension is also lost.

7 Assess the probable impact on Peter's and Hilda's return requirement.

8 Assess the probable impact on Peter's and Hilda's portfolio constraints.

---

9 James Stephenson, 55 years old and single, is a surgeon. He has accumulated a $2.0 million investment portfolio with a large concentration in small-capitalization US equities. During the last five years, his portfolio has averaged a 20 percent annual total return on investment. Stephenson's current portfolio of $2.0 million is invested as shown in Exhibit 1.

Exhibit 1 Summary of Stephenson's Current Portfolio

	Value ($)	Percent of Total (%)	Expected Annual Return (%)	Annual Standard Deviation (%)
Short-term bonds	200,000	10	4.6	1.6
Domestic large-cap equities	600,000	30	12.4	19.5
Domestic small-cap equities	1,200,000	60	16.0	29.9
Total portfolio	2,000,000	100	13.8	23.1

His newly hired financial advisor, Caroline Coppa, has compiled the following notes from her meetings with Stephenson:

> Stephenson hopes that long term, his investment portfolio will continue to earn 20 percent annually. For the remainder of this year, he would like to earn a return greater than the 5 percent yield to maturity currently available from short-term government notes. When asked about his risk tolerance, he described it as "average." He was surprised when informed that US small-cap portfolios have historically experienced extremely high volatility.
>
> Stephenson does not expect to retire before age 70. His current annual income from his surgical practice is $250,000, which is more than sufficient to meet his current yearly expenses of $150,000. Upon

retirement, he plans to sell his surgical practice and use the proceeds to purchase an annuity to cover his post-retirement cash flow needs. He could not state any additional long-term goals or needs.

Stephenson's income and realized capital gains are taxed at a 30 percent rate. No pertinent legal or regulatory issues apply. He has no pension or retirement plan but does have sufficient health insurance for post-retirement needs.

Stephenson soon expects to receive an additional $2.0 million from an inheritance and plans to invest the entire amount in an index fund that best complements the current portfolio. Coppa is evaluating the four index funds shown in Exhibit 2 for their ability to produce a portfolio that will meet the following two criteria relative to the current portfolio:

- maintain or enhance expected return;
- maintain or reduce volatility.

Each fund is invested in an asset class that is not substantially represented in the current portfolio.

Exhibit 2 Index Fund Characteristics

Index Fund	Expected Annual Return (%)	Expected Annual Standard Deviation (%)	Correlation of Returns with Current Portfolio
A	15	25	+0.80
B	11	22	+0.60
C	16	25	+0.90
D	14	22	+0.65

A Formulate the following elements of Stephenson's investment policy statement and justify your response for each element with two arguments:

i. Return objective.

ii. Risk tolerance.

iii. Liquidity requirements.

iv. Time horizon.

B State which fund Coppa should recommend to Stephenson. Justify your choice by describing how your chosen fund best meets both of the criteria set forth by Coppa. (No calculations are required.)

10 Robert Taylor, 50 years old and a US resident, recently retired and received a $500,000 cash payment from his employer as an early retirement incentive. He also obtained $700,000 by exercising his company stock options. Both amounts are net of tax. Taylor is not entitled to a pension; however, his medical expenses are covered by insurance paid for by his former employer. Taylor is in excellent health and has a normal life expectancy.

Taylor's wife died last year after a long illness, which resulted in devastating medical expenses. All their investments, including a home, were liquidated to fully satisfy these medical expenses.

Taylor has no assets other than the $1,200,000 cash referenced above, and he has no debts. He plans to acquire a $300,000 home in three months and insists on paying cash given his recent adverse experience with creditors. When presented with investment options, Taylor consistently selects the most conservative alternative.

After settling into his new home, Taylor's living expenses will be $2,000 per month and will rise with inflation. He does not plan to work again.

Taylor's father and his wife's parents died years ago. His mother, Renee, is 72 years old and in excellent physical health. Her mental health, however, is deteriorating and she has relocated to a long-term care facility. Renee's expenses total $3,500 per month. Her monthly income is $1,500 from pensions. Her income and expenses will rise with inflation. She has no investments or assets of value. Taylor, who has no siblings, must cover Renee's income shortfall.

Taylor has one child, Troy. Troy and a friend need funds immediately for a start-up business with first-year costs estimated at $200,000. The partners have no assets and have been unable to obtain outside financing. The friend's family has offered to invest $100,000 in the business in exchange for a minority equity stake if Taylor agrees to invest the same amount.

Taylor would like to assist Troy; however, he is concerned about the partners' ability to succeed, the potential loss of his funds, and whether his assets are sufficient to support his needs and to support Renee. He plans to make a decision on this investment very soon. If he invests $100,000 in Troy's business, he insists that this investment be excluded from any investment strategy developed for his remaining funds.

With the above information, portfolio manager Sarah Wheeler prepared the investment policy statement for Taylor shown in Exhibit 3.

Exhibit 3 Robert Taylor Investment Policy Statement

Return objective	• Income requirement is $2,000 monthly. • Total return requirement is 2.7% annually ($24,000/$900,000).
Risk tolerance	• Substantial asset base and low return requirement provide ample resources to support an aggressive, growth-oriented portfolio.
Time horizon	• Client is 50 years old, recently retired, and in excellent health. • Time horizon exceeds 20 years.
Liquidity needs	• $300,000 is needed in three months for purchase of home. • Modest additional cash is needed for normal relocation costs. $100,000 may be needed for possible investment in son's business. • A normal, ongoing cash reserve level should be established.
Tax concerns	• There is little need to defer income. • Mother's expenses may have an effect.
Legal and regulatory factors	• No special considerations exist.
Unique circumstances	• Client desires to support mother. • Client insists that any investment in son's business be excluded from long-term planning. • Client has strong aversion to debt.

A Evaluate the appropriateness of Taylor's investment policy statement with regard to the following objectives:

i. Return requirement.
ii. Risk tolerance.
iii. Time horizon.
iv. Liquidity requirements.

After revising the investment policy statement and confirming it with Taylor, Wheeler is now developing a long-term strategic asset allocation for Taylor. Wheeler will use the following revised information to recommend one of the allocations in Exhibit 4.

- Taylor has decided to invest $100,000 in his son's business but still insists that this investment be disregarded in making his allocation decision.
- Taylor's total cash flow needs have changed to $4,200 a month.
- The available asset base is $800,000.
- Wheeler estimates that the inflation rate will be 1 percent next year.
- Taylor is determined to maintain the real value of his assets because he plans to set up a charitable foundation in the future.
- Taylor insists on taking no more risk than absolutely necessary to achieve his return goals.
- The expected annual nominal risk-free rate of return is 3%.

Exhibit 4 Potential Long-Term Strategic Asset Allocations

	Allocation			
	A	B	C	D
Asset Class Weighting				
Stocks	20%	40%	60%	80%
Bonds	75%	55%	35%	15%
Cash	5%	5%	5%	5%
Total	100%	100%	100%	100%
Expected Annual				
Return	6.7%	7.5%	8.2%	9.1%
Standard deviation	9.0%	11.5%	15.3%	19.0%
Potential for Growth				
Asset growth	Very low	Low	Moderate	High
Income growth	Very low	Low	Moderate	High
Current income	High	High	Low	Very low
Stability	Very high	High	Moderate	Low

B Select the strategic asset allocation that is most appropriate for Taylor and justify your selection with two supporting reasons related to the revised information shown above.

11 Mark and Andrea Mueller, US residents, are reviewing their financial plan. The Muellers, both 53 years old, have one daughter, 18 years old. With their combined after-tax salaries totaling $100,000 a year, they are able to meet their living expenses and save $25,000 after taxes annually. They expect little change in either their incomes or expenses on an inflation-adjusted basis other than the

addition of their daughter's college expenses. Their only long-term financial goal is to provide for themselves and for their daughter's education. The Muellers both wish to retire in 10 years.

Their daughter, a talented musician, is now entering an exclusive five-year college program. This program requires a $50,000 contribution, payable now, to the college's endowment fund. Thereafter, her tuition and living expenses, to be paid entirely by the Muellers, are estimated at $40,000 annually.

The Mueller's personal investments total $600,000, and they plan to continue to manage the portfolio themselves. They prefer "conservative growth investments with minimal volatility." One-third of their portfolio is in the stock of Andrea's employer, a publicly traded technology company with a highly uncertain future. The shares have a very low-cost basis for tax purposes. The Muellers, currently taxed at 30 percent on income and 20 percent on net realized capital gains, have accumulated losses from past unsuccessful investments that can be used to fully offset $100,000 of future realized gains.

In 10 years, Mark will receive a distribution from a family trust. His portion is now $1.2 million and is expected to grow prior to distribution. Mark receives no income from the trust and has no influence over, or responsibility for, its management. The Muellers know that these funds will change their financial situation materially but have excluded the trust from their current financial planning.

A Construct the objectives and constraints portion of an investment policy statement for the Muellers, addressing each of the following:

i. Return objective.

ii. Risk tolerance.

iii. Time horizon.

iv. Liquidity requirements.

v. Tax concerns.

vi. Unique circumstances.

Ten years have passed. The Muellers, now both aged 63, will retire this year. The distribution from Mark's family trust will occur within the next two weeks. The Muellers' current circumstances are summarized below:

Personal Circumstances and Assets

- Pension income will total $100,000 a year and will not increase with inflation.
- Annual expenses will total $180,000 initially and will increase with inflation.
- Inflation is expected to be 2 percent annually.
- Their personal investments now total $1,000,000 (excluding trust distribution).
- The Muellers will rely on this $1,000,000 portfolio to support their lifestyle and do not wish to reduce their level of spending.
- The Muellers have health problems and neither is expected to live more than 10 years. All health care expenses will be covered by employer-paid insurance.
- The Muellers' daughter is now financially independent, and the Muellers' sole investment objective is to meet their spending needs.
- The Muellers are not concerned with growing or maintaining principal. The income deficit may be met with both investment income and by invading principal.

Trust Distribution Assets

- The trust distribution totals $2,000,000 and will occur within the next two weeks. No tax liability is created by the distribution.
- The Muellers will maintain separate accounts for their personal assets and the trust distribution.
- They do not plan to withdraw income or principal.
- Tax liabilities produced by these assets will be paid from this portfolio.
- The Muellers plan to donate these assets to an arts society when the surviving spouse dies. They have made a minimum pledge of $2.6 million toward construction of a new building.
- An after-tax annual return of 5.4 percent is required over five years to meet the minimum pledge.
- The Muellers are concerned only that a minimum gift of $2.6 million is available. The Muellers assume that at least one of them will live at least five years and that neither will live more than 10 years.

Alternative portfolios for the Muellers' consideration appear in Exhibit 5.

Exhibit 5

	Portfolio			
Asset Allocation	**A (%)**	**B (%)**	**C (%)**	**D (%)**
Domestic large-cap stocks	14	30	40	30
Domestic small-cap stocks	3	5	10	25
Foreign stocks	3	5	10	25
Intermediate-term fixed income	70	60	30	20
Cash equivalents	10	0	10	0
Total	100	100	100	100
Expected annual return[a]	4.2	5.8	7.5	8.5
Annual standard deviation	6.0	8.0	13.0	18.0

[a] Nominal after-tax returns.

B Select and justify with three reasons the most appropriate of the four portfolios from Exhibit 5 as an asset allocation for the Muellers' $1,000,000 in personal assets.

C Select and justify with three reasons the most appropriate of the four portfolios from Exhibit 5 as an asset allocation for the Muellers' $2,000,000 in trust distribution assets.

12 John Mesa, CFA, is a portfolio manager in the Trust Department of BigBanc. Mesa has been asked to review the investment portfolios of Robert and Mary Smith, a retired couple and potential clients. Previously, the Smiths had been working with another financial advisor, WealthMax Financial Consultants (WFC). To assist Mesa, the Smiths have provided the following background information:

Family: We live alone. Our only daughter and granddaughter are financially secure and independent.

Health: We are both 65 years of age and in good health. Our medical costs are covered by insurance.

Housing: Our house needs major renovation. The work will be completed within the next six months, at an estimated cost of $200,000.

Expenses: Our annual after-tax living costs are expected to be $150,000 for this year and are rising with inflation, which is expected to continue at 3 percent annually.

Income: In addition to income from the Gift Fund and the Family Portfolio (both described below), we receive a fixed annual pension payment of $65,000 (after taxes), which continues for both of our lifetimes.

Financial Goals: Our primary objective is to maintain our financial security and support our current lifestyle. A secondary objective is to leave $1 million to our grandchild and $1 million to our local college. We recently completed the $1 million gift to the college by creating a "Gift Fund." Preserving the remaining assets for our granddaughter is important to us.

Taxes: Our investment income, including bond interest and stock dividends, is taxed at 30 percent. Our investment returns from price appreciation (capital gains) are taxed at 15 percent, at the time of sale. We have no other tax considerations.

General Comments: We needed someone like WFC to develop a comprehensive plan for us to follow. We can follow such a plan once it is prepared for us. We invest only in companies with which we are familiar. We will not sell a security for less than we paid for it. Given our need for income, we invest only in dividend-paying stocks.

Investments: We benefit from two investment accounts:

- The Gift Fund ($1 million) represents our gift to the college. During our lifetimes, we will receive fixed annual payments of $40,000 (tax free) from the Gift Fund. Except for the annual payments to us, the Gift Fund is managed solely for the benefit of the college—we may not make any other withdrawals of either income or principal. Upon our deaths, all assets remaining in the Gift Fund will be transferred into the college's endowment.
- The Family Portfolio ($1.2 million) represents the remainder of our lifetime savings. The portfolio is invested entirely in very safe securities, consistent with the investment policy statement prepared for us by WFC as shown in Exhibit 6.

Exhibit 6 WFC Investment Policy Statement for Smith Family Portfolio

The Smith Family Portfolio's primary focus is the production of current income, with long-term capital appreciation a secondary consideration. The need for a dependable income stream precludes investment vehicles with even modest likelihood of losses. Liquidity needs reinforce the need to emphasize minimum-risk investments. Extensive use of short-term investment-grade investments is entirely justified by the expectation that a low-inflation environment will exist indefinitely into the future. For these reasons, investments will emphasize US Treasury bills and notes, intermediate-term investment-grade corporate debt, and select "blue chip" stocks with assured dividend distributions and minimal price fluctuations.

To assist in a discussion of investment policy, Mesa presents four model portfolios used by BigBanc; Exhibit 7 applies the bank's long-term forecasts for asset class returns to each portfolio.

Exhibit 7 BigBanc Model Portfolios

Asset Class	Total Return	Yield	Portfolios A	B	C	D
US large-cap stocks	13.0%	3.0%	0%	35%	45%	0%
US small-cap stocks	15.0	1.0	0	5	15	0
Non-US stocks	14.0	1.5	0	10	15	10
US corporate bonds (AA)	6.5	6.5	80	20	0	30
US Treasury notes	6.0	6.0	0	10	5	20
Non-US government bonds	6.5	6.5	0	5	5	0
Municipal bonds (AA)[a]	4.0	4.0	0	10	0	10
Venture capital	20.0	0.0	0	0	10	25
US Treasury bills	4.0	4.0	20	5	5	5
Total			100%	100%	100%	100%
After-tax expected return			4.2%	7.5%	13.0%	6.4%
Sharpe ratio			0.35	0.50	0.45	0.45
After-tax yield			4.2%	2.9%	1.9%	3.3%
Expected inflation: 3.0%						

[a] Tax exempt.

A Prepare and justify an alternative investment policy statement for the Smiths' Family Portfolio.

B Describe how your IPS addresses three specific deficiencies in the WFC investment policy statement.

C Recommend a portfolio from Exhibit 7 for the Family Portfolio. Justify your recommendation with specific reference to:

i. three portfolio characteristics in Exhibit 7 other than expected return or yield; and

ii. the Smiths' return objectives. Show your calculations.

13 Louise and Christopher Maclin live in London, United Kingdom, and currently rent an apartment in the metropolitan area. Christopher Maclin, aged 40, is a supervisor at Barnett Co. and earns an annual salary of £80,000 before taxes. Louise Maclin, aged 38, stays home to care for their newborn twins. She recently inherited £900,000 (after wealth-transfer taxes) in cash from her father's estate. In addition, the Maclins have accumulated the following assets (current market value):

- £5,000 in cash;
- £160,000 in stocks and bonds;
- £220,000 in Barnett common stock.

The value of their holdings in Barnett stock has appreciated substantially as a result of the company's growth in sales and profits during the past ten years. Christopher Maclin is confident that the company and its stock will continue to perform well.

The Maclins need £30,000 for a down payment on the purchase of a house and plan to make a £20,000 non-tax deductible donation to a local charity in memory of Louise Maclin's father. The Maclins' annual living expenses are £74,000. After-tax salary increases will offset any future increases in their living expenses.

During discussions with their financial advisor, Grant Webb, the Maclins express concern about achieving their educational goals for their children and their own retirement goals. The Maclins tell Webb:

- They want to have sufficient funds to retire in 18 years when their children begin their four years of university education.
- They have been unhappy with the portfolio volatility they have experienced in recent years. They state that they do not want to experience a loss in portfolio value greater than 12 percent in any one year.
- They do not want to invest in alcohol and tobacco stocks.
- They will not have any additional children.

After their discussions, Webb calculates that in 18 years the Maclins will need £2 million to meet their educational and retirement goals. Webb suggests that their portfolio be structured to limit shortfall risk (defined as expected total return minus two standard deviations) to no lower than a negative 12 percent return in any one year. Maclin's salary and all capital gains and investment income are taxed at 40 percent and no tax-sheltering strategies are available. Webb's next step is to formulate an investment policy statement for the Maclins.

A **i.** Formulate the risk objective of an investment policy statement for the Maclins.

ii. Formulate the return objective of an investment policy statement for the Maclins. Calculate the pre-tax rate of return that is required to achieve this objective. Show your calculations.

B Formulate the constraints portion of an investment policy statement for the Maclins, addressing *each* of the following:

i. Time horizon.

ii. Liquidity requirements.

iii. Tax concerns.

iv. Unique circumstances.

Note: Your response to Part B should not address legal and regulatory factors.

SOLUTIONS

1 Need for cash:

Ongoing expenses:	€132,500/year
Emergency reserve:	€132,500
Anticipated income:	€50,000/year art sales
	€82,500/year expected total return on portfolio (subject to risk)
	€1,020,000 after taxes from sale of IngerMarine

The after-tax proceeds from the imminent sale of IngerMarine well exceed Christa's anticipated needs for cash for the coming year (2 × €132,500 = €265,000). Thus her liquidity needs are currently met. Because portfolio returns are risky and her anticipated annual income of €132,500 just covers her annual cash needs, however, Christa may face a challenge in the form of liquidity requirements at some point in the future.

2 After the sale of IngerMarine, Christa's portfolio will have a market value of roughly €1,120,000, taking account of the after-tax proceeds from the sale of IngerMarine (€1,020,000), her balanced mutual funds (€75,000), and her money market fund (€25,000). Her expected portfolio return is €82,500, equal to a 7.4 percent rate of return. Her required real return, if she reduces her spending by combining her apartment and studio, is €50,000 (art sales of €50,000 less €100,000 expenses), or 4.5 percent as a rate of return on her portfolio.

Because the portfolio's expected return of 7.4 percent translates to a real return of approximately 4.4 percent (7.4 percent less 3 percent inflation), the portfolio is *not* expected to meet the return requirement of 4.5 percent.

3 Portfolio guidelines and investment policy should be reviewed whenever a significant change occurs in the underlying assumptions of the policy statement. At Christa's portfolio performance reviews, the need for an interim reevaluation of the policy statement should always be considered. Possible triggers for a policy statement review might include the following:

- A change in personal circumstances affecting risk–return objectives or portfolio constraints. Examples could include an increase in expected income from nonportfolio sources, uninsured health problems, or marriage.
- A change in market conditions affecting long-term risk–return relationships among asset classes. Examples could include a shift in outlook for inflation and global political changes.
- New investment markets or vehicles. Examples could include markets made accessible through commingled investment funds and Retirement Saving Accounts.
- A change in tax laws. An example could be elimination of the capital gains tax.
- A severe performance shortfall, sufficient to jeopardize the portfolio's ability to meet expense needs in excess of income from other sources.

4 Hans' reckless actions will significantly reduce his portfolio. Hopefully this incident will make him aware of his financial vulnerability and the long-term consequences of his actions. The potential costs of the accident have created an immediate need for liquidity. Currently, Hans has a diversified equity portfolio valued at €200,000 and cash of €100,000. If he has not already done so, he

should immediately use the cash to retain an attorney for his upcoming legal challenges. He should also make his financial advisor aware of his situation and instruct him or her to establish a high level of portfolio liquidity. Hans may need to convert a portion of his IngerMarine holdings to cash, if he can, and should notify his father of this possibility. Alternatively, Hans may be able to obtain a loan using IngerMarine shares as collateral. If the IngerMarine holdings cannot be monetized, Hans may be able to borrow against the equity in his home.

5 In light of the auto accident, Hans must reassess his investment portfolio. Assuming that the legal challenges against him are successful, he stands to lose €1,000,000 in savings (after insurance). In addition, his legal fees may be large, resulting in a further decline in net worth. His salary has not been reduced, but depending on the outcome of his legal troubles, he may face job termination. His investment personality profile classified Hans as a spontaneous risk-taker, and his propensity to engage in riskier investing will have to be reevaluated. Even though Hans is young, his ability to take risk has been severely curtailed by the recent incident. His net worth may be reduced by as much as half, and he faces the potential loss of his current income. Hans will now need to consider rebuilding his life, engaging in lower-risk investing until his contingent liabilities are settled.

6 Peter and Hilda are subject to a flat tax of 25 percent on all income and a capital gains tax of 15 percent. The analysis below presents comparative after-tax returns. Even though the High Growth Stock Fund maintains high portfolio turnover, its return is high enough to provide superior after-tax performance. Of course, a complete investment evaluation should also address the relative risk of each investment alternative. The High Growth Stock Fund is quite likely to have high portfolio volatility, and this factor must also be considered before a final decision is made.

After-Tax Investment Evaluation

Investment Vehicle	High-Growth Stock Fund (€)	Equity Value Fund (€)	Municipal Bond Fund (€)
Investment	1,000,000	1,000,000	1,000,000
Projected income	20,000	25,000	50,000
Projected price appreciation	120,000	100,000	20,000
Projected income tax liability	(5,000)	(6,250)	0
Projected capital gains tax liability[a]	(13,500)	(3,750)	(450)
Net investment gains	**121,500**	**115,000**	**69,550**

[a] Gains tax liability = Price appreciation × 15% × Turnover rate

7 Remaining investment portfolio:

Stocks	€750,000
Bonds	1,000,000
Cash	1,000,000
Gold	500,000
	€3,250,000

Additional resources:

Hilda's trust distribution	€75,000/year
House	€1,200,000
Peter's RSA	€50,000

The goal of replacing Peter's €500,000 salary has become a "desired" portfolio return that is clearly not realistic. Peter and Hilda must now reconsider the return that they will "require" in order to meet their basic financial goals. The required return must be reconcilable with their new investment constraints and ability to assume risk. Before reaching an achievable return objective, Peter and Hilda will have to address some difficult decisions regarding their future lifestyle and long-term goals. Possible changes might include the following:

- postpone retirement;
- attempt to rebuild IngerMarine;
- return to the workforce as consultants or salaried employees;
- sell home;
- curtail gifting programs;
- cancel plans for second home;
- cancel investment in *Exteriors* magazine;
- liquidate Hilda's design company.

8 Portfolio Constraints

- *Liquidity.* The Ingers' short-term liquidity needs have clearly increased. Because spending commitments are sometimes difficult to curtail, Peter and Hilda may need to withdraw as much as €500,000 in the coming year from their remaining assets, to pay for expenses previously covered by Peter's salary. Fortunately, the Ingers have an emergency reserve of cash and bullion equivalent to approximately three years' salary.

  The Ingers must ultimately reconcile their ongoing liquidity needs, as well as targeted liquidity events, with their remaining net worth. Left unchanged, the increased liquidity requirements will require an increasing allocation to investments with lower volatility and lower return. At the same time, withdrawals will begin to outstrip returns, leaving the Ingers' portfolio in a deteriorating situation.
- *Time horizon.* Peter and Hilda's investment time horizon has been shortened, as the increased need to secure their own financial future has left them less able to approach portfolio risk from a multigenerational perspective. Their joint life expectancy, however, would reasonably warrant a portfolio time horizon that is still long term (20 to 25 years or more).
- *Taxes.* Tax rates remain unchanged for the Ingers, although their tax burden will decline with the loss of Peter's income. Their business loss from IngerMarine may be available to offset future investment gains.
- *Regulatory environment.* The regulatory environment is unchanged.
- *Unique circumstances.* It would be appropriate to note the bankruptcy of IngerMarine and any consequences it might have for portfolio management, such as the allocation of portfolio assets to build a new family business.

9 A **i.** *Return objective.* Stephenson's expressed desire for 20 percent average annual return is unrealistic. Coppa should counsel Stephenson on the level of return he can reasonably expect from the financial markets over long time periods and to define an achievable return objective.

Nevertheless, Stephenson's circumstances support an above-average return objective that emphasizes capital appreciation. This formulation is justified by the following:

- Because Stephenson has a sizable asset base and ample income to cover his current spending, focus should be on growing the portfolio.
- Stephenson's low liquidity needs and long time horizon support a long-term capital appreciation approach.
- Stephenson is in the consolidation phase of his life cycle and does not rely on the portfolio to meet living expenses.

Stephenson stated that he wants a return in excess of 5.0 percent for the remainder of the year. This short-term goal needs to be considered to the extent possible but should not be a significant factor in the IPS, which focuses on the client's long-term return objective.

ii. *Risk tolerance.* Stephenson has an above-average risk tolerance.

- Although Stephenson describes his risk tolerance as "average," his current investment portfolio indicates an apparent above-average willingness to take risk.
- His financial situation (large current asset base, ample income to cover expenses, lack of need for liquidity or cash flow, and long time horizon) indicates an above-average ability to assume risk.

iii. *Liquidity requirements.* Stephenson's liquidity needs are low.

- Stephenson has no regular cash flow needs from the portfolio because the income from his medical practice meets all current spending needs.
- No large, one-time cash needs are stated. It would be appropriate, however, to keep a small cash reserve for emergencies.

iv. *Time horizon.* Stephenson's time horizon is long term and consists of two stages:

- time until retirement, which he expects to be 15 years; and
- his lifetime following retirement, which could range from 15 to 20 years.

B Fund D represents the single best addition to complement Stephenson's current portfolio, given his selection criteria. First, Fund D's expected return (14.0 percent) has the potential to increase the portfolio's return somewhat. Second, Fund D's relatively low correlation coefficient with his current portfolio (+0.65) indicates that it will provide larger diversification benefits than any of the other alternatives except Fund B. The result of adding Fund D should be a portfolio with about the same expected return and somewhat lower volatility compared with the original portfolio.

The three other funds have shortcomings in either expected return enhancement or volatility reduction through diversification benefits:

- Fund A offers the potential for increasing the portfolio's return but is too highly correlated to provide substantial volatility reduction benefits through diversification.
- Fund B provides substantial volatility reduction through diversification benefits but is expected to generate a return well below the current portfolio's return.
- Fund C has the greatest potential to increase the portfolio's return but is too highly correlated to provide substantial volatility reduction benefits through diversification.

10 A **i.** The IPS's *return objective* section is inadequate.

- Although Wheeler accurately indicates Taylor's personal income requirement, she has not recognized the need to support Renee.
- Wheeler does not indicate the need to protect Taylor's purchasing power by increasing income by at least the rate of inflation over time.
- Wheeler does not indicate the impact of income taxes on the return requirement.
- Wheeler calculates required return based on assets of $900,000, appropriately excluding Taylor's imminent $300,000 liquidity need (house purchase) from investable funds. However, Taylor may invest $100,000 in his son's business. If he does, Taylor insists this asset be excluded from his plan. In that eventuality, Taylor's asset base for purposes of Wheeler's analysis would be $800,000.
- Assuming a $900,000 capital base, Wheeler's total return estimate of 2.7 percent is lower than the actual required after-tax real return of 5.3 percent ($48,000/$900,000).

ii. The *risk tolerance* section is inappropriate.

- Wheeler fails to consider Taylor's below-average willingness to assume risk as exemplified by his aversion to loss, his consistent preference for conservative investments, his adverse experience with creditors, and his desire not to work again.
- Wheeler fails to consider Taylor's below-average ability to assume risk, which is based on his recent life changes, the size of his capital base, high personal expenses versus income, and expenses related to his mother's care.
- Wheeler's policy statement implies that Taylor has a greater willingness and ability to accept volatility (higher risk tolerance) than is actually the case. Based on Taylor's need for an after-tax return of 5.3 percent, a balanced approach with both a fixed-income and growth component is more appropriate than an aggressive growth strategy.

iii. The *time horizon* section is partially appropriate.

- Wheeler accurately addresses the long-term time horizon based only on Taylor's age and life expectancy.
- Wheeler fails to consider that Taylor's investment time horizon is multistage. Stage 1 represents Renee's life expectancy, during which time Taylor will supplement her income. Stage 2 begins at Renee's death, concluding Taylor's need to supplement her income, and ends with Taylor's death.

iv. The *liquidity* section is partially appropriate.

- Wheeler addresses potential liquidity events.
- Wheeler fails to specifically consider ongoing expenses ($2,000/month for Taylor's living expenses and $2,000/month to support his mother) relative to expected portfolio returns.
- The reference to a "normal, ongoing cash reserve" is vague. The reserve's purpose and size should be specified.

B Allocation B is most appropriate for Taylor. Taylor's real-return annual return requirement is 6.3 percent, based on his cash flow (income) needs ($50,400 annually), to be generated from a current asset base of $800,000. After adjusting for expected annual inflation of 1.0 percent, the nominal

requirement becomes 7.3 percent. To grow to $808,000 ($800,000 × 1.01), the portfolio must generate $58,400 ($50,400 + $8,000) in the first year ($58,400/$800,000 = 7.3%).

Allocation B meets Taylor's minimum return requirement. Of the possible allocations that provide the required minimum real return, Allocation B also has the lowest standard deviation of returns (i.e., the least volatility risk) and by far the best Sharpe ratio. In addition, Allocation B offers a balance of high current income and stability with low growth prospects.

Allocation A has the lowest standard deviation and best Sharpe ratio but does not meet the minimum return requirement when inflation is included in that requirement. Allocation A also has very low growth prospects.

Allocation C meets the minimum return requirement and has moderate growth prospects but has a higher risk level (standard deviation) and a lower Sharpe ratio, as well as less potential for stability, than Allocation B.

11 A The Muellers' investment policy statement should include the following objectives and constraints:

i. *Return objective.* The Mueller's return objective should reflect a total return approach that combines capital appreciation and capital preservation. After retirement, they will need approximately $75,000 (adjusted for inflation) annually to maintain their current standard of living. Given the Muellers' limited needs and asset base, preserving their financial position on an inflation-adjusted basis may be a sufficient objective. Their long life expectancy and undetermined retirement needs, however, lead to the likely requirement for some asset growth over time, at least to counter any effects of inflation.

Although the Muellers wish to exclude the future trust distribution from their current planning, that distribution will substantially increase their capital base and dramatically alter the return objective of their future IPS, primarily by reducing their needed return level.

ii. *Risk tolerance.* The Muellers are in the middle stage of the investor life cycle. Their income (relative to expenses), total financial resources, and long time horizon give them the ability to assume at least an average, if not an above-average, level of investment risk. Their stated preference of "minimal volatility" investments, however, apparently indicates a below-average willingness to assume risk. The large realized losses they incurred in previous investments may contribute to their desire for safety. Also, their need for continuing cash outflow to meet their daughter's college expenses may temporarily and slightly reduce their risk-taking ability. In sum, the Muellers' risk tolerance is average.

Two other issues affect the Muellers' ability to take risk. First, the holding of Andrea's company stock represents a large percentage of the Mueller's total investable assets and thus is an important risk factor for their portfolio. Reducing the size of this holding or otherwise reducing the risk associated with a single large holding should be a priority for the Muellers. Second, the future trust distribution will substantially increase their capital base and thus increase their ability to assume risk.

iii. *Time horizon.* Overall, the Muellers' ages and long life expectancies indicate a long time horizon. They face a multistage horizon, however, because of their changing cash flow and resource circumstances. Their time horizon can be viewed as having three distinct stages: the next five years from now (some assets, negative cash flow because of their

daughter's college expenses), the following five years (some assets, positive cash flow), and beyond 10 years (increased assets from a sizable trust distribution, decreased income because they plan to retire).

iv. *Liquidity.* The Muellers need $50,000 now to contribute to the college's endowment fund. Alternatively, they may be able to contribute $50,000 of Andrea's low-cost-basis stock to meet the endowment obligation. In addition, they expect the regular annual college expenses ($40,000) to exceed their normal annual savings ($25,000) by $15,000 for each of the next five years. This relatively low cash flow requirement of 2.7 percent ($15,000/$550,000 asset base after $50,000 contribution) can be substantially met through income generation from their portfolio, further reducing the need for sizable cash reserves. Once their daughter completes college, the Muellers' liquidity needs should be minimal until retirement because their income more than adequately covers their living expenses.

v. *Tax concerns.* The Muellers are subject to a 30 percent marginal tax rate for ordinary income and a 20 percent rate for realized capital gains. The difference in the rates makes investment returns in the form of capital gains preferable to equivalent amounts of taxable dividends and interest.

Although taxes on capital gains would normally be a concern to investors with low-cost-basis stock, this is not a major concern for the Muellers because they have a tax loss carryforward of $100,000. The Muellers can offset up to $100,000 in realized gains with the available tax loss carryforward without experiencing any cash outflow or any reduction in asset base.

vi. *Unique circumstances.* The large holding of the low-basis stock in Andrea's company, a "technology company with a highly uncertain future," is a key factor to be included in the evaluation of the risk level of the Muellers' portfolio and the future management of their assets. In particular, the family should systematically reduce the size of the investment in this single stock. Because of the existence of the tax loss carryforward, the stock position can be reduced by at least 50 percent (perhaps more depending on the exact cost basis of the stock) without reducing the asset base to pay a tax obligation.

In addition, the trust distribution in 10 years presents special circumstances for the Muellers, although they prefer to ignore these future assets in their current planning. The trust will provide significant assets to help meet their long-term return needs and objectives. Any long-term investment policy for the family must consider this circumstance, and any recommended investment strategy must be adjusted before the distribution takes place.

B *Personal portfolio.* Portfolio A is the most appropriate portfolio for the Muellers. Because their pension income will not cover their annual expenditures, the shortfall will not likely be met by the return on their investments, so the 10 percent cash reserve is appropriate. As the portfolio is depleted over time, it may be prudent to allocate more than 10 percent to cash equivalents. The income deficit will be met each year by a combination of investment return and capital invasion.

Now that their daughter is financially independent, the Muellers' sole objective for their personal portfolio is to provide for their own living expenses. Their willingness and need to accept risk is fairly low. Clearly, there is no need to expose the Muellers to the possibility of a large loss. Also, their

health situation has considerably shortened their time horizon. Therefore, a 70 percent allocation to intermediate-term high-grade fixed-income securities is warranted.

The income deficit will rise each year as the Muellers' expenses rise with inflation, but their pension income remains constant. The conservative 20 percent allocation to equities should provide diversification benefits and some protection against unanticipated inflation over the expected maximum 10-year time horizon.

Portfolio B, the second-best portfolio, has no cash reserves, so it could not meet the Muellers' liquidity needs. Also, although it has a higher expected return, Portfolio B's asset allocation results in a somewhat higher standard deviation of returns than Portfolio A.

Portfolios C and D offer higher expected returns but at markedly higher levels of risk and with relatively lower levels of current income. The Muellers' large income requirements and low risk tolerance preclude the use of Portfolios C and D.

C *Trust distribution portfolio.* Portfolio B is the most appropriate for the trust assets. Portfolio B's expected return of 5.8 percent exceeds the required return of 5.4 percent, and the required return will actually decline if the surviving spouse lives longer than five years. The portfolio's time horizon is relatively short, ranging from a minimum of 5 years to a maximum of 10 years. The Muellers' sole objective for this money is to adequately fund the building addition. The portfolio's growth requirements are modest, and the Muellers have below-average willingness to accept risk. The portfolio would be unlikely to achieve its objective if large, even short-term losses were absorbed during the minimum five-year time horizon. Except for taxes, no principal or income disbursements are expected for at least five years; therefore, only a minimal or even zero cash reserve is required. Accordingly, an allocation of 40 percent to equities to provide some growth and 60 percent to intermediate-term fixed-income to provide stability and capital preservation is appropriate.

There is no second-best portfolio. Portfolio A's cash level is higher than necessary, and the portfolio's expected return is insufficient to achieve the $2,600,000 value within the minimum value in five years. Portfolio C has a sufficient expected return, but it has a higher cash level than is necessary and, more importantly, a standard deviation of return that is too high given the Muellers' below-average risk tolerance. Portfolio D has a sufficient return and an appropriate cash level but a clearly excessive risk (standard deviation) level. Portfolios C and D share the flaw of having excessive equity allocations that fail to recognize the relatively short time horizon and that generate risk levels much higher than necessary or warranted.

12 A To prepare an appropriate IPS, a manager should address the Smiths' return objective, risk tolerance, and constraints.

Return objective. To achieve its objectives, the Family Portfolio must provide for after-tax distributions equal to the difference between the Smiths' expenses and their fixed income payments. To maintain its real value, the portfolio must also grow at a rate that offsets inflation's impact on the Smiths' total expenses, including those currently covered by the fixed pension and Gift Fund payments.

A secondary objective is the gifting of $1 million to the Smiths' granddaughter. Because the Family Portfolio will be worth $1 million after the renovation of their house, the Smiths need no further capital growth to reach their nominal goal. To maintain its real value, the portfolio must have growth at least equal to the rate of inflation.

Risk tolerance. The Smiths are in a relatively late stage of the investor life cycle, and their comments suggest a conservative bias or below-average willingness to accept risk. In light of their long-term goals and current financial security, however, the Smiths have the ability to accommodate moderate portfolio volatility.

In the short term, the consequences of an adverse investment outcome are limited; the Smiths could use principal from the Family Portfolio to cover occasional performance shortfalls. They are thus able to accommodate some measure of short-term volatility in return for greater long-term expected returns. In extreme circumstances, the Smiths could modify or forgo their secondary objective of leaving $1 million to their granddaughter.

The consequences of an adverse portfolio outcome in the long term, however, could be serious. Depending on the length of their remaining lifetimes and the growth rate of their expenses, the Smiths could seriously deplete the corpus of the Family Portfolio and jeopardize their financial security.

The Smiths' comments imply that they have spent a lifetime saving and building a "safe" collection of income-oriented investments. Their desire to preserve market value and the WealthMax Financial Consultants (WFC) policy statement's emphasis on secure investments suggest that they may fall, at least partially, into the "cautious" category, a group with below-average risk tolerance.

Time horizon. The Family Portfolio should have an intermediate to slightly longer-term investment horizon.

The Smiths' joint life expectancy, at 65 years of age, is still substantial. Because their objective of financial security is well provided for in the short term (see discussion of risk tolerance), the Smiths can afford to focus more on the long-term aspects of that objective.

To the extent that the Smiths emphasize the objective of leaving $1 million to their granddaughter in their planning, a longer-term time horizon would be warranted.

Liquidity requirements. The Smiths' current annual living costs ($150,000 after taxes) are being met, which allows them to address longer-term growth objectives. The Smiths must plan for the upcoming expense of renovating their home. Their Family Portfolio should anticipate the renovation costs by holding a reserve of at least $200,000 in highly liquid, short-term funds.

Laws and regulations. No special legal or regulatory problems are apparent.

Tax concerns. The Smiths must pay a higher tax on dividends and interest than on capital gains. All else being equal, therefore, they prefer portfolio returns in the form of capital gains rather than equivalent amounts of taxable investment income.

Unique circumstances. Establishment of the Gift Fund had increased the Smiths' dependence on fixed payments. As a consequence of this increased exposure to the eroding effects of inflation, the Smiths' long-term financial security is significantly reduced.

Synopsis. The Smiths may not fully appreciate the impact of inflation and taxes on their financial security. The Family Portfolio can meet their immediate needs, but it is unlikely to grow at the same rate as disbursements. Depending on how long the Smiths live, the secondary objective of giving $1 million to their granddaughter may not be fully attainable, even in nominal terms.

B Rather than a true policy statement, the WFC statement is a compendium of opinions and assertions that may or may not be supportable by evidence and may or may not be appropriate to the Smiths' specific situation. WFC's statement fails to:

- identify specific return requirement;
- consider inflation;
- consider the Smiths' willingness and ability to accept risk;
- consider the Smiths' investment time horizon;
- specify the Smiths' liquidity requirements;
- address the possibility of legal and regulatory constraints;
- consider tax concerns; and
- consider possible unique circumstances.

C **i.** Portfolio B is an appropriate recommendation based on three portfolio characteristics other than expected return and yield: diversification, efficiency (Sharpe ratio), and risk.

- Diversification across asset classes contributes to portfolio efficiency and is a desirable portfolio characteristic. Portfolio B appears to be the most broadly diversified.
- Efficiency, as measured by return for each unit of risk (Sharpe ratio), is a desirable portfolio characteristic. Portfolio B dominates the other portfolios on this criterion.
- Risk is an attribute that must be constrained to fit the Smiths' fiscal and psychological tolerance levels. The 85 percent allocation to equities and venture capital in Portfolio C entails relatively high risk. Portfolio B, which is more balanced between fixed-income and equity markets, is better suited to the Smiths' below-average risk profile.

ii. Meeting the Smiths' return objectives in the first year will require an after-tax total return of 7.5 percent on the $1 million remaining in the Family Portfolio after their house renovation. The Family Portfolio must accommodate a disbursement of $45,000 and grow at a rate that offsets the impact of inflation:

Expenses		($150,000)
Sources of funds		
Pension (after tax)	65,000	
Gift Fund (after tax)	40,000	105,000
Family Portfolio disbursement (after tax)		45,000
		$150,000
Required return		
Disbursement ($45,000)	4.50%	
Inflation	3.00%	
Total	7.50%	

Subsequent distributions from the Family Portfolio will increase at a rate substantially higher than inflation (to offset the lack of growth in $105,000 of fixed pension and Gift Fund payments):

	Year 1	Year 2	Change
Expenses (3% growth)	$150,000	$154,500	3%
Portfolio distribution	$45,000	$49,500	10%

Portfolios B and C both have expected returns that meet the Smiths' projected disbursements in Year 1. Portfolio C's expected return is closer to that necessary to meet their objective over a longer time frame. However, Portfolio C's level of risk is too high given the Smiths' risk tolerance. Although Portfolio C should allow the Smiths to both fund their lifetime real income needs and leave $1 million to their grandchild, the risk in Portfolio C may endanger both their income and the bequest.

The Smiths' advisor should select Portfolio B based on its appropriate risk level and conformity with the Smiths' constraints. As a consequence of Portfolio B's probable inability to meet the Smiths' long-term spending needs, however, principal invasion may be necessary, and the secondary objective of giving $1 million, even in nominal terms, to their granddaughter may be forfeited.

13 A **i.** The Maclins' overall risk objective must consider both willingness and ability to take risk:

Willingness. The Maclins have a below-average willingness to take risk, based on their unhappiness with the portfolio volatility they have experienced in recent years and their desire not to experience a loss in portfolio value in excess of 12 percent in any one year.

Ability. The Maclins have an average ability to take risk. Although their fairly large asset base and long time horizon in isolation would suggest an above-average ability to take risk, their living expenses of £74,000 are significantly higher than Christopher's after-tax salary of £80,000(1 – 0.40) = £48,000, causing them to be very dependent on projected portfolio returns to cover the difference and thereby reducing their ability to take risk.

Overall. The Maclins' overall risk tolerance is below average, as their below-average willingness to take risk dominates their average ability to take risk in determining their overall risk tolerance.

ii. The Maclins' return objective is to grow the portfolio to meet their educational and retirement needs as well as to provide for ongoing net expenses. The Maclins will require annual after-tax cash flows of £26,000 (calculated below) to cover ongoing net expenses and will need £2 million in 18 years to fund their children's education and their retirement. To meet this objective, the Maclins' pretax required return is 7.38 percent, which is determined below.

The after-tax return required to accumulate £2 million in 18 years beginning with an investable asset base of £1,235,000 (calculated below) and with annual outflows of £26,000 is 4.427 percent, which when adjusted for the 40 percent tax rate, results in a 7.38 percent pretax return [4.427%/(1 – 0.40) = 7.38%].

Christopher's annual salary	£80,000
Less: Taxes (40%)	–32,000

Living expenses	–74,000
Net annual cash flow	–£26,000
Inheritance	900,000
Barnett Co. common stock	220,000
Stocks and bonds	160,000
Cash	5,000
Subtotal	£1,285,000
Less one-time needs:	
Down payment on house	–30,000
Charitable donation	–20,000
Investable asset base	£1,235,000

Note: No inflation adjustment is required in the return calculation because increases in living expenses will be offset by increases in Christopher's salary.

B The Maclins' investment policy statement should include the following constraints:

i. *Time horizon.* The Maclins have a two-stage time horizon, because of their changing cash flow and resource needs. The first stage is the next 18 years. The second stage begins with their retirement and the university education years for their children.

ii. *Liquidity requirements.* The Maclins have one-time immediate expenses totaling £50,000 that include the deposit on the house they are purchasing and the charitable donation in honor of Louise's father.

iii. *Tax concerns.* A 40 percent tax rate applies to both ordinary income and capital gains.

iv. *Unique circumstances.* The large holding of the Barnett Co. common stock represents almost 18 percent of the Maclins' investable asset base. The concentrated holding in Barnett Co. stock is a key risk factor of the Maclins' portfolio, and achieving better diversification will be a factor in the future management of the Maclins' assets.

The Maclins' desire not to invest in alcohol and tobacco stocks is another constraint on investment.

CUSTOMER SERVICE

68

READING

9

Taxes and Private Wealth Management in a Global Context

by Stephen M. Horan, PhD, CFA, CIPM, and Thomas R. Robinson, PhD, CFA

Stephen M. Horan, PhD, CFA, CIPM, is at CFA Institute (USA). Thomas R. Robinson, PhD, CFA, is at AACSB International (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** compare basic global taxation regimes as they relate to the taxation of dividend income, interest income, realized capital gains, and unrealized capital gains;
☐	**b.** determine the effects of different types of taxes and tax regimes on future wealth accumulation;
☐	**c.** explain how investment return and investment horizon affect the tax impact associated with an investment;
☐	**d.** discuss the tax profiles of different types of investment accounts and explain their effects on after-tax returns and future accumulations;
☐	**e.** explain how taxes affect investment risk;
☐	**f.** discuss the relation between after-tax returns and different types of investor trading behavior;
☐	**g.** explain tax loss harvesting and highest-in/first-out (HIFO) tax lot accounting;
☐	**h.** demonstrate how taxes and asset location relate to mean–variance optimization.

INTRODUCTION

1

Private wealth managers have the basic goal of maximizing after-tax wealth subject to a client's risk tolerance and portfolio constraints. Portfolio managers can add value in a number of ways, such as buying undervalued securities, selling overpriced securities, and improving asset allocations. This is challenging in highly efficient markets where

© 2008 CFA Institute. All rights reserved.

informational advantages are difficult to exploit as market participants compete with each other in search of abnormal returns. Managing a portfolio efficiently from a tax perspective, however, is a reasonable goal in almost all markets. In most economies around the world, taxes have a significant impact on net performance and affect an adviser's understanding of risk for the taxable investor. Tax rates, particularly those for high-net-worth (HNW) individuals, are non-trivial and typically affect returns more than portfolio management costs.

Despite a long history of high tax rates on investment returns, most modern portfolio theory is grounded in a pretax framework. This phenomenon is understandable because most institutional and pension portfolios are tax-exempt. As more wealth becomes concentrated with individuals, it is important to examine the impact of taxes on risk and return characteristics of a portfolio and wealth accumulation. The purpose of this reading is to outline basic concepts that serve as the foundation for building tax-aware investment models that can be applied in a global environment.

The approach developed here is valuable for several reasons. First, it can be applied in a broad range of circumstances representing different taxing jurisdictions, asset classes, and account types. Second, it can provide a framework with which advisers can better communicate the impact of taxes of portfolio returns to private clients and develop techniques to improve their after-tax performance. Third, tax codes change over time. The models developed here provide the adviser a framework to manage changes should they occur.

2 OVERVIEW OF GLOBAL INCOME TAX STRUCTURES

Tax structures (the specifics of how governments collect taxes) are determined by national, regional, and local jurisdictions in order to meet governmental funding needs. Major sources of government tax revenue include:

- *Taxes on income.* These taxes apply to individuals, corporations, and often other types of legal entities. For individuals, income types can include salaries, interest, dividends, realized capital gains, and unrealized capital gains, among others. Income tax structure refers to how and when different types of income are taxed.
- *Wealth-based taxes.* These include taxes on the holding of certain types of property (e.g., real estate) and taxes on the transfer of wealth (e.g., taxes on inheritance).
- *Taxes on consumption.* These include sales taxes (which are taxes collected in one step from the final consumer on the price of a good or service) and value-added taxes (which are collected in intermediate steps in the course of producing a good or service but borne ultimately by the final consumer).

This reading's focus will be on the taxes that most directly affect tax planning for investments, specifically taxes on investment income to individuals and, secondarily, wealth-based taxes.

In many cases, the tax system is used to encourage or discourage certain activities (for example, investing in domestic companies or encouraging retirement savings). Tax structures vary globally and can change as the needs and objectives of the governmental jurisdiction change. In such a dynamic environment, the investment manager needs to understand the impact of different tax structures on investment returns and wealth. Rather than delineate specific country tax rules, this reading provides

a framework for managers to understand and implement investment strategies in a dynamic environment where different tax environments may apply to different clients and tax environments can change over time.

2.1 International Comparisons of Income Taxation

We reviewed the taxation of different types of income, particularly investment income, around the world in order to summarize the major tax regimes.[1] The review was based on data from over 50 countries as reported in the Deloitte Touche Tohmatsu International Business Guides, which were available during the summer of 2007. This summary provided the basis for our discussion of the common elements of individual income taxation around the world and our classification of different countries into general income tax regimes.

2.2 Common Elements

In most tax jurisdictions, a tax rate structure applies to ordinary income (such as earnings from employment). Other tax rates may apply to special categories of income such as investment income (sometimes referred to as capital income for tax purposes). Investment income is often taxed differently based on the nature of the income: interest, dividends, or capital gains and losses. Most of the countries examined in our review have a progressive ordinary tax rate structure. In a progressive rate structure, the tax rate increases as income increases. For example:

Taxable Income (€)		Tax on	Percentage on Excess
Over	Up to	Column 1	Over Column 1
0	15,000	—	23
15,000	28,000	3,450	27
28,000	55,000	6,960	38
55,000	75,000	17,220	41
75,000		25,420	43

In such an environment, if an individual has taxable income of €60,000, the first €15,000 is taxed at 23 percent; the next €13,000 (i.e., from €15,000 to €28,000) is taxed at 27 percent; and so on. The amount of tax due on taxable income of €60,000 would be €17,220 + 0.41(€60,000 – €55,000) or €19,270. This would represent an average tax rate of €19,270/€60,000 or 32.12 percent. In tax planning for investments, it is useful to think about how much tax would be paid on additional income, known as the marginal tax rate. The marginal rate, or rate on the next €1 of income, would be 41 percent in this example. This taxpayer could have €15,000 more in income before moving into the next tax bracket (a new marginal rate of 43 percent). Some countries do not have a progressive tax system and instead impose a flat tax. In a flat tax structure, all taxable income is taxed at the same rate. For example, at the time of this writing, Russia had a flat tax rate of 13 percent.

Many countries provide special tax provisions for interest income. These special provisions included an exemption for certain types of interest income (for example, Argentina exempted interest income from Argentine banks for residents), a favorable tax rate on interest income (for example, Italy taxed some interest income at 12.5 percent even though the minimum marginal rate is 23 percent), or an exclusion

1 The guides are available at www.deloitte.com and are updated on a rotational basis. As a result, some data may not be current as of the summer of 2007.

amount where some limited amount of interest income is exempt from tax (for example, Germany provided such an exclusion). Some fixed income instruments are indexed for inflation and this inflation adjustment may not be subject to taxation in some jurisdictions. Unless special provisions exist, interest income, including inflation adjustments, is taxed at the tax rates applicable to ordinary income (ordinary rates).

Similarly, dividend income may have special provisions. In some cases there are exemptions, special tax rates, or exclusions as described above for interest income. In other cases, there may be provisions for mitigating double taxation because dividends are a distribution of company earnings and the company may have already paid tax on the earnings. Tax credits can be used to mitigate the effects of double taxation. For example, the dividend can be taxed at ordinary rates but the individual is entitled to a credit for a portion of the taxes paid by the company (referred to as "franking" in some jurisdictions such as Australia). As with interest income, absent special rules dividend income is taxed at ordinary rates.

Finally, capital gains (losses) may have special provisions or rates. These often vary depending upon how long the underlying investment has been held. Generally, long term gains are treated more favorably than short term gains. Long term is defined differently in different jurisdictions; for example, in the data examined, we observed required holding periods of six months, one year, two years, and five years. Special provisions observed included total exemption of capital gains or long-term capital gains from taxation (for example, Austria exempted long-term gains), exemption of a certain percentage of gains from taxation (for example, Canada exempted 50 percent of gains), a favorable tax rate on capital gains (for example, Brazil provided a flat 15 percent rate for capital gains), or indexing the cost of the investment for inflation (for example, India permitted inflation indexing for some investments). In some cases, countries provided more favorable provisions for domestic companies or companies traded on a local exchange (sometimes applied to both dividend income and capital gains). In most cases, only realized gains were taxed (when the investment was sold). In rare cases, countries impose a tax on unrealized gains (appreciation of the investment prior to sale) either annually, upon exiting the country to relocate domicile, or upon inheritance.[2]

EXAMPLE 1

Tax Rates

Vanessa Wong is a new client living in a jurisdiction with a progressive tax rate structure. She expects to have taxable ordinary income of €70,000 this year. The tax rate structure in her jurisdiction is as follows:

Taxable Income (€)		Tax on	Percentage on Excess
Over	Up to	Column 1	Over Column 1
0	30,000	—	20
30,000	60,000	6,000	30
60,000	90,000	15,000	40
90,000		27,000	50

1 Wong's marginal tax rate is *closest* to:

A 35%.

2 In other cases upon inheritance the recipient receives a "step-up in basis" such that for tax purposes the value on the date of death is used to compute any future gain or loss.

B 40%.

C 50%.

2 Wong's average tax rate is *closest* to:

A 27%.

B 35%.

C 40%.

Solution to 1:

B is correct. Wong's marginal tax rate is 40 percent. Because Wong's income is over €60,000 but below €90,000, her next €1 of income would be taxed at 40 percent.

Solution to 2:

A is correct. Wong's tax liability would be €15,000 + 0.40 (€70,000 – €60,000) = €19,000. With a tax liability of €19,000 and taxable income of €70,000, her average tax rate would be about 27 percent (€19,000/€70,000).

2.3 General Income Tax Regimes

Each country's income tax structure can be classified as either progressive or flat. Income tax regimes can be further distinguished based on the taxation of investment returns in taxable accounts. Interest income is either taxed at ordinary rates or at favorable rates under special provisions. In this review, interest income is considered to be taxable at ordinary rates unless significant exceptions apply. Similar classifications were used for dividends and capital gains. Seven different tax regimes were observed in the sample of countries examined. Exhibit 1 classifies common elements of tax regimes and is further explained below.

- *Common Progressive Regime*: This regime has progressive tax rates for ordinary income, but favorable treatment in all three investment income categories: interest, dividends, and capital gains. This was the most common regime observed. Even though categorized as "common," there is variation within this regime with some countries treating some interest income as ordinary and other interest income as tax exempt, while other countries provide for exemption or special treatment for all interest.
- *Heavy Dividend Tax Regime*: This regime has a progressive tax system for ordinary income and favorable treatment for some interest and capital gains but taxes dividends at ordinary rates.
- *Heavy Capital Gain Tax Regime*: This regime has a progressive tax system for ordinary income and favorable treatment for interest and dividends, but taxes capital gains at ordinary rates. Only one such country was observed.
- *Heavy Interest Tax Regime*: This regime has a progressive tax system for ordinary income and favorable treatment for dividends and capital gains, but taxes interest income at ordinary rates.
- *Light Capital Gain Tax Regime*: This regime has a progressive tax system for ordinary income, interest, and dividends, but favorable treatment of capital gains. This was the second most commonly observed regime.

Exhibit 1 Classification of Income Tax Regimes

Regime	1 – Common Progressive	2 – Heavy Dividend Tax	3 – Heavy Capital Gain Tax	4 – Heavy Interest Tax	5 – Light Capital Gain Tax	6 – Flat and Light	7 – Flat and Heavy
Ordinary Tax Rate Structure	Progressive	Progressive	Progressive	Progressive	Progressive	Flat	Flat
Interest Income	Some interest taxed at favorable rates or exempt	Some interest taxed at favorable rates or exempt	Some interest taxed at favorable rates or exempt	Taxed at ordinary rates	Taxed at ordinary rates	Some interest taxed at favorable rates or exempt	Some interest taxed at favorable rates or exempt
Dividends	Some dividends taxed at favorable rates or exempt	Taxed at ordinary rates	Some dividends taxed at favorable rates or exempt	Some dividends taxed at favorable rates or exempt	Taxed at ordinary rates	Some dividends taxed at favorable rates or exempt	Taxed at ordinary rates

Exhibit 1 (Continued)

Regime	1 – Common Progressive	2 – Heavy Dividend Tax	3 – Heavy Capital Gain Tax	4 – Heavy Interest Tax	5 – Light Capital Gain Tax	6 – Flat and Light	7 – Flat and Heavy
Capital Gains	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Taxed at ordinary rates	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Taxed at ordinary rates
Example Countries	Austria Brazil China Czech Republic Finland France Greece Hong Kong Hungary Ireland Italy Japan Latvia Malaysia Netherlands Nigeria Philippines Poland Portugal Singapore South Africa Sweden Thailand United Kingdom United States Vietnam	Argentina Indonesia Israel Venezuela	Colombia	Canada Denmark Germany Luxembourg Pakistan	Australia Belgium India Kenya Mexico New Zealand Norway Spain Switzerland Taiwan Turkey	Kazakhstan Russia Saudi Arabia (Zakat)	Ukraine

Sources: Classified based on information provided in International Business Guides from Deloitte Touche Tohmatsu (available at www.deloitte.com) and online database of worldwide taxation provided by PricewaterhouseCoopers (www.taxsummaries.pwc.com).

- *Flat and Light Regime*: This regime has a flat tax system and treats interest, dividends, and capital gains favorably.
- *Flat and Heavy Regime*: This regime has a flat tax system for ordinary income, dividends, and capital gains. It does not have favorable treatment for dividends and capital gains, but has favorable treatment for interest income.

2.4 Other Considerations

In addition to the different tax regimes in which different types of income are taxed at possibly different rates, there are other important dimensions in tax planning for investments. Some countries permit the use of tax deferred retirement accounts. A tax deferred account

- defers taxation on investment returns within the account;
- may permit a deduction for contributions;
- may occasionally permit tax free distributions.

On the other hand, a few countries impose a wealth tax on accumulations on a periodic basis which reduces after-tax returns and accumulations similar to income taxes.

In the next section we will examine how taxes affect after-tax returns and accumulations. We also examine the impact of tax deferred accounts and wealth taxes. In a later section we will discuss planning opportunities suitable for the various tax regimes.[3]

3 AFTER-TAX ACCUMULATIONS AND RETURNS FOR TAXABLE ACCOUNTS

Taxes on investment returns have a substantial impact on performance and future accumulations. This section develops models to estimate the tax impact on future accumulations in various tax environments. These models enable the investment adviser to evaluate potential investments for taxable investors by comparing returns and wealth accumulations for different types of investments subject to different tax rates and methods of taxation (accrued annually or deferred).

3.1 Simple Tax Environments

As the preceding analysis of global tax regimes suggests, investment returns can be taxed in a number of different ways. This section begins with some straightforward methods that illustrate basic concepts and serve as building blocks for more complex environments.

All but four of the countries studied in the tax regime analysis have a progressive income tax system.[4] The discussion in this section assumes uniform marginal tax rates based on the investor's current tax bracket which is effectively flat for some range of income. Models that accommodate multiple tax brackets grow in complexity very quickly. Also, investors are often subject to a single rate on the margin, limiting the usefulness of an analysis based on multiple tax brackets. Finally, much of the intuition and analysis that is derived in a flat tax framework applies in a setting with multiple tax brackets.

3 Gift, death, or estate taxes are also imposed in some jurisdictions. These are not addressed in this reading.
4 Countries with a flat tax include the Ukraine, Russia, Kazakhstan, and Saudi Arabia.

3.1.1 *Returns-Based Taxes: Accrual Taxes on Interest and Dividends*

One of the most straightforward methods to tax investment returns is to tax an investment's annual return at a single tax rate, regardless of its form. Accrual taxes are levied and paid on a periodic basis, usually annually, as opposed to deferred taxes that are postponed until some future date. Most of the countries examined above tax interest income on an accrual basis annually, either at ordinary rates or at favorable rates as the result of special provisions. Germany, Greece, Canada, Colombia, and the United States, for example, tax most interest income at ordinary rates, although some interest income may receive favorable tax treatment. Japan, China, Finland, the Czech Republic, and the United Kingdom tax interest income at a special fixed rate. Dividends, like interest income, are typically taxed in the year they are received, albeit often at different rates.

When returns are subject to accrual taxes, the after-tax return is equal to the pretax return, r, multiplied by $(1 - t_i)$ where t_i represents the tax rate applicable to investment income. For the purposes of this section, we consider an investment with a return that is entirely taxed at a single uniform rate.

The amount of money accumulated for each unit of currency invested after n years, assuming that returns (after taxes at rate t_i are paid) are reinvested at the same rate of return, r, is simply

$$FVIF_i = [1 + r(1 - t_i)]^n \quad (1)$$

Equation 1 is simply a future value interest factor (FVIF) based on an after-tax return. For example, €100 invested at 6 percent per annum for ten years in an environment in which returns are taxed each year at a rate of 30 percent will accumulate to be €100[1 + 0.06(1 – 0.30)]^{10} = €150.90. Had returns not been taxed, this investment would have grown to €100[1 + 0.06(1 – 0.00)]^{10} = €179.08, a difference of €28.18. Notice that taxes reduce the potential gain on investment by (€179.08 – €150.90)/(€179.08 – €100.00) = €28.18/€79.08 = 35.6 percent, which is more than the ordinary income tax rate. This suggests that the tax drag on capital accumulation compounds over time when taxes are paid each year. (Tax drag refers to the negative effect of taxes on after-tax returns.) By contrast, when taxes on gains are deferred until the end of the investment horizon, the tax rate equals the tax drag on capital accumulation as we shall see in the next section.

Exhibit 2 illustrates the impact of taxes on capital growth for various investment horizons and rates of return and demonstrates several conclusions. First, when investment returns are taxed annually, the effect of taxes on capital growth is greater than the nominal tax rate as noted above. Second, the adverse effects of taxes on capital growth increase over time. That is, the proportional difference between pretax and after-tax gains grows as the investment horizon increases. Third, the tax drag increases as the investment return increases, all else equal. Fourth, return and investment horizon have a multiplicative effect on the tax drag associated with future accumulations. Specifically, the impact of returns on the tax effect is greater for long investment horizons, and the impact of investment horizon is greater for higher returns because figures in the bottom right corner change more rapidly than figures in the upper left corner.

Exhibit 2 Proportion of Potential Investment Growth Consumed by Annual Taxes on Return

	Investment Horizon in Years (n)							
r (%)	5	10	15	20	25	30	35	40
2	0.308	0.319	0.330	0.340	0.351	0.362	0.373	0.384
4	0.317	0.338	0.359	0.381	0.403	0.425	0.447	0.469

(continued)

Exhibit 2 (Continued)

	Investment Horizon in Years (*n*)							
r (%)	5	10	15	20	25	30	35	40
6	0.325	0.356	0.389	0.421	0.454	0.486	0.518	0.549
8	0.333	0.375	0.418	0.461	0.503	0.545	0.584	0.622
10	0.341	0.393	0.446	0.499	0.550	0.598	0.643	0.684
12	0.348	0.411	0.474	0.535	0.593	0.646	0.694	0.737
14	0.356	0.429	0.501	0.569	0.633	0.689	0.739	0.781
16	0.364	0.446	0.526	0.601	0.669	0.727	0.776	0.818
18	0.371	0.462	0.551	0.631	0.701	0.760	0.808	0.848

Note: The calculations assume a 30 percent annual tax rate on investment returns.

Conceptually, this framework could apply to securities, such as fixed-income instruments or preferred stock, in which most or possibly all of the return is subject to annual taxes. This is an oversimplification, of course, but we will address that concern below.

EXAMPLE 2

Accrual Taxes

Vladimir Kozloski is determining the impact of taxes on his expected investment returns and wealth accumulations. Kozloski lives in a tax jurisdiction with a flat tax rate of 20 percent which applies to all types of income and is taxed annually. Kozloski expects to earn 7 percent per year on his investment over a 20 year time horizon and has an initial portfolio of €100,000.

1 What is Kozloski's expected wealth at the end of 20 years?

2 What proportion of potential investment gains were consumed by taxes?

Solution to 1:

$$\begin{aligned} \text{FV} &= €100{,}000 \times FVIF_i \\ &= €100{,}000 \times [1 + 0.07(1 - 0.20)]^{20} \\ &= €297{,}357. \end{aligned}$$

Solution to 2:

Ignoring taxes, FV = €100,000 $[1 + 0.07]^{20}$ = €386,968. The difference between this and the after tax amount accumulated from above is €89,611. The proportion of potential investment gains consumed by taxes was €89,611/€286,968 = 31.23 percent.

3.1.2 *Returns-Based Taxes: Deferred Capital Gains*

Another straightforward method of taxing returns is to focus on capital gains, the recognition of which can usually be deferred until realized, instead of interest income and dividends, which are generally taxable each year. A portfolio of non-dividend-paying

stocks could fall under this type of framework. The analysis of global tax systems in the previous section indicates that it is very rare for unrealized investment gains to be taxed, so this implicit deferral mechanism has nearly universal application.

If the tax on an investment's return is deferred until the end of its investment horizon, n, and taxed as a capital gain at the rate t_{cg}, then the after-tax future accumulation for each unit of currency can be represented in several ways, including the following:

$$FVIF_{cg} = (1 + r)^n - [(1 + r)^n - 1]t_{cg} \quad \textbf{(2a)}$$

$$FVIF_{cg} = (1 + r)^n(1 - t_{cg}) + t_{cg} \quad \textbf{(2b)}$$

The first term of Equation 2a represents the pretax accumulation. The bracketed term is the capital gain (i.e., future accumulation less the original basis), while the entire second term represents the tax obligation on that gain. Viewed differently, the first term of Equation 2b represents the future accumulation if the entire sum (including the original basis) were subject to tax. The second term returns the tax of the untaxed cost (also known as cost basis or basis) associated with the initial investment.

For example, €100 invested at 6 percent for ten years in an environment in which capital gains are taxed at the end of that time at a rate of 30 percent will accumulate to be €100$[(1 + 0.06)^{10}(1 - 0.30) + 0.30]$ = €155.36. Notice that this sum is greater than the €150.90 accumulated in the previous example using Equation 1, where returns are taxed annually at the same rate. This comparison illustrates the value of tax deferral.

Notice, as well, that the after-tax investment gain equals the pretax investment gain multiplied by one minus the tax rate. That is, €55.36 = €79.08 × (1 − 0.30). Whereas the tax drag on after-tax accumulations subject to annual accrual taxes compounds over time, the tax drag from deferred capital gains is a fixed percentage regardless of the investment return or time horizon. In other words, when deferral is permitted, the proportion of potential investment growth consumed by taxes is always the same as the tax rate, 30 percent in this case, which is less than that presented in Exhibit 2 when there was annual taxation.

Because the tax drag in Exhibit 2 increases with the investment return and time horizon, the value of a capital gain tax deferral also increases with the investment return and time horizon. One implication of the value of tax deferral is that investments taxed on a deferred capital gain basis can be more tax efficient (i.e., tax advantaged) than investments with returns that are taxed annually, all else equal, even if the marginal tax rate on the two is the same. Moreover, the difference compounds over time. The tax regime analysis from Exhibit 1 reveals that relatively few jurisdictions tax components of equity returns (dividends and capital gains) more heavily than interest income. There are rare exceptions where dividends (but usually not capital gains) are taxed to a greater extent than interest (such as the Heavy Dividend Tax Regime countries in Exhibit 1). Moreover, even if the tax rate on deferred capital gains is greater than the tax rate on interest income, the value of the deferral can more than offset a lower tax rate on annually taxed income, especially over time.

Exhibit 3 illustrates the value of tax deferral and its compounding effects more generally by presenting the ratio of after-tax accumulation in a deferred capital gain regime to after-tax accumulation in a regime in which returns are taxed annually. For example, with a 6 percent annual return, 20-year time horizon and a 30 percent tax rate, the accumulation of €100 in a deferred capital gain environment, is €100$[(1 + 0.06)^{20}(1 - 0.30) + 0.30]$ = €254.50. In an annual taxation environment, it is €100$[1 + 0.06(1 - 0.30)]^{20}$ = €227.70. Therefore, a deferred capital gain environment accumulates €254.50/€227.70 = 1.118 times the amount accumulated in an annual taxation environment. The relative accumulations can be substantially larger when gains are deferred for long time horizons, especially for high returns. It is important to note, however, that the advantages of tax deferral can be offset or even eliminated if securities taxed on an accrual basis have greater risk-adjusted returns.

Exhibit 3 Ratio of Future Accumulations: Accumulation in a Deferred Capital Gain Environment to Accumulation in an Annual Taxation Environment

	Investment Horizon in Years (*n*)							
r **(%)**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
2	1.001	1.004	1.008	1.015	1.023	1.033	1.045	1.058
4	1.003	1.014	1.031	1.056	1.086	1.123	1.165	1.213
6	1.007	1.030	1.067	1.118	1.181	1.257	1.346	1.447
8	1.012	1.050	1.113	1.198	1.305	1.432	1.582	1.754
10	1.018	1.075	1.169	1.294	1.453	1.644	1.871	2.136
12	1.025	1.104	1.232	1.405	1.624	1.892	2.214	2.598
14	1.033	1.137	1.303	1.529	1.818	2.177	2.616	3.149
16	1.041	1.172	1.380	1.666	2.035	2.500	3.080	3.799
18	1.050	1.210	1.464	1.814	2.273	2.862	3.612	4.561

Note: The calculations assume a 30 percent annual tax rate on investment returns and a 30 percent tax rate on deferred capital gains.

In many countries, the rate applied to capital gains is lower than the rate applied to interest income. In such cases, the investor gets a dual benefit from returns in the form of capital gains: deferral of taxation and a favorable tax rate when gains are realized. The capital gain tax rate may also vary depending on the holding period. Longer holding periods may receive a lower tax rate to encourage long-term rather than short-term investment. Australia, for example, taxes short-term gains (i.e., holding period less than 12 months) at ordinary rates. Only half the gains on assets held for more than 12 months are taxed, however, making the effective long-term capital gain tax rate half of the rate on ordinary income. In such cases the investor gets a dual benefit; deferral of taxation and a favorable rate on realized gains. The holding period can vary. Belgium and the Czech Republic, for example, require a five-year holding period to receive preferential tax treatment on capital gains.

EXAMPLE 3

Deferred Capital Gains

Assume the same facts as in Example 2. Kozloski invests €100,000 at 7 percent. However, the return comes in the form of deferred capital gains that are not taxed until the investment is sold in 20 years hence.

1. What is Kozloski's expected wealth at the end of 20 years?
2. What proportion of potential investment gains were consumed by taxes?

Solution to 1:

$$\begin{aligned} FV &= €100{,}000 \times FVIF_{cg} = €100{,}000 \times [(1 + 0.07)^{20}(1 - t) + t] \\ &= €100{,}000 \times [(1 + 0.07)^{20}(1 - 0.20) + 0.20] = €329{,}575. \end{aligned}$$

Solution to 2:

Ignoring taxes, FV = €100,000 $[1 + 0.07]^{20}$ = €386,968. The difference between this and the after-tax amount accumulated from above is €57,393. The proportion of potential investment gains consumed by taxes was €57,393/€286,968 = 20.0 percent. This result compares favorably to the potential investment gains consumed by taxes in Example 2.

3.1.3 *Cost Basis*

In taxation, cost basis is generally the amount that was paid to acquire an asset. It serves as the foundation for calculating a capital gain, which equals the selling price less the cost basis. The taxable gain increases as the basis decreases. In consequence, capital gain taxes increase as the basis decreases. In some circumstances, this basis may be adjusted under tax regulations or carry over from another taxpayer. The previous capital gains examples assume that cash is newly invested so that the cost basis was equal to the current market value. That is, the tax liability at the end of the investment horizon is based on the difference between the pretax ending value and the current market value today.

In many cases, an investment being evaluated today was purchased some time ago and has a cost basis that is different from the current market value. If a security has risen in value since its initial purchase, the cost basis may be less than its current market value. Cost basis affects an investment's after-tax accumulation because it determines the taxable capital gain. Specifically, the after-tax cash flow from liquidation increases as the cost basis increases, holding all else equal. Put differently, an investment with a low cost basis has a current embedded tax liability because, if it were liquidated today, capital gain tax would be owed even before future capital growth is considered. Newly invested cash has no such current tax liability.

If the cost basis is expressed as a proportion, B, of the current market value of the investment, then the future after-tax accumulation can be expressed by simply subtracting this additional tax liability from the expression in either Equation 2a or 2b. In other words,

$$FVIF_{cgb} = (1 + r)^n(1 - t_{cg}) + t_{cg} - (1 - B)t_{cg} \quad \textbf{(3a)}$$

Notice that if cost basis is equal to the current market value of the investment, then $B = 1$ and the last term simply reduces to Equation 2b. The lower the cost basis, however, the greater the embedded tax liability and the lower the future accumulation. Distributing and canceling terms produces

$$FVIF_{cgb} = (1 + r)^n(1 - t_{cg}) + t_{cg}B \quad \textbf{(3b)}$$

This form resembles Equation 2b, and the last term represents the return of basis at the end of the investment horizon. The lower the basis, the lower is the return of basis. For example, suppose an investment has a current market value of €100 and a cost basis of €80. The gain when realized will be subject to a capital gains tax of 30 percent. The cost basis is equal to 80 percent of the current market value of €100. If it grows at 6 percent for 10 years, the future after-tax accumulation is €100 $[(1.06)^{10}(1 - 0.30) + (0.30)(0.80)]$ = €149.36, which is €6 less than the €155.36 accumulation that would result if the basis were equal to €100. The €6 difference represents the tax liability associated with the embedded capital gain.

EXAMPLE 4

Cost Basis

Continuing with the facts in Examples 2 and 3, Kozloski has a current investment with a market value of €100,000 and cost basis of €80,000. The stock price grows at 7 percent per year for 20 years.

1 Express the cost basis as a percent of the current market value.

2 What is Kozloski's expected wealth after 20 years?

Solution to 1:

Cost basis/Current market value = B = €80,000/€100,000 = 0.80.

Solution to 2:

$$\begin{aligned} \text{FV} &= €100{,}000 \times FVIF_{cbg} \\ &= €100{,}000 \times [(1 + 0.07)^{20}(1 - 0.20) + 0.20(0.80)] \\ &= €325{,}575. \end{aligned}$$

This amount is €4,000 smaller than Kozloski's expected wealth in Example 3, in which it was assumed that the cost basis equaled the current market value.

3.1.4 *Wealth-Based Taxes*

Some jurisdictions impose a wealth tax, which is applied annually to a specific capital base. Often the wealth tax is restricted to real estate investments (e.g., Australia, Singapore, Belgium, Germany, and the United Kingdom). In other countries, it is levied on aggregate assets including financial assets above a certain threshold (e.g., Colombia). If limited to real estate holdings, the tax may be levied at the federal level or a municipal level. In any case, the wealth tax rate tends to be much lower than capital gains or interest income rates because it applies to the entire capital base—i.e., principal and return—rather than just the return.

The expression for an after-tax accumulation subject to a wealth tax is therefore different from the previous scenarios in which only incremental gains are taxed. If wealth is taxed annually at a rate of t_w, then after n years each unit of currency accumulates to

$$FVIF_w = [(1 + r)(1 - t_w)]^n \tag{4}$$

For example, if wealth capital is taxed at 2 percent, then €100 invested at 6 percent for ten years will grow to $[(1.06)(1 - 0.02)]^{10}$ = €146.33. Because the form of a wealth tax differs from the form of taxes on either investment returns or deferred capital gains, this figure is not comparable to the previous two examples. This figure is substantially less than the pretax accumulation of €179.08, however. In other words, the two percent wealth tax consumed 41.4 percent of the investment growth that would have accrued over ten years in the absence of a wealth tax (i.e., (€79.08 – €46.33)/€79.08).

Exhibit 4 illustrates the impact of a wealth tax on investment growth for various rates of return and investment horizons. Because wealth taxes apply to the capital base, the absolute magnitude of the liability they generate (measured in units of currency) is less sensitive to investment return than taxes based on returns. Consequently, the proportion of investment growth that it consumes decreases as returns increase. Viewed differently, a wealth tax consumes a greater proportion of investment growth when returns are low. In fact, when returns are flat or negative, a wealth tax effectively reduces principal. Like the previous two types of taxes, however, the wealth tax consumes a greater share of investment growth as the investment horizon increases.

Exhibit 4 Proportion of Investment Growth Consumed by Wealth Taxes

	Investment Horizon in Years (*n*)							
r **(%)**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
4	0.540	0.564	0.588	0.611	0.635	0.657	0.679	0.700
6	0.380	0.414	0.449	0.483	0.517	0.550	0.583	0.614
8	0.301	0.341	0.382	0.423	0.464	0.505	0.544	0.581
10	0.253	0.298	0.344	0.390	0.437	0.482	0.526	0.567
12	0.222	0.270	0.320	0.371	0.421	0.470	0.517	0.560
14	0.200	0.250	0.304	0.358	0.412	0.464	0.512	0.557
16	0.183	0.237	0.293	0.350	0.406	0.460	0.510	0.556
18	0.171	0.226	0.285	0.345	0.403	0.458	0.508	0.555

Note: The calculations assume a 2 percent annual wealth tax.

EXAMPLE 5

Wealth Tax

Olga Sanford lives in a country that imposes a wealth tax of 1.0 percent on financial assets each year. Her €400,000 portfolio is expected to return 6 percent over the next ten years.

1. What is Sanford's expected wealth at the end of ten years?
2. What proportion of investment gains was consumed by taxes?

Solution to 1:

$$FV = €400{,}000[(1.06)(1 - 0.01)]^{10} = €647{,}844.$$

Solution to 2:

Had the wealth tax not existed, $FV = €400{,}000(1.06)^{10} = €716{,}339$. This sum represents a €316,339 investment gain compared to a €247,844 gain in the presence of the wealth tax. Therefore, the one percent wealth tax consumed 21.65 percent of the investment gain (i.e., (€316,339 – €247,844)/€316,339).

3.2 Blended Taxing Environments

The discussion in the previous section is an oversimplification because each model assumes that investment gains were taxed according to only one of a number of possible taxes. In reality, portfolios are subject to a variety of different taxes depending on the types of securities they hold, how frequently they are traded, and the direction of returns. The different taxing schemes mentioned above can be integrated into a single framework in which a portion of a portfolio's investment return is received in the form of dividends (p_d) and taxed at a rate of t_d; another portion is received in the form of interest income (p_i) and taxed as such at a rate of t_i; and another portion is taxed as realized capital gain (p_{cg}) at t_{cg}. The remainder of an investment's return is

unrealized capital gain, the tax on which is deferred until ultimately recognized at the end of the investment horizon.[5] These return proportions can be computed by simply dividing each income component by the total dollar return.

EXAMPLE 6

Blended Tax Environment

Zahid Kharullah has a balanced portfolio of stocks and bonds. At the beginning of the year, his portfolio has a market value of €100,000. By the end of the year, the portfolio was worth €108,000 before any annual taxes had been paid, and there were no contributions or withdrawals. Interest of €400 and dividends of €2,000 were reinvested into the portfolio. During the year, Kharullah had €3,600 of realized capital gains. These proceeds were again reinvested into the portfolio.

1. What percentage of Kharullah's return is in the form of interest?
2. What percentage of Kharullah's return is in the form of dividends?
3. What percentage of Kharullah's return is in the form of realized capital gain?
4. What percentage of Kharullah's return is in the form of deferred capital gain?

Solution to 1:

p_i = €400/€8,000 = 0.05 or 5 percent.

Solution to 2:

p_d = €2,000/€8,000 = 0.25 or 25 percent.

Solution to 3:

p_{cg} = €3,600/€8,000 = 0.45 or 45 percent.

Solution to 4:

Unrealized gain = €8,000 – €400 – €2,000 – €3,600 = €2,000. Expressed as a percentage of return, €2,000/€8,000 = 0.25, or 25 percent. The unrealized gain is the portion of investment appreciation that was not taxed as either interest, dividends, or realized capital gain.

In this setting, the annual return after realized taxes can be expressed as

$$r^* = r(1 - p_i t_i - p_d t_d - p_{cg} t_{cg})$$

In this case, r represents the pre-tax overall return on the portfolio. From the preceding example, note that the pre-tax return was 8 percent [(€108,000/€100,000) – 1], however there would be taxes due on the interest, dividends and realized capital gains. The effective annual after-tax return, r^*, reflects the tax erosion caused by a portion of the return being taxed as ordinary income and other portions being taxed as realized capital gain and dividends. It does not capture tax effects of deferred unrealized capital

5 Capital gains are almost always taxed when recognized. Some countries, such as Denmark and Australia, however, impose an exit tax on some unrealized gains for residents who become non-residents. In Canada, capital gains are taxed at death as if realized unless the property is transferred to a surviving spouse.

gains. One can view this expression as being analogous to the simple expression in which after-tax return equals the pretax return times one minus the tax rate. The aggregate tax rate has several components in this case, but the intuition is the same.[6]

EXAMPLE 7

Blended Tax Environment: After Tax Return

Continuing with the facts in Example 6, assume that dividends and realized capital gains are taxed at 15 percent annually while interest is taxed at 35 percent annually.

1. What is the annual return after realized taxes?
2. Assuming taxes are paid out of the investment account, what is the balance in the account at the end of the first year?

Solution to 1:

$$\begin{aligned} r^* &= r(1 - p_i t_i - p_d t_d - p_{cg} t_{cg}) \\ &= 8\%[1 - (0.05 \times 0.35) - (0.25 \times 0.15) - (0.45 \times 0.15)] \\ &= 7.02\% \end{aligned}$$

Solution to 2:

Using the income data from above,

Income Type	Income Amount (€)	Tax Rate (%)	Tax Due (€)
Interest	400	35	140
Dividends	2,000	15	300
Realized capital gains	3,600	15	540
Total tax due			980

After paying taxes there would be €107,020 in the account (€108,000 – €980). Note that this is consistent with the 7.02 percent return computed for the first question.

A portion of the investment return has avoided annual taxation, and tax on that portion would then be deferred until the end of the investment horizon. Holding the tax rate on capital gains constant, the impact of deferred capital gain taxes will be diminished as more of the return is taxed annually in some way as described above. Conversely, as less of the return is taxed annually, more of the return will be subject to deferred capital gains. One can express the impact of deferred capital gain taxes using an effective capital gain tax rate that adjusts the capital gains tax rate t_{cg} to reflect previously taxed dividends, income, or realized capital gains. The effective capital gains tax rate can be expressed as[7]

$$T^* = t_{cg}(1 - p_i - p_d - p_{cg})/(1 - p_i t_i - p_d t_d - p_{cg} t_{cg})$$

6 This expression could be expanded to incorporate any number of different taxable components, such as a different rate for short term capital gains or special treatment of certain types of taxable income. The general principle is that a portfolio can generate return in different forms, each of which may be taxed differently.
7 Horan and Peterson (2001) and Horan (2002) provide more thorough developments of these expressions.

The adjustment to the capital gains tax rate takes account of the fact that some of the investment return had previously been taxed as interest income, dividends, or realized capital gain before the end of the investment horizon and will not be taxed again as a capital gain.

The future after-tax accumulation for each unit of currency in a taxable portfolio can then be represented by

$$FVIF_{Taxable} = (1 + r^*)^n(1 - T^*) + T^* - (1 - B)t_{cg} \quad (5)$$

Although this formulation appears unwieldy, $(1 + r^*)^n(1 - T^*) + T^*$ is analogous to the after-tax accumulation for an investment taxed entirely as a deferred capital gain in Equation 3. The only difference is that r^* is substituted for r, and T^* is substituted for t_{cg} in most places.[8]

Different assets and asset classes generate different amounts of return as interest income, dividends, or capital gain, and will thus have different values for p_i, p_d, and p_{cg}. Moreover, Equation 5 can replace the equations introduced in the previous sections.[9] For example, the return on a hypothetical taxable bond with no capital appreciation or depreciation over the course of a tax year might be taxed entirely at ordinary rates so that $p_i = 1$, $p_d = 0$, and $p_{cg} = 0$. If the cost basis is equal to market value (i.e., $B = 1$), the expression for the after-tax future value simply reduces to $[1 + r(1 - t_i)]^n$.

On the other hand, the return for a passive investor with a growth portfolio of non-dividend paying stocks and no portfolio turnover may be entirely tax-deferred such that $p_d = 0$, $p_i = 0$ and $p_{cg} = 0$, and the future value reduces to $(1 + r)^n(1 - t_{cg}) + t_{cg}$. The return for an active investor with a similar growth portfolio might be composed entirely of realized long-term capital gains and taxed annually at t_{cg} in which case $p_d = p_i = 0$ and $p_{cg} = 1$, and the after-tax future value is $[1 + r(1 - t_{cg})]^n$.

Most accounts conform to none of these extremes, but can be accommodated by simply specifying the proper distribution rates for interest income, dividends, and capital gain. It is useful then to have an understanding of how investment style affects the tax-related parameters (e.g., p_i, p_d, and p_{cg}).

EXAMPLE 8

Blended Tax Environment: Future Long Term Accumulation

Continuing with the facts in the previous example, assume there is a five-year investment horizon for the account. Annual accrual taxes will be paid out of the account each year with the deferred tax on previously unrealized capital gains paid at the end of the five-year horizon. The account is rebalanced annually. Consider a €100,000 portfolio with the return and tax profile listed in Panel A of Exhibit 5. What is the expected after-tax accumulation in five years?

Exhibit 5 Hypothetical Tax Profile

Panel A: Tax Profile

	Annual Distribution Rate (*p*)	Tax Rate (*T*)
Ordinary Income (*i*)	5%	35%
Dividends (*d*)	25%	15%

8 Although Equation 5 ignores the wealth tax, it could be modified to incorporate it.

9 Equation 5 does not replace the equation for the wealth tax. It can be modified, however, to do so.

Exhibit 5 (Continued)

Panel A: Tax Profile

	Annual Distribution Rate (p)	Tax Rate (T)
Capital Gain (cg)	45%	15%
Investment Horizon (n)		5 years
Average Return (r)		8%
Cost Basis		€100,000

Panel B: Intermediate Accumulation Calculations

Annual after-tax return (r^*)	7.02%
Effective capital gains tax rate (T^*)	4.27%

In this case, 25 percent of the return is composed of dividends; 5 percent is composed of interest; and 45 percent is composed of realized long-term gains. These figures imply that the remaining 25 percent (i.e., 1 – 0.05 – 0.25 – 0.45) of portfolio returns are deferred capital gains and not taxed until the end of the investment horizon.

The annual return after realized taxes, r^*, is 0.08[1 – (0.05)(0.35) – (0.25)(0.15) – (0.45)(0.15)] = 7.02 percent as computed previously. This figure reflects the annual return after having accounted for the tax drag imposed by annually levied taxes on the portion of return composed of elements like dividends, interest, and realized capital gains. It does not take into account, however, tax obligations from gains not yet realized; that effect is considered in the effective capital gains tax rate, T^*, which equals 0.15[(1 – 0.05 – 0.25 – 0.45)/(1 – 0.05 × 0.35 – 0.25 × 0.15 – 0.45 × 0.15)] = 0.15(0.25/0.8775) = 4.27 percent. The figure is relatively low in this example because a relatively small proportion of return, 25 percent, is subject to deferred capital gains tax.

Because the cost basis and the current market value portfolio are both €100,000, the cost basis expressed as a percent of current market value is 1.00. Substituting these intermediate results into Equation 5, the expected future accumulation of the portfolio in 5 years equals €100,000[$(1 + r^*)^n(1 - T^*) + T^* - (1 - B)t_{cg}$] = €100,000[$(1.0702)^5(1 - 0.0427) + 0.0427 - (1 - 1.00)0.15$] = €138,662.

3.3 Accrual Equivalent Returns and Tax Rates

Because returns can come in various forms and be taxed in various ways, an overall understanding of the impact of taxes on return can be obscure. A useful way to summarize the impact of taxes on portfolio returns is to calculate an accrual equivalent after-tax return. Conceptually, an accrual equivalent after-tax return is the tax-free return that, if accrued annually, produces the same after-tax accumulation as the taxable portfolio.[10] For example, in the previous example Kharullah's €100,000 portfolio earned an 8 percent return before taxes and will grow to €138,662 over a 5 year period after accrued and deferred taxes are considered. The tax-free return that will accumulate

10 This term is coined by Poterba (2000).

€138,662 over 5 years is the accrual equivalent return. The difference between the accrual equivalent return and the taxable return of 8 percent is a measure of the tax drag imposed on the portfolio.

An analogous way to measure tax drag is with the accrual equivalent tax rate. An accrual equivalent tax rate finds the annual accrual tax rate (of the simple form described in Section 3.1.1) that would produce the same after-tax accumulation as a tax system based in whole or in part on deferred realized gains (such as those described in Sections 3.1.2 or 3.2). Both these concepts recognize that deferring taxes through unrealized gains does not eliminate the tax liability but moves its payment through time.

3.3.1 *Calculating Accrual Equivalent Returns*

Calculating accrual equivalent returns is straightforward. In the previous example, the €100,000 portfolio has an after-tax accumulation 5 years hence of €138,662. The accrual equivalent return is found by solving for the return that equates the standard future value formula to the after-tax accumulation and solving for the return. In this example, we solve the following equation for R_{AE}:

$$€100{,}000(1 + R_{AE})^5 = €138{,}662$$

The accrual equivalent return, R_{AE}, is 6.756 percent. Notice that this rate is less than the annual return after realized taxes, r^*, of 7.02 percent because the accrual equivalent return incorporates the impact of deferred taxes on realized gains as well as taxes that accrue annually. The accrual equivalent return is always less than the taxable return, r. It approaches the annual return after realized taxes, however, as the time horizon increases. This phenomenon demonstrates the value of tax deferral. The value of deferral in this example is relatively modest, however, because only 25 percent of the tax obligation associated with the return is assumed to be deferred. If more of the return is in the form of deferred gains, the value of the deferral increases.

3.3.2 *Calculating Accrual Equivalent Tax Rates*

The accrual equivalent tax rate is derived from the accrual equivalent return. It is the hypothetical tax rate, T_{AE}, that produces an after-tax return equivalent to the accrual equivalent return. In our example, it is found by solving for T_{AE} in the following expression:

$$r(1 - T_{AE}) = R_{AE} \tag{6}$$

In the blended tax regime example, $0.08(1 - T_{AE}) = 0.06756$. Solving for T_{AE}, the accrual equivalent tax rate is therefore, 0.1555 or 15.55 percent. This rate is much lower than the marginal tax rate on ordinary income and only slightly higher than the favorable rate on dividends and capital gains in this example because a relatively small portion (i.e., 5 percent) of the portfolio's return is generated from highly taxed income. Most of the return receives preferential tax treatment in either the form of a reduced rate for dividends or a reduced rate on realized capital gains combined with valuable deferral for unrealized gains. As a result, investments with this tax profile are relatively tax efficient. The accrual equivalent tax rate would increase if either the return had a larger component taxed at ordinary rates, or if dividends and capital gains received less favorable treatment. In either case, R_{AE} would be smaller, implying a higher value of T_{AE} for a given level of pretax return r in Equation 6.

The accrual equivalent tax rate can be used in several ways. First, it can be used to measure the tax efficiency of different asset classes or portfolio management styles. Second, it illustrates to clients the tax impact of lengthening the average holding periods of stocks they own. Third, it can be used to assess the impact of future tax law changes. If the client's tax rate is likely to change in the future, the manager can determine the impact of the expected change on the accrual equivalent tax rate. The future tax rate could change for several reasons such as tax law changes, changes in

client circumstances, or the client taking advantage of tax rules designed to encourage certain behaviors such as charitable contributions which may be deductible in some tax regimes.

EXAMPLE 9

Accrual Equivalent Return

We extend Example 3 with the same facts repeated here: Vladimir Kozloski is determining the impact of taxes on his expected investment returns and wealth accumulations. Kozloski lives in a tax jurisdiction with a flat tax rate of 20 percent, which applies to all types of income and is taxed annually. He expects to earn 7 percent per year on his investment over a 20-year time horizon and has an initial portfolio of €100,000. The 7 percent return is expected to come from deferred capital gains, which are not taxed until sold in 20 years. Kozloski's expected wealth at the end of 20 years is:

$$\text{FV} = €100{,}000 \times FVIF_{cg} = €100{,}000 \times [(1 + 0.07)^{20}(1 - 0.2) + 0.2]$$
$$= €329{,}575$$

1. What is the accrual equivalent return?
2. What is the accrual equivalent tax rate?

Solution to 1:

$$€100{,}000(1 + R_{AE})^{20} = €329{,}575$$
$$R_{AE} = 6.1446 \text{ percent}$$

Kozloski would be just as well off if he could find a tax-free investment earning 6.1446 percent.

Solution to 2:

$$0.07(1 - T_{AE}) = 0.061446$$
$$T_{AE} = 12.22 \text{ percent}$$

This rate is lower than the stated tax rate on dividends because there is an advantage from the deferral of taxes.

TYPES OF INVESTMENT ACCOUNTS

4

The previous section examined models for taxable accounts in which the tax profile was determined by the asset class and/or the portfolio management style. The impact of taxes on future accumulations often depends heavily on the type of account in which assets are held. Many countries have account structures with different tax profiles designed to provide some relief to the taxable investor. These structures are often intended to encourage retirement savings, but may also accommodate savings for health care and education. Most industrialized and developing countries have tax incentives to encourage retirement savings. An international survey of 24 industrialized and developing countries commissioned by the American Council for Capital Formation

(ACCF) indicates that tax-advantaged savings accounts are offered to taxpayers by two-thirds of the countries surveyed, including Australia, Canada, Germany, Italy, the Netherlands, and the United Kingdom.[11]

Most types of investment accounts can be classified into three categories. The first type is taxable accounts. Investments to these accounts are made on an after-tax basis and returns can be taxed in a variety of ways as discussed in the previous section. A second class of accounts can be called tax-deferred accounts, or TDAs. Contributions to these accounts may be made on a pretax basis (i.e., tax-deductible), and the investment returns accumulate on a tax-deferred basis until funds are withdrawn at which time they are taxed at ordinary rates. As such, these accounts are sometimes said to have front-end loaded tax benefits. All but one of the countries in the ACCF study have some kind of retirement account that permits tax deductible contributions. In Canada they are called Registered Retirement Savings Plans (RRSPs), and in the United States some are called Individual Retirement Accounts (IRAs). In some countries, like Australia and Chile, individuals are mandated to contribute a fixed proportion of their income to these accounts. Many types of defined contribution pension plans, whether sponsored by the state or an employer, fall into this category. Argentina, for example, offers citizens the option to make contributions to a public pension fund company.

A third class of accounts has back-end loaded tax benefits. These accounts can be called tax-exempt (at least on a forward-looking basis) because although contributions are not deductible, earnings accumulate free of taxation even as funds are withdrawn, typically subject to some conditions. An example is the Roth IRA in the United States.

4.1 Tax-Deferred Accounts

Assets held in a TDA accumulate on a tax deferred basis. Tax is owed when funds are withdrawn at the end of an investment horizon at which time withdrawals are taxed at ordinary rates or another rate, T_n, prevailing at the end of the investment horizon. The future after-tax accumulation of a contribution to a TDA is therefore equal to

$$FVIF_{TDA} = (1 + r)^n(1 - T_n) \tag{7}$$

The form of Equation 7 is similar to the future value interest factor when tax is based entirely on capital gains that are recognized at the end of the investment horizon with a cost basis equal to zero (see Equation 3).

4.2 Tax-Exempt Accounts

Tax-exempt accounts have no future tax liabilities. Earnings accumulate without tax consequence and withdrawals create no taxable event. Therefore, the future accumulation of a tax-exempt account is simply

$$FVIF_{TaxEx} = (1 + r)^n \tag{8}$$

Potential insights are available in comparing Equations 7 and 8. First, we notice that $FVIF_{TDA} = FVIF_{TaxEx}(1 - T_n)$, which means that future after-tax accumulation of assets held in a tax deferred account are less than the after-tax accumulation of the same assets when held in a tax-exempt account regardless of the type of asset (assuming equivalent returns). Put simply, assets in a TDA have a built-in tax liability whereas assets in a tax-exempt account do not. It can be shown that the value of an asset held in a TDA measured on an after-tax basis is therefore equal to $(1 - T_n)$ times the value

11 American Council for Capital Formation, "An International Comparison of Incentives for Retirement Saving and Insurance" (June 1999).

of the same asset held in a tax-exempt account. The taxing authority essentially owns T_n of the principal value of a TDA, regardless of the type of asset held in it, leaving the investor effectively owning only $(1 - T_n)$ of the principal.

EXAMPLE 10

Comparing Accumulations of Account Types

Extending Examples 2 and 3, recall that Vladimir Kozloski lives in a tax jurisdiction with a flat tax rate of 20 percent which applies to all types of income. Kozloski expects to earn 7 percent per year on his investment over a 20 year time horizon and has an initial portfolio of €100,000. Assume that Kozloski has the following current investments:

1. €100,000 invested in a taxable account earning 7 percent taxed annually
2. €100,000 invested in a taxable account earning 7 percent deferred capital gains (cost basis = €100,000)
3. €100,000 invested in a tax deferred account earning 7 percent
4. €100,000 invested in a tax exempt account earning 7 percent

Compute the after-tax wealth for each account at the end of 20 years assuming all assets are sold and accounts liquidated at the end of 20 years and assuming a tax rate of 20 percent.

Solution to 1:

$$FV = €100{,}000[1 + 0.07(1 - 0.20)]^{20} = €297{,}357$$

Solution to 2:

$$FV = €100{,}000[(1 + 0.07)^{20}(1 - 0.20) + 0.20] = €329{,}575$$

Solution to 3:

$$FV = €100{,}000[(1 + 0.07)^{20}(1 - 0.20)] = €309{,}575$$

Solution to 4:

$$FV = €100{,}000[(1 + 0.07)^{20}] = €386{,}968$$

4.3 After-Tax Asset Allocation

The notion that a TDA is worth $(1 - T_n)$ times an otherwise equivalent tax-exempt account has implications for after-tax asset allocation, which is the distribution of asset classes in a portfolio measured on an after-tax basis. Consider, for example, an investor with €1,500,000 worth of stock held in a TDA and €500,000 of bonds held in a tax-exempt account as displayed in Exhibit 6. Withdrawals from the TDA account will be taxed at 40 percent. A traditional view of asset allocation based on pretax values would suggest the investor has €2,000,000 of assets, 75 percent of which are allocated in stocks and 25 percent of which are allocated in bonds. In after-tax terms, however, the total portfolio is worth only €1,400,000 because the TDA has a built-in tax liability of €600,000, money the investor cannot spend. Moreover, because

the investor is holding stock in the TDA, her after-tax equity exposure is less than a pretax analysis would suggest. Specifically, the after-tax equity allocation is only 64.3 percent rather than 75 percent.[12]

Exhibit 6 Simple Example of After-Tax Asset Allocation

Account Type	Asset Class	Pretax Market Value (€)	Pretax Weights (%)	After-Tax Market Value (€)	After-Tax Weights (%)
TDA	Stock	1,500,000	75	900,000	64.3
Tax-Exempt	Bonds	500,000	25	500,000	35.7
Total Portfolio		2,000,000	100	1,400,000	100

Note: Withdrawals at the end of the investment horizon are assumed to be taxed at a rate of 40 percent.

This simple example excludes taxable accounts and does not depend on an investor's time horizon. However, the after-tax value of taxable accounts may depend on an investor's time horizon, which can be difficult to estimate and may change over time. Therefore, estimating an investor's time horizon presents a potential impediment to incorporating after-tax asset allocation in portfolio management. Another challenge is improving client awareness, understanding, and comfort with asset allocation from an after-tax perspective. Suppose an adviser increases pretax equity exposure to achieve a target after-tax asset allocation. Her client may have difficulty accepting the notion of after-tax asset allocation, especially in a bear market when the extra equity exposure would hinder performance.

4.4 Choosing Among Account Types

A euro invested in a tax-exempt account always has a higher after-tax future value than a euro invested in a TDA, all else equal. Based on this, one may infer that it is always better to save in a tax-exempt account instead of a TDA. That conclusion would be premature, however, because the comparison overlooks the fact that contributions to TDAs are often tax-deductible whereas contributions to the tax-exempt accounts considered here generally are not.

Let's compare after-tax future values of contributions of a *pretax* euro to a tax-exempt account and a TDA. Because contributions to a tax-exempt account are taxable, a pretax investment is reduced by taxes such that the after-tax investment is $(1 - T_0)$, where T_0 is the tax rate applicable to the initial pretax contribution. The future value of a pretax dollar invested in a tax-exempt account is therefore $(1 - T_0)(1 + r)^n$. This expression reflects that taxes reduce the initial investment. The future value of a pretax dollar invested in a TDA is $(1 + r)^n(1 - T_n)$ because withdrawals are taxed at T_n. The only difference between the equations is the beginning and ending tax rates. The tax-exempt account is taxed at today's rate, T_0, while the TDA is eventually taxed at the tax rate in the withdrawal year, T_n. Therefore, comparing the attractiveness of the two types of accounts reduces to comparing the tax rate today to the expected tax rate when funds are withdrawn. If the prevailing tax rate when funds are withdrawn is less than the tax rate when they are invested, the TDA will accumulate more after-tax wealth than the tax-exempt account, and vice versa.

12 Reichenstein (1998, 2001, 2006, 2007) and Horan (2007a and 2007b) develop the concept of after-tax asset allocation in more detail.

For example, consider an investor currently in the 40 percent tax bracket who is willing to forego €1,200 of spending this year. He could invest €2,000 pretax dollars in a TDA or €1,200 after taxes in a tax-exempt account. Both investments will reduce this year's spending by €1,200 because the €2,000 TDA contribution would reduce this year's taxes by €800. He invests in an asset that earns a 5 percent annual return for ten years. Assuming his tax rate is unchanged, in ten years, the TDA will be worth €$2{,}000(1.05)^{10}(1 - 0.40)$ = €1,955 after taxes. The tax-exempt account will be worth €$1{,}200(1.05)^{10}$ = €1,955, the same as the TDA.

In this example, he could invest €2,000 in the TDA or €1,200 in the tax-exempt account; a contribution limit did not affect his choice of account type. However, annual contribution limits are usually expressed as a set amount whether the contribution is made with pretax or after-tax funds. A €2,000 contribution of after-tax funds to a tax-exempt account is effectively a larger contribution than a €2,000 contribution of pretax funds to a TDA. As a result, the tax-exempt account allows the investor to put more after-tax funds in a tax-sheltered account than a TDA, all else equal. Horan (2003, 2005) developed a more general approach that incorporates contribution limits in the balance of considerations.

Suppose, however, that the investor's tax rate upon withdrawal will be 20 percent, which is lower than his current tax rate. The future value of the €1,200 contribution to tax-exempt accumulation is unchanged at €1,955, but the TDA accumulation increases to €2,606 or $2{,}000(1.05)^{10}(1 - 0.20)$ making the TDA the better choice. The decision would be reversed if the tax rate at withdrawal exceeds the current tax rate.

EXAMPLE 11

Choosing Among Account Types

Bettye Mims would like to invest for retirement and is willing to reduce this year's spending by €3,000. She will invest €3,000 *after taxes* this year and is in a 25 percent tax bracket, which is the top marginal tax rate in her jurisdiction. Mims is considering three types of accounts but would invest in the same portfolio which is expected to have a pre-tax return of 6 percent annually. If invested in a taxable account the income would be taxed each year at the same 25 percent rate.

Assuming Mims will make a single contribution today and withdraw all funds—paying any necessary taxes in 30 years—which of the following accounts will result in the largest after-tax accumulation?

- *Account A*. A taxable account with an initial investment of €3,000.
- *Account B*. A tax deferred account, where Mims can make a €4,000 tax deductible contribution (a €3,000 after tax cost to Mims).
- *Account C*. A tax exempt account, where a €3,000 contribution is not deductible.

Solution:

The taxable account would accumulate €11,236 after taxes:

For A, FV = €$3{,}000[1 + 0.06(1 - 0.25)]^{30}$ = €11,236

The tax deferred account would accumulate €17,230 after taxes:

For B, FV = €$4{,}000[(1 + 0.06)^{30}(1 - 0.25)]$ = €17,230

The tax exempt account would also accumulate €17,230 after taxes:

For C, FV = €$3{,}000[(1 + 0.06)^{30}]$ = €17,230

Both B and C achieve the same after-tax accumulation assuming her tax rates in the contribution year and withdrawal year are the same.

5 TAXES AND INVESTMENT RISK

It is fairly obvious that taxes reduce returns. Less obvious is the impact of taxes on investment risk. A fundamental premise regarding taxes and risk is that, by taxing investment returns, a government shares risk as well as return with the investor. Because the returns on assets held in TDAs and tax-exempt accounts are not currently taxed, investors bear all of the risk associated with returns in these accounts. Even in the case of TDAs in which the government effectively owns T_n of the principal, the variability of an investor's return in relation to the current after-tax principal value is unaffected by the tax on withdrawals.[13]

Because the returns on assets held in taxable accounts are typically taxed annually in some way, investors bear only a fraction of the risk associated with these assets. Suppose asset returns are taxed entirely as ordinary income at a rate of t_i. If the standard deviation of pretax returns is σ, returns are fully taxed at ordinary rates (and all investment losses can be recognized for tax purposes in the year they are incurred), then the standard deviation of after-tax returns for a taxable account is $\sigma(1 - t_i)$. That is, an investor bears only $(1 - t_i)$ of the pretax risk.

This concept is best demonstrated by way of example. Consider a €100,000 investment with an expected return of 10 percent, which is taxed annually at 40 percent. A three-state probability distribution of equally likely outcomes is presented in Exhibit 7. The standard deviation of pretax returns is 12.25 percent. The after-tax accumulations one year hence and the after-tax returns are presented in the last two columns.[14]

Exhibit 7 Simple Example of Investment Risk and Taxes

Outcome	Prob.	Pretax Accumulation (€)	Pretax Return (%)	After-Tax Accumulation (€)	After-Tax Returns (%)
Good	1/3	125,000	25	115,000	15
Average	1/3	110,000	10	106,000	6
Bad	1/3	95,000	–5	97,000	–3
Exp. Value		110,000	10	106,000	6
Std. Dev. (σ)			12.25		7.35

Note: Investment returns are assumed to be taxed at a rate of 40 percent in the year they are earned.

13 For example, the after-tax accumulation of €1 in a TDA that earns a pretax return of r for n years is $(1 + r)^n(1 - T_n)$. The euro can be conceptually separated into $(1 - T_n)$ of the investor's funds plus T_n, the taxing authority's portion of the current principal. The investor's portion grows tax exempt from $(1 - T_n)$ today to $(1 + r)^n(1 - T_n)$ at withdrawal.

14 Readers will recognize that this analysis assumes symmetry in the tax system. That is, the €5,000 pretax loss in the bad state is partially offset by a €2,000 tax deduction in the same way a pretax gain is partially offset by a tax liability. Some jurisdictions do not build this symmetry into the tax code or may at least place restrictions on the amount of losses that can be used to reduce taxes. These complexities are not considered here.

The standard deviation of after-tax returns equals 7.35 percent, which also equals 0.1225(1 – 0.40). In other words, taxes absorbed t_{oi} of the pretax volatility; the after-tax volatility is $(1 - t_{oi})$ of the pretax volatility. As a result, the taxes not only reduce an investor's returns, but also absorb some investment risk. This concept has implications for portfolio optimization discussed below.

To see how taxes affect after-tax risk in a portfolio context, consider an investor with 50 percent of her wealth invested in equities and 50 percent invested in fixed income, both held in taxable accounts. The equity has a pretax standard deviation of 20 percent and is relatively tax-efficient such that all returns are taxed each year at a 20 percent tax rate. The fixed income is also taxed annually but at a 40 percent rate with pretax volatility of 5 percent. If the two asset classes are perfectly correlated, the pretax portfolio volatility is 0.50(0.20) + 0.50(0.05) = 0.125 = 12.5 percent. On an after-tax basis, however, portfolio volatility is 0.50(0.20)(1 – 0.20) + 0.50(0.05)(1 – 0.40) = 0.095 = 9.5 percent. This example illustrates that annually paid taxes reduce portfolio volatility.[15]

Alternatively, suppose that the equity is held in a taxable account and the fixed income is held in a tax-exempt account like those described in the previous section. In this case, the investor absorbs all of the bond volatility in the tax-exempt account, and the new portfolio volatility is 0.50(0.20)(1 – 0.20) + 0.50(0.05) = 0.105 = 10.5 percent. After-tax volatility increased from the previous measure of after-tax volatility of 9.5 percent because one of the assets (bonds) became tax sheltered. The government therefore absorbed less investment risk through taxes, and the investor is left bearing more investment risk.

IMPLICATIONS FOR WEALTH MANAGEMENT

6

The concepts introduced above have several important implications for financial analysts and portfolio managers. The value created by using investment techniques that effectively manage tax liabilities is sometimes called tax alpha. This section briefly discusses some opportunities for considering taxation in the management of individual's portfolios and tax-planning opportunities to maximize the after-tax accumulation of wealth.

6.1 Asset Location

In most tax regimes, a security's asset class determines its tax profile when held in taxable accounts. Interest income on fixed income securities are often taxed differently from capital gains on stocks, for example. We have also seen how the account structure (e.g., TDAs or tax-exempt accounts) can override this tax treatment. Further, investments in TDAs and tax-exempt accounts are limited such that investors may not place all of their investments in these types of accounts. Investors, therefore, often have multiple types of accounts (e.g., taxable, TDAs, and tax-exempt) when tax advantaged accounts are permitted. An interaction exists between deciding what assets to own and in which accounts they should be held. The choice of where to place specific assets is called the asset location decision. It is distinct from the asset allocation decision.

15 The arithmetic is somewhat more complicated when the two assets are not perfectly correlated in which case one would use the standard expression for the volatility of a two security portfolio, $\sigma_p = (w_a^2\sigma_a^2 + w_b^2\sigma_b^2 + 2w_a w_b \rho\sigma_a\sigma_b)^{1/2}$. The general point that taxes reduce portfolio volatility remains unaffected.

A well designed portfolio not only prescribes a proper asset allocation but simultaneously tells the portfolio manager the proper location for those assets. This section presents some valuable intuition and general guidance derived from the literature.

Much of the intuition is based on an arbitrage argument developed for corporate pension fund policy by Black (1980) and Tepper (1981). Suppose contributions to a pension plan are tax-deductible and the returns on pension assets are exempt from tax, much like a TDA for an individual investor. The basic idea behind the arbitrage argument is that a company should place assets that would otherwise be heavily taxed assets within the tax shelter of the pension fund, and locate more lightly taxed securities outside the pension fund. If this strategy causes the allocation of the heavily taxed asset held in the pension fund to be too high, an offsetting short position in the heavily taxed asset outside the pension fund can offset the excessive exposure in the pension fund.

For example, suppose bonds are more heavily taxed than equity. Moreover, suppose filling a company's pension fund with bonds causes an excessive allocation to bonds. The company can borrow (i.e., short bonds) outside the pension fund and invest the proceeds in equities. In this way, lending (i.e., investing in bonds) in the pension fund offsets borrowing outside the pension fund, allowing the company to achieve the desired overall asset allocation. The exact amount of borrowing required to offset the fixed-income investment in the pension fund depends on the tax rate and how assets are taxed, but the concept remains the same.

This same logic applies to individual investors. That is, investors would place in TDAs and tax-exempt accounts those securities that would otherwise be heavily taxed if held in taxable accounts (e.g., securities subject to high tax rates and/or annual taxation). The taxable account would hold lightly taxed assets (e.g., securities subject to low rates and/or tax deferral). For example, suppose an investor has €100,000 in tax-deferred accounts and €25,000 in taxable accounts as in Exhibit 8. As suggested, the €100,000 of bonds is placed in the TDA, and €25,000 of stock is placed in the taxable account, creating a pretax bond allocation of 80 percent. Suppose that the target pretax allocation is 60 percent bonds and 40 percent stocks. The investor would borrow €25,000 and purchase additional stock in the taxable account for a total of €50,000 stock. The overall asset allocation is €75,000 bonds and €50,000 stock, which attains the target allocation of 60 percent bonds and 40 percent stock.[16]

Exhibit 8 Simple Example of Asset Location

Account Type	Asset Class	Existing Pretax Market Value (€)	Existing Pretax Allocation (%)	Asset Class	Target Pretax Market Value (€)	Target Pretax Allocation (%)
TDA	Bond	100,000	80	Bond	100,000	80
Taxable	Stock	25,000	20	Stock	50,000	40
				Short Bond	(25,000)	(20)
Total		125,000	100		125,000	100

16 In this example, asset allocation is expressed in pretax terms. Technically, the asset location question should be solved jointly with asset allocation because changing locations changes asset allocation in after-tax terms. We abstract from that complexity in this example and the following examples for illustrative ease.

There are limitations to this basic arbitrage argument. Investors may face restrictions on the amount and form of borrowing. For instance, the tax arbitrage argument assumes that investors can borrow and lend at the same rate in whatever amounts they wish. In reality, this is not the case. Investors are undoubtedly subject to borrowing costs that are greater than the yield on a bond of similar risk. At least a portion of the tax gains from the arbitrage are therefore consumed by this rate differential. Moreover, behavioral constraints can limit implementation because some investors are apprehensive about borrowing money (i.e., shorting bonds) to manage their retirement portfolio.

In addition, investors may face liquidity constraints (e.g., margin requirements or withdrawal penalties from TDAs and tax-exempt accounts) that would make the arbitrage strategy costly. For example, margin rules may preclude investors from borrowing as much as the arbitrage strategy would suggest or force them to borrow at rates in excess of the bond returns in the TDA. In some jurisdictions investors face penalties for withdrawing assets held in a TDA or tax-exempt account prior to a particular date. If the equity in a taxable account suffers a substantial decline in value, an investor may be forced to liquidate assets in the tax-deferred account to finance consumption, which may trigger an early withdrawal penalty for some investors. These constraints may make strictly executing the arbitrage strategy costly or impossible.

In these cases, asset location is still important. If there are constraints to borrowing in the taxable account then the investor may hold €25,000 in stocks in the taxable account. In the TDA, she could hold €75,000 in bonds and €25,000 in stocks in the TDA. This would achieve the target allocation, while following the location preference in the absence of borrowing.

Separately, suppose she has borrowing constraints and needs €5,000 as a cash reserve in her taxable account. She could hold €20,000 in stocks and €5,000 in cash in the taxable account. In the TDA, she could hold €70,000 in bonds and €30,000 in stocks, which would achieve her target asset allocation. In each example, she follows the asset location preference to the extent possible, while satisfying her other constraints and target asset allocation.

Some jurisdictions exempt municipal bond interest or other types of interest from taxes. In this case, it could conceivably make sense to place tax-free municipal bonds in a taxable account and more heavily taxed stock in the TDA. The yield on tax-free bonds, however, is generally much lower than those on taxable bonds so that in a well functioning market their after-tax returns are approximately equal. This yield concession is a significant disadvantage to placing low yielding tax-free bonds in a taxable account and equity in a TDA. In most instances the yield concession more than offsets the value of sheltering equity returns from taxes. As a result, it is generally better to follow the general strategy of locating bonds in TDAs and equity in taxable accounts.[17]

The tax regime governing the investor determines the relative importance of asset location. In a regime where all income is taxed annually (including unrealized capital gains) and at the same rates, asset location would not matter. As noted earlier, however, these regimes are rare. In most regimes the individual tax structure should be examined to determine which assets are taxed annually and highly versus those that are tax deferred or taxed lightly. Additionally, investment style impacts how an asset or asset class is taxed. For example, active management (discussed further below) or a covered call strategy for an equity portfolio may eliminate the ability to defer taxes.

Of course, taxes are only one of many factors that go into the asset location decision. Others include behavioral constraints, access to credit facilities, age, time horizon, and investment availability. Another factor is planned holding period. If the investor has two accounts—a tax deferred account and a taxable account—that contain funds intended for retirement, then they would both have long term objectives and locating

17 See Dammon, Spatt, and Zhang (2004).

assets based on their taxation makes sense. However, if the tax deferred account contains retirement funds and the taxable account contains funds held for short term needs, it may not be appropriate to locate assets based strictly on their taxation. The asset allocation should be appropriate to the client's time horizon for each account.

6.2 Trading Behavior

The tax burden for many asset classes, such as equities when held in taxable accounts, depends on an investor's trading behavior or that of the mutual fund held by an investor. Consider four types of equity investors. The first type is a *trader* who trades frequently and recognizes all portfolio returns in the form of annually taxed short term gains. This equity management style may subject investment returns to tax burdens similar to those applied to interest income thereby eroding possible tax efficiencies associated with equities. An *active investor*, who trades less frequently so that gains are longer term in nature, may receive more favorable tax treatment.[18] The *passive investor* passively buys and holds stock. The *exempt investor* not only buys and holds stocks, but he never pays capital gains tax.[19] Optimal asset allocation and asset location for each of these investors is likely to differ.

For example, suppose these four individuals invest €1,000 in non-dividend paying stocks that earn 8 percent annually for 20 years. They live in a country that taxes capital gains realized within a year at 40 percent and gains realized after at least one year at 20 percent. The after-tax accumulations and accrual equivalent tax rates are listed in Exhibit 9.

Exhibit 9 Future Accumulations for Different Types of Investors

Investor Type	Future Accumulation (€)	Expression (€)	Accrual Equivalent Return (%)	Accrual Equivalent Tax Rate (%)
Trader	2,554	$1{,}000[1 + 0.08(1 - 0.4)]^{20}$	4.8	40.0
Active Investor	3,458	$1{,}000[1 + 0.08(1 - 0.2)]^{20}$	6.4	20.0
Passive Investor	3,929	$1{,}000[(1.08)^{20}(1 - 0.2) + 0.2]$	7.1	11.5
Exempt Investor	4,661	$1{,}000(1.08)^{20}$	8.0	0.0

Holding all else constant, the trader accumulates the least amount of wealth, and the tax exempt investor accumulates the most. The active and passive investors fall in between. This comparison illustrates that trading behavior affects the tax burden on stocks (and other assets that provide capital gain appreciation) when held in taxable accounts.

Research suggests that active managers must earn greater pretax alphas than passive managers to offset the tax drag of active trading.[20] Other research suggests that mutual fund rankings change significantly depending on whether performance is measured on a pretax or after-tax basis.[21] Therefore, it is important for the taxable investor to consider the impact of taxes on after-tax returns. Generally, for assets held in taxable accounts, portfolio turnover generates taxable gains that might otherwise

18 Examples include Australia, Belgium, Denmark, Germany, Japan, Latvia, Luxemburg, the United Kingdom, and the United States.
19 Some jurisdictions permit capital gains tax to be avoided by making charitable contributions or passing assets to an estate upon death.
20 See, for example, Jeffrey and Arnott (1993).
21 See, for example, Dickson and Shoven (1993).

be deferred. Because a number of countries have lower long-term capital gains tax rates for investment held beyond a particular holding period, higher portfolio turnover also foregoes preferential tax treatment associated with longer holding periods and lower turnover.

It is important to note that although locating highly taxed assets in tax sheltered accounts can add value for investors, a proper investment management strategy remains more important than the proper asset location strategy. That is, optimally locating assets in TDAs and taxable accounts cannot overcome the negative impact of a poor investment strategy that either produces a negative pretax alpha or is highly tax inefficient.[22]

6.3 Tax Loss Harvesting

Although the previous section indicates that active management can create a tax drag, not all trading is necessarily tax inefficient. While jurisdictions allow realized capital losses to offset realized capital gains, limitations are often placed on the amount of net losses that can be recognized or the type of income it can offset (e.g., short-term capital gains, long-term capital gains, or ordinary income). Canada, for example, only allows tax deductible losses up to the level of realized taxable gains. Realized losses in excess of realized gains may be used to offset gains realized within the last three years. Realized losses beyond that point can be carried forward and applied against gain realized at some future date.

Regardless of the specific tax rules the opportunity to recognize a loss that offsets some kind of taxable gain in a given tax year can create value. The practice of realizing a loss to offset a gain or income—and thereby reducing the current year's tax obligation—is called tax loss harvesting.

EXAMPLE 12

Tax Loss Harvesting: Current Tax Savings

Eduardo Cappellino has a €1,000,000 portfolio held in a taxable account. The end of the 2008 tax year is approaching and Cappellino has recognized €100,000 worth of capital gains. His portfolio has securities that have experienced €60,000 of losses. These securities have not yet been sold and their losses are therefore unrecognized. Cappellino could sell these securities and replace them with similar securities expected to earn identical returns.[23] The federal government taxes capital gains at 20 percent.

1. Without making any further transactions, how much tax does Cappellino owe this year?
2. How much tax will Cappellino owe this year if he sells the securities with the €60,000 loss?
3. How much tax will Cappellino save this year if he sells the securities with the €60,000 loss?

Solution to 1:

Capital gain tax = 0.20 × €100,000 = €20,000.

22 See Reichenstein (2001).

23 Realizing losses by selling and buying similar securities may be subject to certain restrictions by the government or taxing authority.

Solution to 2:

If Cappellino realizes €60,000 of losses, the net gain will be reduced to €40,000. New capital gain tax = 0.20 × (€100,000 – €60,000) = €8,000.

Solution to 3:

Tax Savings = €20,000 – €8,000 = €12,000.

It is important to understand that the tax savings realized in a given tax year from tax loss harvesting overstates the true gain. Selling a security at a loss and reinvesting the proceeds in a similar security effectively resets the cost basis to the lower market value, potentially increasing future tax liabilities. In other words, taxes saved now may be simply postponed. The value of tax loss harvesting is largely in deferring the payment of tax liabilities.[24]

EXAMPLE 13

Tax Loss Harvesting: Tax Deferral

In the previous example, the securities with an unrealized loss have a current market value of €110,000 and cost basis of €170,000 (an unrealized loss of €60,000). Cappellino could:

Option A Hold the securities with the unrealized loss, or

Option B Sell the securities in 2008 and replace them with securities offering the same return.

Next tax year (2009), the securities increase in value to €200,000 and the securities are sold regardless of which option Cappellino chooses.

1. Calculate Cappellino's 2009 tax liability if he holds the securities until year end 2009.
2. Calculate Cappellino's 2009 tax liability if he recognizes the loss today in 2008, replaces them with securities offering the same return, and realizes the capital gain at year end 2009.
3. Compare the total two-year tax liability under both options using the 2008 tax liability computed in Example 12, in which the 2008 tax liability was €20,000 if the loss was not realized and €8,000 if the loss was realized.

Solution to 1:

Capital gain tax = 0.20(€200,000 – €170,000) = €6,000.

Solution to 2:

If Cappellino recognizes the loss in 2008 and replaces the securities, the basis will be reset to €110,000 from €170,000.

Capital gain tax in 2009 = 0.20(€200,000 – €110,000) = €18,000.

24 In cases where securities receive a step up in basis upon inheritance or are gifted to charity, the government will never recapture the current year tax savings, greatly increasing the harvesting value to the investor. Furthermore, in the United States the value of a built-in capital loss is lost at death. For example, someone could realize a $1,000 loss before death and save taxes. But the asset sold immediately after his death would not benefit from this tax loss.

Solution to 3:

The two-year tax liability for both options is the same:

	2008 (€)	2009 (€)	Total (€)
Option A	20,000	6,000	26,000
Option B	8,000	18,000	26,000

Although the two-year tax liability does not change, an advantage of tax loss harvesting is pushing a portion of the tax liability into subsequent years.

A subtle benefit of tax loss harvesting is that recognizing an already incurred loss for tax purposes increases the amount of net-of-tax money available for investment. Realizing a loss saves taxes in the current year, and this tax savings can be reinvested. This technique increases the amount of capital the investor can put to use.

EXAMPLE 14

Tax Loss Harvesting: Adding Net-of-Tax Principal

In the previous example, suppose Cappellino reinvests the 2008 tax savings if he sells the securities with an unrealized loss of €60,000. His two options are therefore:

Option A Hold the securities, or

Option B Sell the securities, and reinvest the proceeds and the tax savings in nearly identical securities.

In 2009, the securities experience an 81.81 percent increase regardless of which option Cappellino chooses.

1. Calculate the securities' pretax value next year if he holds the securities.
2. Calculate the securities' pretax value next year if he recognizes the loss, and reinvests the proceeds and the tax savings in nearly identical securities.
3. What will the after-tax value be under both options if the securities are sold the next year?

Solution to 1:

FV = €110,000(1.8181) = €200,000 (approximately).

Solution to 2:

If Cappellino replaces the securities and invests the tax savings of €12,000, the invested capital will become €110,000 + €12,000 = €122,000.

FV = €122,000(1.8181) = €221,808.

Solution to 3:

The new capital gain tax for Option B at the end of the next tax year is 0.20(€221,808 – €122,000) = €19,962.

	Pretax (€)	Tax (€)	After-Tax (€)
Option A	200,000	6,000	194,000
Option B	221,808	19,962	201,846

Another advantage of tax loss harvesting is increasing the net-of-tax capital invested in the portfolio.

A concept related to tax loss harvesting is using highest-in, first-out (HIFO) tax lot accounting to sell a portion of a position. When positions are accumulated over time, lots are often purchased at different prices. Depending on the tax system, investors may be allowed to sell the highest cost basis lots first, which defers realizing the tax liability associated with lots having a lower cost basis.

Opportunities to create value through tax loss harvesting and HIFO are greater in jurisdictions with high tax rates on capital gains. Studies have shown that a tax loss harvesting program can yield substantial benefits. Although cumulative tax alphas from tax loss harvesting increase over time, the annual tax alpha is largest in the early years and decreases through time as deferred gains are ultimately realized.[25] The complementary strategies of tax loss harvesting and HIFO tax lot accounting have more potential value when securities have relatively high volatility, which creates larger gains and losses with which to work.

The previous section suggests that active trading creates a tax drag on portfolio performance. A certain amount of trading activity is required, however, to harvest tax losses if a portfolio contains unrealized losses. That is, tax-efficient management of stocks in taxable accounts does not require passive management. It requires passively allowing gains to grow unharvested, but actively realizing losses.

Harvesting losses is not always an optimal strategy. For example, in cases where an investor is currently in a relatively low tax rate environment and will face higher tax rates on gains in a subsequent period (either because her tax bracket will increase or because tax rates generally are increasing) the best strategy may be to defer harvesting losses. Doing so would offset gains that will be taxed relatively lightly compared to subsequent gains if tax rates will increase.[26] Likewise, one might want to liquidate low basis stock (lowest in, first out or LIFO) if the current tax rate is temporarily low.

6.4 Holding Period Management

The tax regime analysis earlier in the reading indicated that many jurisdictions encourage long-term investing (or equivalently discourage short-term trading) by reducing tax rates on long-term gains. The required holding period varies, of course. Depending on the magnitude of gain from waiting, short-term trading can be difficult to justify on an after-tax basis. If short-term gains are taxed at 40 percent and long-term gains are taxed at 20 percent, then 20 percent (i.e., 40 percent less 20 percent) of an investor's gains are dictated by the holding period.

Exhibit 10 shows the relative benefit of gains subject to a lower tax rate. Using a twelve-month holding period requirement for a long-term capital gain tax of 20 percent versus a short-term capital gain tax of 40 percent, the table assumes that the entire return is taxed each year. For example, consider an 8 percent return over ten years. If returns are completely taxed each year as long term gains at 20 percent, €100 will grow to €$100[1 + 0.08(1 - 0.20)]^{10}$ = €185.96. If returns are completely taxed as short-term gains at 40 percent, the accumulation is €$100[1 + 0.08(1 - 0.40)]^{10}$ =

25 See, for example, Berkin, Ye, and Arnott (2001), Stein (2004b), and Berkin and Ye (2003).
26 See Stein (2004a) for further discussion.

€159.81. The ratio between the two figures is €185.96/€159.81 = 1.164. The benefit of realizing long-term gains in lieu of short-term gains is substantial, especially for long investment horizons and higher returns.

Exhibit 10 Ratio of Future Accumulations: Accumulation Using Long-Term Capital Gains Tax Rate to Accumulation Using Short-Term Capital Gains Tax Rate

	Investment Horizon in Years (*n*)							
***r*(%)**	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**
2	1.020	1.040	1.061	1.082	1.104	1.126	1.148	1.171
4	1.040	1.081	1.124	1.168	1.215	1.263	1.313	1.365
6	1.059	1.122	1.189	1.259	1.334	1.413	1.496	1.585
8	1.079	1.164	1.255	1.354	1.461	1.575	1.699	1.833
10	1.098	1.206	1.324	1.453	1.596	1.752	1.924	2.112
12	1.117	1.248	1.394	1.557	1.739	1.943	2.170	2.425
14	1.136	1.290	1.466	1.665	1.892	2.149	2.441	2.773
16	1.155	1.333	1.540	1.778	2.053	2.371	2.738	3.162
18	1.173	1.377	1.615	1.896	2.224	2.610	3.062	3.593

Note: Capital gains are assumed to be taxed each year. Short-term gains are taxed at a rate of 40 percent. Long-term gains are taxed at 20 percent.

The penalty associated with realizing short-term gains in this environment can be viewed from a different perspective. An investment earning a 10 percent pretax return subject to a long term rate yields 8 percent after-tax [i.e., 0.10 × (1 – 0.20)]. A 13.33 percent pretax return taxed as a short-term gain is necessary to produce the same result [e.g., 0.08/(1 – 0.40)]. In other words, the pretax return must be one-third greater to produce the same after-tax result. It can be quite difficult to generate enough pretax alpha to overcome the effect of taxes on short capital gains in these types of tax environments.

Another aspect of holding period management is more tactical in terms of which tax year the tax is due. If a taxpayer subject to taxation on a calendar year basis is contemplating an asset sale in December, it may be wise to defer the sale until January if there is a built-in capital gain or sell the asset in December if there is a built-in loss. Of course the timing of taxation is not the only consideration. The attractiveness of this investment relative to alternative investments must be considered.

EXAMPLE 15

Long-Term Gain

Gretel Hazburger is considering two different portfolio strategies. The first is a hyper-active market-timing trading strategy that is expected to yield a pretax return of 12 percent. All gains will be recognized each year and taxed at the short term capital gain rate of 50 percent. Alternatively, a less active tactical asset

allocation trading strategy is expected to yield a pretax return of 10 percent. All gains will be recognized each year but classified as long term and taxed at 30 percent.

1 Which strategy is likely to produce a better after tax return?

2 What pretax return is required on the market timing strategy to produce the same after-tax return as the tactical asset allocation strategy?

Solution to 1:

After-tax return to market timing = 0.12(1 – 0.50) = 0.06 = 6 percent.
After-tax return to tactical asset allocation = 0.10 (1 – 0.30) = 0.07 = 7 percent.
The tactical asset allocation strategy produces a better return.

Solution to 2:

Required return for market timing = 0.07/(1 – 0.50) = 0.14 = 14 percent.

6.5 After-Tax Mean–Variance Optimization

We have seen how basic principles of measuring asset allocation in a pretax environment do not necessarily apply in a more economically relevant after-tax environment. The same is true for portfolio optimization techniques. That is, pretax efficient frontiers may not be reasonable proxies for after-tax efficient frontiers. It is beyond the scope of this reading to develop specific after-tax mean–variance optimization (MVO) methods. However, an important concept supporting those methods is that the same asset held in different types of accounts is essentially a distinct after-tax asset because it will produce different after-tax accumulations. In other words, an investor optimizing between two different asset classes (e.g., stocks and bonds) across two types of accounts (e.g., taxable and tax deferred accounts) has four different after-tax assets to allocate—stocks or bonds in each of the two accounts.

After recognizing that important insight, an important element in developing an after-tax MVO model is to substitute accrual equivalent returns, like those introduced above, for pretax returns in developing return expectations. Similarly, a portfolio manager would substitute the asset's after-tax standard deviation of returns for pretax standard deviations in the optimization algorithm.

The optimization process must include some constraints. For example, an optimization algorithm cannot allocate more to a tax deferred account than the funds that are available in that account. Specific investment options may also be constrained in some types of accounts. For example, privatized retirement accounts in certain countries may limit investors' options to certain types of securities. In sum, however, standard portfolio optimization practices can be adapted to consider the impact of taxes on investment returns and risk.

SUMMARY

Taxes can have a significant impact on investment returns and wealth accumulation, and managing taxes in an investment portfolio is one way advisers can add value. Taxes come in various forms and each country has its own tax code. Nonetheless, many jurisdictions share some common salient features, and many of those common elements can be identified. This allows one to define regimes that include countries

with similar rules of taxation and to build models that capture the salient features of these regimes. That is the approach taken here and the resulting analysis suggests the following:

- Taxes on investments can take at least three primary forms as discussed here. They can be based on:
  - returns—accrued and paid annually;
  - returns—deferred until capital gains are recognized;
  - wealth—accrued and paid annually.
- The impact of taxes on wealth accumulation compounds over time.
- Deferred taxes on capital gains have less impact on wealth accumulation than annual tax obligations for the same tax rate.
- An investment with a cost basis below its current market value has an embedded tax liability that may reduce future after-tax accumulations.
- Wealth taxes apply to principal rather than returns and in consequence wealth tax rates tend to be much lower than returns-based tax rates.
- Investments are typically subject to multiple forms of taxation. The specific exposure depends on the asset class, portfolio management style, and type of account in which it is held.
- An accrual equivalent after-tax return is the tax-free return that, if accrued annually, produces a given after-tax accumulation.
- An accrual equivalent tax rate is the annually accrued tax rate that, when applied to the pretax return, produces a given after-tax accumulation.
- Sometimes the type of investment account overrides the tax treatment of an investment based on its asset class.
- Tax-deferred accounts allow tax-deductible contributions and/or tax-deferred accumulation of returns, but funds are taxed when withdrawn.
- Tax-exempt accounts do not allow tax-deductible contributions, but allow tax-exempt accumulation of returns even when funds are withdrawn.
- By taxing investment returns, a taxing authority shares investment risk with the taxpayer. As a result, taxes can reduce investment risk.
- The practice of optimally placing particular asset classes in particular types of accounts is called asset location.
- Tax loss harvesting defers tax liabilities from current to subsequent periods and permits more after-tax capital to be invested in current periods.
- When short-term gains are taxed more heavily than long-term gains, it can be difficult for a short-term trading strategy to generate enough alpha to offset the higher taxes associated with short term trading.
- Traditional mean–variance optimization can be modified to accommodate after-tax returns and after-tax risk.
- Otherwise identical assets held in different types of investment accounts should be evaluated as distinct after-tax assets.
- An after-tax portfolio optimization model that optimizes asset allocation also optimizes asset location.

PRACTICE PROBLEMS

The following information relates to Questions 1–7

Alan Jackson has a new client, Aldo Motelli, who expects taxable ordinary income (excluding investments) of €200,000 this tax year. Motelli currently has €250,000 in a taxable investment account for which his main objective is retirement in 15 years. He is considering making the maximum investment of €10,000 in a new type of tax deferred account permitted in his country of residence. The contribution would be deductible and distributions are expected to be taxed at a 20 percent rate when withdrawn. The income tax structure of his country is:

Taxes on Ordinary Income

Taxable Income (€)		Tax on	Percentage on Excess
Over	Up to	Column 1 (€)	Over Column 1
0	20,000	—	10
20,000	40,000	2,000	15
40,000	60,000	5,000	20
60,000	80,000	9,000	25
80,000	100,000	14,000	30
100,000		20,000	35

Taxes on Investment Income	
Interest	10% flat rate
Dividends	10% flat rate
Realized capital gains	10% flat rate

1 What is Motelli's average tax rate on ordinary income?

A 22.5%.

B 27.5%.

C 35.0%.

2 If Motelli's current investment account of €250,000 is invested in an asset which is expected to earn annual interest of 6.5 percent and no capital gains, what is his expected after tax accumulation in 15 years?

A €578,664.

B €586,547.

C €642,960.

3 What is the accrual equivalent return assuming the facts in Question 2?

A 5.85%.

B 6.50%.

C 7.22%.

© 2011 CFA Institute. All rights reserved.

4 If Motelli's current investment account of €250,000 is invested in an investment which is expected to earn a return of 7.5 percent, all of which are deferred capital gains, what is his expected after-tax accumulation in 15 years? The account's market value is equal to its cost basis.

A €640,747.

B €665,747.

C €690,747.

5 If Motelli's current investment account of €250,000, has a cost basis of €175,000, and is invested in an investment which is expected to earn a return of 7.5 percent, all of which are deferred capital gains, what is his expected after tax accumulation in 15 years?

A €673,247.

B €683,247.

C €690,747.

6 How much after-tax wealth would Motelli accumulate assuming the same facts as in Question 4 except that 50 percent of all capital gains are recognized each year?

A €640,747.

B €665,747.

C €678,158.

7 Assuming an annual return of 7.5 percent, what would be the after-tax wealth accumulated in 15 years for a single current contribution to the TDA? Assume the contribution would be deductible but taxed at the end of 15 years at a 20 percent tax rate.

A €23,671.

B €23,965.

C €29,589.

---

8 Sam Nakusi is managing a balanced portfolio of fixed income and equity securities worth £1,000,000. The portfolio's pretax expected return is 6.0 percent. The percentage of return composed of interest, dividends and realized capital gain as well as the associated tax rates are listed below. Assume the portfolio's cost basis equals market value.

Hypothetical Tax Profile and Example

Tax Profile	Annual Distribution Rate (*p*)	Tax Rate (*T*)
Interest (*i*)	20%	35%
Dividends (*d*)	30%	15%
Capital gain (*cg*)	40%	25%

What is the expected future accumulation in 15 years assuming these parameters hold for that time period?

A £1,930,929.

B £1,962,776.

C £1,994,447.

9 In the previous question, recalculate the expected accumulation assuming the portfolio's costs basis is equal to £700,000.

A £1,373,943.

B £1,962,776.

C £1,887,776.

10 Gloria Vander is pursuing a buy-and-hold equity strategy on non-dividend paying stocks. She expects her €400,000 portfolio to experience no turnover over the next 10 years but expects to liquidate it at that time. The cost basis is currently equal to market value. If Vander expects an 8 percent pretax return and capital gains are taxed at 20 percent, what is her accrual equivalent return over that time period?

A 6.40%.

B 6.78%.

C 4.60%.

11 What is the accrual equivalent tax rate in the previous question?

A 15.25%.

B 20.00%.

C 84.75%.

12 Peter Cavuto lives in a country that imposes a wealth tax of 0.5 percent on financial assets each year. His €500,000 portfolio is expected to return 5 percent per year over the next twenty years. Assuming no other taxes, what is Cavuto's expected wealth at the end of twenty years?

A €1,200,100.

B €1,205,857.

C €1,326,649.

13 A client has funds in a tax deferred account and a taxable account. Which of the following assets would be *most appropriate* in a taxable account in a Flat and Heavy Tax Regime, in which dividends and capital gains are taxed at ordinary rates and interest income is tax exempt? Assume that all assets are held in a client's overall portfolio.

A Bonds.

B Actively traded stocks.

C High dividend paying stocks.

14 John Kaplan and Anna Forest both have €100,000 each split evenly between a tax deferred account and a taxable account. Kaplan chooses to put stock with an expected return of 7 percent in the tax-deferred account and bonds yielding 4 percent in the taxable account. Forest chooses the reverse, putting stock in the taxable account and bonds in the tax deferred account. When held in taxable account, equity returns will be taxed entirely as deferred capital gains at a 20 percent rate, while interest income is taxed annually at 40 percent. The tax rate applicable to withdrawals from the tax deferred account will be 40 percent. Cost basis is equal to market value on asset held in taxable account.

Kaplan's and Forest's Asset Location

Tax Profile	Kaplan (€)		Forest (€)	
Taxable Account	50,000	bonds	50,000	stock
Tax deferred Account	50,000	stock	50,000	bonds
Total (Before-tax)	100,000		100,000	

What is Kaplan's after-tax accumulation after 20 years?

A €196,438.

B €220,521.

C €230,521.

15 In the previous question, what is Forest's after-tax accumulation after 20 years?

A €196,438.

B €220,521.

C €230,521.

16 What is the after-tax asset allocation for the following portfolio if withdrawals from the TDA will be taxed at 40 percent?

Account	Pretax Market Value (€)	Asset Class
TDA	200,000	Bonds
Tax-exempt	80,000	Stock
Total	280,000	

A 71.4% bonds; 28.6% stock.

B 50% bonds; 50% stock.

C 60% bonds; 40% stock.

17 Lorraine Newman is evaluating whether to save for retirement using a TDA or a tax-exempt account. The TDA permits tax-deductible contributions but withdrawals will be taxed at 30 percent. The tax-exempt account permits tax-free accumulation and withdrawals but contributions are taxable at a 40 percent tax rate. Assuming contribution limits do not affect Newman's choice of accounts, which account should she choose?

A TDA.

B Tax-exempt.

C The choices are the same.

18 Which of the following assets would be most appropriate to locate in a tax deferred account in a Heavy Interest Tax Regime assuming all assets are held in a client's overall portfolio?

A Low dividend paying stock.

B Tax exempt bonds.

C Taxable bonds.

19 Consider a portfolio that is generally appreciating in value. Active trading is most likely to be *least* attractive in a:

A taxable account.

B tax deferred account.

C tax exempt account.

20 Jose DiCenzo has some securities worth €50,000 that have a cost basis of €75,000. If he sells those securities and can use the realized losses to offset other realized gains, how much can DiCenzo reduce his taxes in the *current* tax year assuming capital gains are taxed at 30 percent?

A €7,500.

B €15,000.

C €17,500.

21 In the previous question, suppose DiCenzo sells the securities in the current tax year and replaces them with securities having the same returns. He will then sell the new securities in the next tax year. What is the total tax savings assuming DiCenzo does *not* reinvest the tax savings?

A €0.

B €7,500.

C €15,000.

22 Tax loss harvesting is most effective when:

A there are few similar investment opportunities for the security with the loss.

B the taxpayer is currently in a relatively high tax environment.

C the taxpayer is currently in a relatively low tax environment.

SOLUTIONS

1 B is correct. Motelli's tax liability on ordinary income is €20,000 (on the first €100,000, third column of table, last row) + (€200,000 – €100,000) × 0.35, or €55,000. The average tax rate on ordinary income is €55,000/€200,000, or 27.5 percent.

2 B is correct. The after tax wealth accumulation for annually taxable income is

$$FVIF_i = [1 + r(1 - t_i)]^n$$
$$\text{FV} = €250{,}000 \times FVIF_i = €250{,}000 \times [1 + 0.065(1 - 0.10)]^{15}$$
$$= €586{,}547$$

3 A is correct. The accrual equivalent return is found by the following equation:

$$€250{,}000(1 + R_{AE})^{15} = €586{,}547$$

$$R_{AE} = 5.85\%$$

4 C is correct. The after tax wealth accumulation for deferred capital gains is

$$FVIF_{cg} = (1 + r)^n(1 - t_{cg}) + t_{cg}$$
$$FVIF_{cg} = €250{,}000 \times [(1 + 0.075)^{15}(1 - 0.1) + 0.1] = €690{,}747$$

5 B is correct. The after tax wealth accumulation for deferred capital gains is

$$FVIF_{cg} = (1 + r)^n(1 - t_{cg}) + t_{cg} - (1 - B)t_{cg}$$
$$FVIF_{cg} = €250{,}000 \times [(1 + 0.075)^{15}(1 - 0.1) + 0.1 - (1 - 0.70)(0.10)] = €683{,}247$$

6 C is correct.

$$r^* = r(1 - p_{cg}t_{cg})$$
$$= 0.075(1 - (0.5)(0.10)) = 0.075(1 - 0.05) = 0.07125$$
$$T^* = t_{cg}(1 - p_{cg})/(1 - p_{cg}t_{cg})$$
$$= 0.10[(1 - 0.5)/(1 - 0.5 \times 0.10)] = 0.052632$$
$$FVIF_{Taxable} = (1 + r^*)^n(1 - T^*) + T^* - (1 - B)t_{cg},\ B = 1$$
$$FV = €250{,}000 \times [(1 + 0.07125)^{15}(1 - 0.052632) + 0.052632]$$
$$= €678{,}158$$

7 A is correct.

$$FVIF_{TDA} = (1 + r)^n(1 - T_n)$$
$$FVIF = €10{,}000[(1 + 0.075)^{15}(1 - 0.20)] = €23{,}671$$

8 B is correct.

$$r^* = r(1 - p_d t_d - p_i t_i - p_{cg}t_{cg})$$
$$= 0.06^*[1 - (0.30)(0.15) - (0.20)(0.35) - (0.40)(0.25)]$$
$$= 0.0471 \text{ or } 4.71 \text{ percent}$$
$$T^* = t_{cg}(1 - p_d - p_i - p_{cg})/(1 - p_d t_d - p_i t_i - p_{cg}t_{cg})$$
$$= t_{cg}(1 - 0.30 - 0.20 - 0.40)/[1 - (0.30)(0.15) - (0.20)(0.35) - (0.40)(0.25)]$$
$$= 0.0318$$
$$FVIF_{Taxable} = £1{,}000{,}000[(1 + r^*)^n(1 - T^*) + T^*]$$
$$= £1{,}000{,}000[(1 + 0.0471)^{15}(1 - 0.0318) + 0.0318]$$
$$= £1{,}962{,}776$$

9 C is correct.

$$B = £700{,}000/£1{,}000{,}000 = 0.70$$
$$FV_{Taxable} = £1{,}000{,}000[(1 + r^*)^n(1 - T^*) + T^* - (0.25)(1 - 0.70)]$$
$$= £1{,}000{,}000[(1 + 0.0471)^{15}(1 - 0.0318) + 0.0318 - 0.075]$$
$$= £1{,}887{,}776$$

10 B is correct.

$$FV_{cg} = €400{,}000[(1 + r)^n(1 - t_{cg}) + t_{cg}]$$
$$= €400{,}000[(1 + 0.08)^{10}(1 - 0.20) + 0.20]$$
$$= €770{,}856$$

Solving for the rate set equates €770,856 with its present value of €400,000

$$€770{,}856 = €400{,}000(1 + R_{AE})^{10}$$
$$R_{AE} = 0.0678 \text{ or } 6.78 \text{ percent}$$

11 A is correct.

$$r(1 - T_{AE}) = R_{AE}$$
$$0.08(1 - T_{AE}) = 0.0678$$
$$T_{AE} = 0.1525 \text{ or } 15.25 \text{ percent}$$

12 A is correct.

$$FVIF_w = [(1 + r)(1 - t_w)]^n$$
$$FV = €500{,}000[(1.05)(1 - 0.005)]^{20} = €1{,}200{,}100$$

13 A is correct. Tax-exempt assets are not appropriate for tax deferred accounts. In a Flat and Heavy Tax Regime, dividends and capital gains are taxed at ordinary rates and are not the best choices for taxable accounts.

14 A is correct. The taxable account will accumulate to

$$FV_i = €50{,}000[1 + r(1 - t_i)]^n$$
$$= €50{,}000[1 + 0.04(1 - 0.4)]^{20}$$
$$= €80{,}347$$

The tax deferred account will accumulate

$$FV_{TDA} = €50{,}000(1 + r)^n(1 - T_n)$$
$$= €50{,}000(1.07)^{20}(1 - 0.40)$$
$$= €116{,}091$$
$$\text{Total} = €196{,}438$$

15 C is correct. The taxable account will accumulate to

$$FV_{cg} = €50{,}000[(1 + r)^n(1 - t_{cg}) + t_{cg}]$$
$$= €50{,}000[(1.07)^{20}(1 - 0.20) + 0.20]$$
$$= €164{,}787$$

The tax deferred account will accumulate

$$FV_{TDA} = €50{,}000(1 + r)^n(1 - T_n)$$
$$= €50{,}000(1.04)^{20}(1 - 0.40)$$
$$= €65{,}734$$
$$\text{Total} = €230{,}521$$

16 C is correct. The after-tax value of the TDA account is €200,000(1 – 0.40) = €120,000. The after-tax value of the tax-exempt account is €80,000. The total after-tax value of the portfolio is €200,000. Stock represents €80,000/€200,000 = 40 percent of the total, whereas bonds represent €120,000/€200,000 = 60 percent of the total.

17 A is correct. The future accumulation of the TDA is $(1 + r)^n(1 - 0.30)$, whereas the future accumulation of the tax-exempt account is $(1 + r)^n(1 - 0.40)$. Therefore, the TDA will accumulate more wealth.

18 C is correct. In this regime, interest would be taxed heavily and is most appropriate for a tax deferred account.

19 A is correct. Active trading would generate annually taxed income and is most appropriate for a tax-exempt account, all else equal. If a portfolio contains unrealized losses, however, a certain amount of trading activity is required to harvest tax losses. That is, tax-efficient management of stocks in taxable accounts does not require passive management. It requires passively allowing gains to grow unharvested, but actively realizing losses.

20 A is correct. DiCenzo has a €75,000 – €50,000 = €25,000 unrealized loss. Assuming that realizing this loss will decrease his taxable gains by the same amount, his tax bill in the current year will be reduced by 0.30 × €25,000 = €7,500.

21 A is correct. Assuming DiCenzo does not reinvest the tax savings, tax loss harvesting does not reduce the total tax paid over time. It only defers taxes because recognizing the loss resets the cost basis to a lower figure which will ultimately increase the gain realized late by the same amount. Tax loss harvest can augment return by postponing tax liabilities. Reinvesting the current year's tax savings increases the after-tax principal investment, which can augment the value of tax loss harvesting further.

22 B is correct. Tax loss harvesting is best used when tax rates are relatively high.

CUSTOMER SERVICE

68

READING

10

Estate Planning in a Global Context

by Stephen M. Horan, CFA, CIPM, and Thomas R. Robinson, CFA

Stephen M. Horan, PhD, CFA, CIPM, is at CFA Institute (USA). Thomas R. Robinson, PhD, CFA, is at AACSB International (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss the purpose of estate planning and explain the basic concepts of domestic estate planning, including estates, wills, and probate;
☐	**b.** explain the two principal forms of wealth transfer taxes and discuss effects of important non-tax issues, such as legal system, forced heirship, and marital property regime;
☐	**c.** determine a family's core capital and excess capital, based on mortality probabilities and Monte Carlo analysis;
☐	**d.** evaluate the relative after-tax value of lifetime gifts and testamentary bequests;
☐	**e.** explain the estate planning benefit of making lifetime gifts when gift taxes are paid by the donor, rather than the recipient;
☐	**f.** evaluate the after-tax benefits of basic estate planning strategies, including generation skipping, spousal exemptions, valuation discounts, and charitable gifts;
☐	**g.** explain the basic structure of a trust and discuss the differences between revocable and irrevocable trusts;
☐	**h.** explain how life insurance can be a tax-efficient means of wealth transfer;
☐	**i.** discuss the two principal systems (source jurisdiction and residence jurisdiction) for establishing a country's tax jurisdiction;

(continued)

© 2009 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**j.** discuss the possible income and estate tax consequences of foreign situated assets and foreign-sourced income;
☐	**k.** evaluate a client's tax liability under each of three basic methods (credit, exemption, and deduction) that a country may use to provide relief from double taxation;
☐	**l.** discuss how increasing international transparency and information exchange among tax authorities affect international estate planning.

1 INTRODUCTION

Estate planning is a critical component of wealth management for private clients. Translating the goals of an individual or family into effective legal and tax-efficient solutions can be a challenging task, which requires an intimate knowledge of, among other things, the tax and inheritance laws in a particular jurisdiction. The challenge is often magnified when a client has family members, assets, or income in multiple jurisdictions. Increasingly, high-net-worth individuals (HNWI) and families have these types of international interests.

Identifying the real needs of HNWI is crucial for the portfolio management and estate planning process. The issues are broad and differentiated. For example, non-taxable concerns for HNWI include succession and inheritance planning, business succession, charitable intentions, asset gathering and identification, asset protection and preservation, managing risks of divorce, "living" wills, privacy, second families, special assets like art, "toys," and more. Depending on the home country, forced heirship, political risk, kidnapping and security, and confidentiality could also be elements to consider in estate planning.

The wealth manager can add value to the advisor–client relationship by understanding salient tax and inheritance planning issues in a client's home country as well as those in other jurisdictions affecting the client's welfare. Professional tax and legal assistance is typically required to conceive, draft, and execute an estate plan or a particular solution within that plan because the field of estate planning falls largely outside the purview of the wealth manager. As such, this reading should not be considered legal advice or interpreted as a substitute for it. It is important, however, for the wealth manager to understand fundamental estate planning principles to identify issues that deserve attention and to integrate the solutions into an overall estate plan. This reading provides a framework for understanding generic tax and non-tax estate planning considerations in both a domestic and cross-border context. It also explores various approaches that different jurisdictions use to structure rules of wealth transfer.

On one hand, the complexity is daunting. On the other hand, a basic understanding of the landscape creates opportunities to develop valuable solutions to common problems. The approach developed here is valuable for several reasons. First, it can be applied in a variety of jurisdictions. The terminology used is intended to be generic and have international interpretation, but the local lexicon may vary from one jurisdiction to the next. Second, it provides an international perspective that advisors can use to counsel clients with a multi-jurisdictional footprint. Third, it provides a framework advisors can use to communicate tax and succession planning considerations to private clients and develop techniques to address the needs and objectives of such

clients. Finally, inheritance laws and tax codes in many jurisdictions are fluid. They change over time as governments use them to affect social and economic objectives. The framework developed in this reading will help the advisor manage those changes and understand their impact should they occur.

DOMESTIC ESTATE PLANNING: SOME BASIC CONCEPTS

2

2.1 Estates, Wills, and Probate

An **estate**[1] is all of the property a person owns or controls. The property in one's estate may consist of financial assets (e.g., bank accounts, stocks, bonds, or business interests), tangible personal assets (e.g., artwork, collectibles, or vehicles), immovable property (e.g., residential real estate or timber rights), and intellectual property (e.g., royalties).

An estate might exclude, however, assets that a settlor transferred to an irrevocable trust during his or her lifetime as a gift, which would be considered an example of a lifetime gratuitous transfer, also known as an *inter vivos* gift. This is discussed in more detail below. It is important to note that the elements of an estate can differ for legal and tax purposes. For example, assets transferred to a trust may no longer be considered to be legally owned by the trust settlor, or the person giving the assets to the trust, whereby the trustee of the trust becomes the legal owner of the trust assets. The assets may be considered the settlor's assets for tax purposes, however, depending on applicable tax law and the trust structure.

Estate planning is the process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime. It may involve making arrangements for other personal matters, as well, such as burial arrangements and end-of-life medical instructions should one become incapacitated. It can require the counsel of a variety of professionals including financial, legal, and taxation.

The core document most closely associated with an estate plan is a will or testament. A **will** (or testament) outlines the rights others will have over one's property after death. A testator is the person who authored the will and whose property is disposed of according to the will. **Probate** is the legal process to confirm the validity of the will so that executors, heirs, and other interested parties can rely on its authenticity. A decedent without a valid will or with a will that does not dispose of their property is considered to have died **intestate**. In that case, a court will often decide on the disposition of assets under applicable intestacy laws during the probate process.

Some individuals may wish to avoid probate. Court fees may be sizable, and the process can cause a delay in the transfer of assets to intended beneficiaries. A will can be challenged, and its contents are often a matter of public record, which may concern some wealthy families as it can cause embarrassment or divulge sensitive financial information. Moreover, many problems can arise in probate when multiple jurisdictions are involved. In some instances, probate can be avoided or its impact limited by holding assets in other forms of ownership, such as joint ownership (e.g., joint tenancy with right of survivorship), living trusts, or retirement plans. Through these structures, ownership of property is transferred to beneficiaries without the need for a will and hence the probate process can be avoided or substantially reduced.

1 Terminology will vary from jurisdiction to jurisdiction depending upon the legal structure of the jurisdiction. The term "estate" comes from common law. Legal structures such as common law are described further.

Property in an estate can be held in a variety of ways including sole ownership, joint ownership, partnership, trust, or through life insurance. Assets held in **sole ownership** are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will (or, in the absence of their disposition under the decedent's will, applicable intestacy law) through the probate process. In some jurisdictions, assets held in **joint ownership with right of survivorship** automatically transfer to the surviving joint owner or owners, as the case may be, outside the probate process. The transfer of assets held in trust and the payout of death benefit proceeds under a life insurance policy depend on the terms of the trust deed and the provisions of the life insurance contract, respectively. Trusts, life insurance, and other similar planning techniques can, therefore, transfer assets outside the probate process and can be important estate planning tools.

2.2 Legal Systems, Forced Heirship, and Marital Property Regimes

A country's legal system can affect the disposition of a will. For example, common law jurisdictions, such as the United Kingdom and the United States, generally allow a **testator** (i.e., a person who makes a will) testamentary freedom of disposition by will; that is, the right to use their own judgment regarding the rights others will have over their property after death. Most civil law countries place restrictions on such disposition.

Civil law, which is derived from Roman law, is the world's predominant legal system. In civil law states, judges apply general, abstract rules or concepts to particular cases. **Common law** systems, which usually trace their heritage to Britain, draw abstract rules from specific cases. The distinction is arguably analogous to the distinction between deductive and inductive reasoning. Put differently, in civil systems law is developed primarily through legislative statutes or executive action. In common law systems, law is developed primarily through decisions of the courts.

Countries following **Shari'a**, the law of Islam, have substantial variation, but are more like civil law systems especially in regard to estate planning. In addition to the law of the land, Muslims may wish to consider guidance on inheritance provided by Shari'a or Islamic law. Because Shari'a is often not the law of the land in most countries, including many countries where a majority of the population is Muslim, those who wish to follow Islamic guidance on inheritance are usually able to do so through the making of a will, as long as the contents of the will are not in conflict with the concerned law of the land.

Appendix A presents a comparison of non-tax issues related to estate planning for 37 jurisdictions including the legal system of each.[2] Compiled by LawInContext, Appendix A shows that 22 of the 37 jurisdictions have civil law regimes, which are common in Europe, South America, and some larger Asian countries.

The legal concept of a trust is unique to the common law. A trust is a vehicle through which an individual (called a settlor) entrusts certain assets to a trustee (or trustees) who manages the assets. Civil law countries may not recognize foreign trusts. In fact, twelve of the 22 civil law jurisdictions, including France and Germany, do not recognize trusts at all.

Ownership, like other legal principles in civil law, is a precise concept tempered by statutes that place certain limitations on the free disposition of one's assets. Under **forced heirship rules**, for example, children have the right to a fixed share of a parent's

2 None of the referenced appendixes are included or assigned as part of the curriculum. For those interested in further study, all three appendixes have been made available online under the heading "Supplemental Materials" at www.cfainstitute.org.

estate. This right may exist whether or not the child is estranged or conceived outside of marriage. Wealthy individuals may attempt to move assets into an offshore trust governed by a different domicile to circumvent forced heirship rules. They may alternatively attempt to reduce a forced heirship claim by gifting or donating assets to others during their lifetime to reduce the value of the final estate upon death. In a number of jurisdictions, however, "clawback" provisions bring such lifetime gifts back into the estate to calculate the child's share. If the assets remaining in the estate are not sufficient to cover the claim, the child may be able to recover his or her forced share from the donees who received the lifetime gifts.[3] Twenty-five of the 37 jurisdictions in Appendix A have forced heirship rules of some variety, creating a common estate planning consideration.

Spouses typically have similar guaranteed inheritance rights under civil law forced heirship regimes. In addition, spouses have marital property rights, which depend on the marital property regime that applies to their marriage. For example, under **community property regimes**, each spouse has an indivisible one-half interest in income earned during marriage. Gifts and inheritances received before and after marriage may still be retained as separate property. Upon death of a spouse, the property is divided with ownership of one-half of the community property automatically passing to the surviving spouse. Ownership of the other half is transferred by the will through the probate process.

In **separate property regimes**, prevalent in civil law countries, each spouse is able to own and control property as an individual, which enables each to dispose of property as they wish, subject to a spouse's other rights. Italian forced heirship rules, for example, apply to the decedent's community and separate property. It is noteworthy that, in many civil law countries, couples can elect the marital property regime that will apply to their property. The marital property regimes of each of the 37 jurisdictions are summarized in Appendix A.

EXAMPLE 1

Community Property and Forced Heirship

Philippe and Helena Berelli live in a community property regime with their two children. The community property regime entitles a surviving spouse to receive one-half of the community property after the first spouse's death. There are also forced heirship laws in their country that entitle a spouse to one-third of the total estate and the children are entitled to split one-third of the total estate. After their marriage, Philippe received an inheritance that was retained as separate property and is worth €200,000 today. The remainder of the estate is considered community property. Suppose Philippe passes away today with a total estate of €800,000 and wishes to bequeath €300,000 to his surviving mother.

1. What is the minimum that Helena should receive?
2. What is the minimum amount the children should receive under forced heirship rules?
3. May Philippe bequeath €300,000 to his mother?

3 See Hayton (2003).

Solution to 1:

Helena is entitled to the greater of her share under community property or forced heirship rules. Under community property, she is entitled to receive one-half of the community property, or 0.50(€800,000 – €200,000) = €300,000. Under forced heirship rules she is entitled to one-third of the total estate, or (1/3)(€800,000) = €266,667. Therefore, Helena is entitled to €300,000.

Solution to 2:

The children are collectively entitled to receive one-third of the total estate equal to €266,667, or €133,333 for each child.

Solution to 3:

Philippe is able to freely dispose of the remainder, which is €800,000 – €300,000 – €266,667 = €233,333. Therefore, Philippe is unable to bequeath €300,000 to his mother, but may bequeath the remainder of €233,333.

2.3 Income, Wealth, and Wealth Transfer Taxes

An important part of estate planning is an understanding of how (or whether) assets are taxed when their ownership is transferred at or before death. In general, taxes are levied in one of four general ways:[4]

1. Tax on income
2. Tax on spending
3. Tax on wealth
4. Tax on wealth transfers

Taxes on income can be levied at different rates for a variety of income categories such as compensatory income, investment income, etc. Appendix B provides a brief description of income taxes (excluding separate capital gains tax regimes, if any), as well as wealth and gratuitous transfer taxes in 37 different jurisdictions.[5] Almost all jurisdictions in Appendix B, with the exception of the Bahamas, Cayman Islands, and the United Arab Emirates, impose income taxes.

Investment income is typically taxed in several possible ways. It can be taxed annually on either an accrual or cash basis as income or gains are received. Alternatively, tax can be deferred until the gain on an asset is ultimately recognized upon the sale or disposition of the asset. Horan and Robinson (2008) review the investment tax regimes of over 50 developed economies and discuss their investment implications in detail.

Taxes on spending normally take the form of sales taxes where a tax is applied to certain types of purchases. These can be applied at the time of purchase or periodically through some computation of consumption.

Wealth-based taxes can come in several forms. A jurisdiction may levy taxes annually on the principal value of real estate, financial assets, tangible assets, etc. Tax based on one's comprehensive wealth is often referred to as **net worth tax or net wealth tax**. According to Appendix B, only seven of the 37 jurisdictions covered in the appendix impose such wealth taxes. The economic implications of wealth-based

4 This categorization is based primarily on Wilcox, Horvitz, and diBartolomeo (2006) and Horvitz (2008), and corresponds closely with Bronson, Scanlan, and Squires (2007).

5 See Horan and Robinson (2008) for further details on global income tax regimes including capital gains taxes.

taxes are different from taxes on investment returns because the asset's entire capital base (less liabilities associated with the relevant asset), rather than only incremental gains, is subject to tax. These implications are discussed in greater detail elsewhere.[6]

Taxes on wealth transfers are the purview of estate planning and will be a focus of this reading.[7] The two primary forms of taxes on wealth transfers correspond to the primary ways of transferring assets: gifting assets during one's lifetime, and bequeathing assets upon one's death through a will or via some other structure.

In an estate planning context, lifetime gifts are sometimes referred to as **lifetime gratuitous transfers**, or *inter vivos* transfers, and are made during the lifetime of the donor. The term "gratuitous" refers to a transfer made with purely donative intent, that is, without expectation of anything in exchange. Gifts may or may not be taxed depending on the jurisdiction. Where gift tax applies, taxation may also depend on other factors such as the residency or domicile of the donor, the residency or domicile of the recipient, the tax status of the recipient (e.g., nonprofits), the type of asset (moveable versus immovable), and the location of the asset (domestic or foreign).

Bequeathing assets or transferring them in some other way upon one's death is referred to as a **testamentary gratuitous transfer**. The term "testamentary" refers to a transfer made after death. From a recipient's perspective, it is called an inheritance. Similar to lifetime gifts, the taxation of testamentary transfers (transfers at death) may depend upon the residency or domicile of the donor, the residency or domicile of the recipient, the type of asset (moveable versus immovable), and the location of the asset (domestic or foreign).

Taxes on wealth transfer may be applied to the transferor or the recipient. For example, in the case of testamentary gratuitous transfers, some jurisdictions impose an estate tax that is generally on the liability of the transferor (or more precisely, the estate of the transferor). Other jurisdictions impose liability for wealth transfer taxes on the recipient, often referred to as an inheritance tax.[8] These taxes may be applied at a flat rate or based on a progressive tax rate schedule, where the tax rate increases as the amount of wealth transferred increases. Often the tax is applied after the deduction of a statutory allowance. The tax rate may also depend on the relationship between transferor and recipient. Transfers to spouses, for instance, are often tax exempt.

EXAMPLE 2

UK Inheritance Tax Example

Paul Dasani, an unmarried individual, passed away in November 2008. Dasani was a resident of London at the time of his death and had a total estate valued at £600,000. His children are the beneficiaries of the estate. The United Kingdom imposes an inheritance tax threshold on estates valued above £312,000 in 2008. The tax is payable by the trustee of the estate out of estate assets at a rate of 40 percent on the amount over the statutory allowance of £312,000.

What is the amount of inheritance tax payable?

Solution:

The inheritance tax is computed as:

6 See, for example, Wilcox, Horvitz, and diBartolomeo (2006), Horan and Robinson (2008), Horvitz (2008).

7 Wilcox, Horvitz, and diBartolomeo (2006) categorize estate or inheritance taxes as a wealth-based tax, but we and others (including Horvitz 2008) categorize it as a transfer tax because the ownership of inherited assets is transferred to heirs and it is this transaction that is taxed. In addition, an inheritance tax is typically levied once rather than repeatedly as is the case for most wealth-based taxes.

8 As noted earlier, terminology differs from jurisdiction to jurisdiction, and the terms *estate tax* and *inheritance tax* are sometimes used interchangeably.

Estate value	£600,000
Less threshold	(£312,000)
Excess	£288,000
Rate on excess	40%
Inheritance tax	£115,200

EXAMPLE 3

Progressive Estate Tax Example

Ya-wen Chao passed away in a jurisdiction with progressive estate tax rates as provided in the table below. After all applicable exemptions, Chao had a taxable estate of €2,000,000. What is Chao's estate tax?

Taxable Estate (€)	Tax Rate (%)
Up to 600,000	2
600,001–1,500,000	4
1,500,001–3,000,000	7
3,000,001–4,500,000	11
4,500,001–6,000,000	15
6,000,001–10,000,000	20
10,000,001–15,000,000	26
15,000,001–40,000,000	33
40,000,001–100,000,000	41
Over 100,000,000	50

Solution:

The estate tax is computed as:

Tax on first 600,000 (2%) =	€12,000
Tax on next 900,000 (4%) =	36,000
Tax on remaining 500,000 (7%) =	35,000
Total estate tax	€83,000

3 CORE CAPITAL AND EXCESS CAPITAL

Developing an estate plan that will sustain a family and their descendants over multiple generations is a challenging task. A mathematical reality is that the sheer number of family members has a tendency to grow exponentially from one generation to the next as members of subsequent generations propagate, often doubling from one generation to the next.

To put the problem into perspective, consider the case of a 60-year-old couple with no bequest motive; that is, no specific desire to transfer wealth to their children or beyond. One of their likely concerns is how much they can spend from their portfolio without depleting their resources before the end of their lifetimes, which probably

means sustaining wealth for at least another 30 years. Estimates vary, but researchers place the sustainable spending rate between 3.5 percent and 6 percent of the initial portfolio value, assuming that spending increases by the inflation rate in subsequent years.[9] To many, these values are surprisingly modest and illustrate how easily a family can adopt a spending rate that is unsustainable, especially over a time horizon that extends beyond one generation. This challenge of sustaining wealth over multiple generations is magnified as the number of family members grows. Exacerbating the problem further is the potential erosion caused by taxes each time assets are transferred from one generation to the next.

Difficulties also arise when managing the conflicting interests within and across generations. The first generation's wealth transfer goals are often informed by the character, maturity, and circumstances of the individuals involved. In any case, the starting point in developing an estate plan is deciding how much wealth to transfer and whether to transfer wealth to future generations, philanthropic causes, or elsewhere. The answer to this question begins with an understanding of the spending needs of the first generation.

Wilcox, Horvitz, and diBartolomeo (2006) developed the notion of a life balance sheet, which is a comprehensive accounting of an investor's assets and liabilities, both explicit and implied. Explicit assets consist of financial assets (e.g., stocks and bonds), real estate, and other property that can be readily liquidated. A notable implied asset for many is the present value of one's employment capital, often referred to as **human capital** or **net employment capital**. Expected pension benefits are another implied asset that, although non-tradable, provide specific value to the investor.[10]

On the right-hand side of the life balance sheet are an investor's liabilities. Explicit liabilities, such as mortgages or margin loans, are fairly obvious entries. Less obvious are implied liabilities that represent the capitalized value of the investor's desired spending goals. These goals may include providing for a secure retirement, funding children's education, providing a safety reserve for emergencies, or earmarking seed capital for business ventures. The amount of capital required to fund spending to maintain a given lifestyle, fund these goals, and provide adequate reserves for unexpected commitments is called **core capital**.

An investor with more assets than liabilities on the life balance sheet has more capital than is necessary to fund their lifestyle and reserves and therefore has **excess capital** that can be safely transferred to others without jeopardizing the investor's lifestyle.[11] Exhibit 1 presents a hypothetical life balance sheet with assets listed on the left-hand side. Notice that the capitalized value of the investor's college funding obligations, retirement spending, and safety reserve, is represented by the implied liabilities on the right-hand side of the hypothetical balance sheet.

9 See, for example, Bengen (1994, 1996, 1997), Guyton (2004), Milevsky and Robinson (2005), Spitzer and Singh (2006), Spitzer, Strieter, and Singh (2007), Stout and Mitchell (2007).

10 Wilcox, Horvitz, and diBartolomeo (2006) and Ibbotson, Milevsky, Chen, and Zhu (2006) discuss human capital and its relation to life cycle planning in more detail.

11 Wilcox, Horvitz, and diBartolomeo (2006) refer to this excess capital as "discretionary wealth."

Exhibit 1 Hypothetical Life Balance Sheet

Source: Adapted from Wilcox, Horvitz, and diBartolomeo (2006), p.18.

3.1 Estimating Core Capital with Mortality Tables

The amount of core capital needed to maintain an investor's lifestyle in a probabilistic sense can be estimated in a number of ways. First, it is important to incorporate the effects of inflation, particularly over long time horizons. One can either forecast nominal spending needs discounting them to the present values using nominal discount rates, or forecast real spending needs discounting them using real discount rates. The two approaches are indistinguishable.

The most straightforward way of calculating core capital is to calculate the present value of anticipated spending over one's remaining life expectancy. One problem with this approach is that, by definition, an investor has a significant probability of living past their remaining life expectancy because life expectancy is an average that has substantial variation. Estimates of core capital based on life expectancy will fall short of what is actually required in a great many cases.[12]

Another approach is to calculate expected future cash flows by multiplying each future cash flow needed by the probability that such cash flow will be needed, or **survival probability**. When more than one person is relying on core capital (e.g., two

12 See Wilcox (2008) for a more thorough discussion.

spouses), the probability of survival in a given year is a joint probability that either the husband or the wife survives. Specifically, the probability that either the husband or the wife survives equals:

$$p(\text{Survival}) = p(\text{Husband survives}) + p(\text{Wife survives}) - p(\text{Husband survives}) \times p(\text{Wife survives}) \quad (1)$$

assuming their chances of survival are independent of each other. The present value of the spending need is then equal to:

$$PV(\text{Spending need}) = \sum_{j=1}^{N} \frac{p(\text{Survival}_j) \times \text{Spending}_j}{(1+r)^j} \quad (2)$$

The numerator is the expected cash flow in year *j*, that is, the probability of surviving until that year times the spending in that year should the person survive.

For example, consider Ernest and Beatrice Webster, ages 79 and 68, respectively. Their individual probabilities of survival are shown in Columns 3 and 5 of Exhibit 2. Over the next year, Ernest has approximately a 93.6 percent chance of survival, while the younger Beatrice has a 98.3 percent chance of survival.[13] The chance of either one of them surviving, however, is greater than either of their individual probabilities of survival. Specifically, the combined probability that either or both survive for the first year is 0.9989 = 0.9355 + 0.9831 − 0.9355 × 0.9831. This figure is represented in Column 6.

Exhibit 2 Example of Core Capital Calculation for Ernest and Beatrice Webster

	Ernest		Beatrice					
Year (1)	Age (2)	*p*(Survival) (3)	Age (4)	*p*(Survival) (5)	Combined *p*(Survival) (6)	Annual Spending (7)	Expected Spending (8)	Discounted Value (9)
1	80	0.9355	69	0.9831	0.9989	500,000	499,457	489,664
2	81	0.8702	70	0.9649	0.9954	515,000	512,654	492,747
3	82	0.8038	71	0.9457	0.9893	530,450	524,800	494,531
4	83	0.7339	72	0.9249	0.9800	546,364	535,443	494,666
5	84	0.6686	73	0.9025	0.9677	562,754	544,581	493,244
6	85	0.6001	74	0.8785	0.9514	579,637	551,476	489,695
7	86	0.5327	75	0.8526	0.9311	597,026	555,893	483,938
8	87	0.4674	76	0.8252	0.9069	614,937	557,682	475,976
9	88	0.4048	77	0.7958	0.8785	633,385	556,412	465,580
10	89	0.3459	78	0.7646	0.8460	652,387	551,947	452,789
11	90	0.2912	79	0.7311	0.8094	671,958	543,909	437,446
12	91	0.2414	80	0.6952	0.7688	692,117	532,095	419,553
13	92	0.1968	81	0.6582	0.7254	712,880	517,156	399,778
14	93	0.1576	82	0.6173	0.6776	734,267	497,573	377,098
15	94	0.1239	83	0.5775	0.6298	756,295	476,345	353,931
16	95	0.0955	84	0.5340	0.5785	778,984	450,638	328,265

(continued)

13 It is worth noting that survival probabilities change each year. They are conditioned on one surviving until a particular age. For example, Ernest is currently 79 years old and has an 87.02% chance of surviving two more years until age 81. Moving forward one year, if Ernest survives until age 80, his chances of surviving until age 81 increase because he has already made some progress in that direction. Therefore, the probabilities change from one year to the next and will warrant updating.

Exhibit 2 (Continued)

	Ernest		Beatrice					
Year (1)	Age (2)	*p*(Survival) (3)	Age (4)	*p*(Survival) (5)	Combined *p*(Survival) (6)	Annual Spending (7)	Expected Spending (8)	Discounted Value (9)
17	96	0.0720	85	0.4894	0.5262	802,353	422,165	301,494
18	97	0.0532	86	0.4441	0.4736	826,424	391,431	274,064
19	98	0.0373	87	0.3987	0.4211	851,217	358,456	246,055
20	99	0.0262	88	0.3538	0.3707	876,753	325,053	218,751
21	100	0.0180	89	0.3100	0.3224	903,056	291,161	192,101
22	101	0.0000	90	0.2679	0.2679	930,147	249,204	161,195
23	102	0.0000	91	0.2281	0.2281	958,052	218,569	138,607
24	103	0.0000	92	0.1912	0.1912	986,793	188,652	117,289
25	104	0.0000	93	0.1575	0.1575	1,016,397	160,043	97,551
26	105	0.0000	94	0.1273	0.1273	1,046,889	133,275	79,643
27	106	0.0000	95	0.1009	0.1009	1,078,296	108,795	63,739
28	107	0.0000	96	0.0783	0.0783	1,110,645	86,937	49,935
29	108	0.0000	97	0.0594	0.0594	1,143,964	67,905	38,238
30	109	0.0000	98	0.0439	0.0439	1,178,283	51,764	28,578
31	110	0.0000	99	0.0317	0.0317	1,213,631	38,452	20,812
32	111	0.0000	100	0.0000	0.0000	1,250,040	—	—
							Total	9,176,955

The Websters' inflation-adjusted annual spending needs are calculated based on their current spending of €500,000 per year and are increased annually using a 3 percent real growth rate (that is, 3 percent annual spending growth after inflation). The Websters' *expected* spending need each year is presented in the column labeled *Expected Spending* (Column 8). It is calculated as the product of their joint survival probability and their required spending for that year (*Annual Spending*, Column 7). Each year's expected spending is discounted back to the present, using in this case a real risk-free discount rate of 2.0 percent. The sum of each year's present value of expected spending represents the investor's core capital. In this case, Ernest and Beatrice Webster have core capital spending needs of about €9,176,955.[14]

This approach can be modified by conditioning each year's spending based on each spouse's expected survival. For example, if Ernest were to pass away, Beatrice's independent spending needs may be lower than what would have been required if Ernest were also alive. Alternatively, her spending need could be higher. Estimates vary and would certainly be affected by individual circumstances, but some economists estimate that two people can maintain the same living standard for 1.6 times the cost of one. Using this estimate, Beatrice could maintain the same lifestyle with 1/1.6 (or 62.5%) of the amount of spending if Ernest passed away.

In this approach, spending needs are discounted using the real risk-free rate to match the risk of the cash flows. To be sure, the cash flows are not without risk but their uncertainty is most likely unrelated to market risk factors that would be priced in a normal asset pricing model, making their beta equal to zero. One may argue that,

14 A more conservative approach is assuming that both Ernest and Beatrice survive throughout the forecast horizon provided, rather than assigning probabilities to their combined survival each year.

although mortality risk in this context is non-systematic, it is also non-diversifiable. However, mortality risk can be hedged with traditional life insurance allowing the individual to eliminate the non-systematic risk even if it is non-diversifiable. Therefore, discounting spending needs with the risk-free rate is appropriate.

It is tempting to discount spending needs using the expected return of the assets used to fund them. This would be problematic because the risk of the Websters' spending needs is fundamentally unrelated to the risk of the portfolio used to fund those needs. Merton (2007) draws this distinction in the context of a defined-benefit pension plan. He points out that using the expected return of pension fund assets to discount the liabilities they are intended to fund systematically under-prices those liabilities, and has contributed to the decline of defined-benefit pension plans. Another approach using Monte Carlo simulation with expected returns and volatility is discussed below.

3.1.1 *Safety Reserve*

This approach does not, however, fully account for the risk inherent in capital markets. For example, there is no guarantee that capital markets will produce returns greater than the risk-free rate even over long periods of time. Therefore, the present value of the Websters' spending needs underestimates their true core capital needs. One way to adjust for this underestimation is to augment core capital with a safety reserve designed to incorporate flexibility into the estate plan.[15] Incorporating flexibility in this way can be important for at least two reasons. First, it provides a capital cushion if capital markets produce a sequence of unusually poor returns that jeopardize the sustainability of the planned spending program. Second, it allows the first generation to increase their spending beyond that explicitly articulated in the spending program. In this way, the safety reserve addresses not only the uncertainty of capital markets, but the uncertainty associated with a family's future commitments.

The size of the safety reserve can be based on a subjective assessment of the circumstances. For example, Evensky (1997) advocates a safety reserve equal to two years of spending. His reasons are behavioral as well as practical. The reserve provides a psychological buffer between an investor and the volatility of capital markets. The investor perceives that their spending needs are unaffected by short-term capital market volatility and is better able to adhere to a particular investment strategy during turbulent markets.

EXAMPLE 4

Core Capital with Mortality Probabilities

Kenroy and Alicia Trudeau live in South Africa and are 64 and 61 years old, respectively. Their survival probabilities based on their current ages are listed in the table below. They would like to maintain annual spending of ZAR 1,000,000 on an inflation-adjusted basis. Inflation is expected to be 3 percent, and the nominal risk-free rate is 5 percent.

15 Wilcox (2008) proposes a more complex solution that accounts for the joint distribution of uncertain life spans and asset returns and that produces even more conservative estimates of core capital.

	Kenroy		Alicia	
Year	Age	*p*(Survival)	Age	*p*(Survival)
1	65	0.991	62	0.996
2	66	0.981	63	0.986
3	67	0.971	64	0.976

1 What is the probability that either Kenroy or Alicia will survive in each of the next three years?

2 What is the capitalized value of their core capital spending needs over the next three years?

Solution to 1:

The probability that either Kenroy or Alicia will survive is equal to the sum of their individual probabilities less the product of their individual probabilities.

$$p(\text{Joint survival}) = p(\text{Kenroy survives}) + p(\text{Alicia survives}) - p(\text{Kenroy survives})\,p(\text{Alicia survives})$$

For the next three years, the joint probability of survival is:

Year	Joint *p*(Survival)
1	0.9999
2	0.9997
3	0.9993

Solution to 2:

The capitalized value of their core capital spending needs equals the product of the joint probability of survival and the real spending need for each year discounted using the real risk-free rate. Alternatively, one may discount the nominal expected cash flow at the nominal risk-free rate. Using the first approach, the real cash flows will remain constant and be discounted at 2 percent (or 5 percent less 3 percent).[16]

Year	Annual Spending	Expected Spending	Discounted Value
1	1,000,000	999,960	980,360
2	1,000,000	999,730	960,910
3	1,000,000	999,300	941,670
			2,882,940

16 Two percent is an approximation. A more precise calculation is: (1.05/1.03) – 1 = 1.94%.

3.2 Estimating Core Capital with Monte Carlo Analysis

Another approach to estimating core capital uses Monte Carlo analysis, a computer-based simulation technique that allows the analyst to forecast a range of possible outcomes based on, say, 10,000 simulated trials.[17] Rather than discounting future expenses, this approach estimates the size of a portfolio needed to generate sufficient withdrawals to meet expenses, which are assumed to increase with inflation. This approach more fully captures the risk inherent in capital markets than the mortality table approach described above. For example, one could forecast a particular path of portfolio values based on a hypothetical sequence of returns that conforms to the statistical properties associated with the portfolio's expected return. That particular path is one of an infinite set of possible outcomes. The analyst can then forecast another path based on the same set of statistical properties, which will lead to a different outcome. Repeating this procedure thousands of times provides a range of possible outcomes and an understanding of the risk of the portfolio.

One can incorporate recurring spending needs, irregular liquidity needs, taxes, inflation, and other factors into the analysis. In the context of calculating core capital, the wealth manager might estimate the amount of capital required to sustain a pattern of spending over a particular time horizon with, for example, a 95 percent level of confidence. That is, the analyst determines the core capital that sustains spending in at least 95 percent of the simulated trials. A higher level of confidence leads to larger estimates of core capital, and vice versa. The safety reserve may also be added to accommodate flexibility in the first generation's spending patterns. It need not be quite as large as that used in the mortality table method, however, because Monte Carlo analysis already captures the risk of producing a sequence of anomalously poor returns. In contrast to the mortality table method in which cash flows are discounted at the risk-free rate of return, the expected returns used in Monte Carlo analysis are derived from the market expectations of the assets comprising the portfolio.

Milevsky and Robinson (2005) developed a method to calculate sustainable spending rates that approximate those produced from a Monte Carlo simulation but without the need for simulation. Their analysis incorporates life-span uncertainty as well as financial market risk. Exhibit 3 presents an example of ruin probabilities (i.e., the probability of depleting one's financial assets before death) based on their analysis. For example, consider Mr. Harper, a single 65-year-old with the same €500,000 annual spending need as the Websters. He is willing to accept a 9 percent chance that his spending pattern may exhaust his portfolio before the end of his life (e.g., 91 percent level of confidence). This represents the probability of ruin, or the probability that his spending is unsustainable.

This analysis assumes the balanced portfolio has a mean arithmetic return of 5 percent and volatility of 12 percent. It also assumes that the spending rate is determined by the initial portfolio value and increased by the rate of inflation annually thereafter. Under these conditions, Mr. Harper can spend €4.00 for each €100 of core capital, or 4 percent of capital. The core capital required for Mr. Harper to spend €500,000 per year is therefore €12,500,000 = €500,000/0.04. If he is willing to accept a higher probability of failure, Mr. Harper will need less capital. For example, a 15.8 percent chance of Mr. Harper's spending outlasting his portfolio allows him to spend €5.00 for every €100, which requires only €10,000,000, or €500,000/0.05, of core capital.

Asset allocation affects the expected return and volatility of the portfolio, which in turn affects the sustainability of a given spending rate. Obviously, higher return improves sustainability and would require less core capital to generate the same

17 See Sharpe, Chen, Pinto, and McLeavey (2007) for a more detailed discussion of its applications within the context of a retirement portfolio. In addition, Bernstein (2008) presents Monte Carlo analysis in the larger context of estate planning.

Exhibit 3 Ruin Probability for Balanced Portfolio of 50 Percent Equity and 50 Percent Bonds

Retirement Age	Median Age at Death	Hazard Rate, λ (%)	Real Annual Spending per $100 of Initial Nest Egg								
			$2.00 (%)	$3.00 (%)	$4.00 (%)	$5.00 (%)	$6.00 (%)	$7.00 (%)	$8.00 (%)	$9.00 (%)	$10.00 (%)
Endowment	Infinity	0.00	6.7	24.9	49.0	70.0	84.3	92.5	96.6	98.6	99.4
50	78.1	2.47	1.8	6.4	14.0	24.0	35.2	46.3	56.8	66.0	73.8
55	83.0	2.48	1.8	6.3	14.0	24.0	35.1	46.2	56.7	65.9	73.7
60	83.4	2.96	1.5	5.2	11.6	20.1	29.9	40.1	50.0	59.1	67.2
65	83.9	3.67	1.1	4.0	9.0	15.8	24.0	32.8	41.8	50.5	58.5
70	84.6	4.75	0.8	2.8	6.3	11.4	17.6	24.7	32.2	39.8	47.2
75	85.7	6.48	0.5	1.7	3.9	7.2	11.4	16.3	21.9	27.8	33.9
80	87.4	9.37	0.3	0.9	2.0	3.8	6.2	9.1	12.5	16.3	20.5

Note: Mean arithmetic portfolio return = 5 percent; standard deviation of return = 12 percent; mean geometric portfolio return = 4.28 percent.
Source: Milevsky and Robinson (2005).

level of spending. Volatility must also be considered, however, because it decreases the sustainability of a spending program for at least two reasons. First, even in the absence of a spending rule, volatility decreases future accumulations. This concept can be illustrated by noting that future accumulations per unit of currency are equal to the product of one plus the geometric average return, or:

$$\begin{aligned} \text{FV} &= (1 + R_G)^N = \prod_{n=1}^{N}(1 + R_n) \\ &= (1 + R_1)(1 + R_2)(1 + R_3)\ldots(1 + R_N) \end{aligned} \tag{3}$$

where R_G is the geometric average return over period N. It is commonly referred to as the compounded return. The geometric average return is related to the arithmetic average return and its volatility in the following way:

$$R_G \cong r - \frac{1}{2}\sigma^2 \tag{4}$$

where r is the arithmetic average return and σ is the volatility of the arithmetic return. According to Equation 4, higher volatility decreases the geometric average return and hence future accumulations, which in turn decreases sustainability. Another way to illustrate this point is to consider a €100 portfolio that experiences sequential returns of +50 percent followed by −50 percent. Although the arithmetic average of those returns is zero, the portfolio's value after two years is only €75. The €25 decline in value is due to the volatility of returns represented by the second term in Equation 4.

The second reason volatility decreases sustainability relates to the interaction of periodic withdrawals and return sequences. Equation 3 shows that future accumulations do not depend on the sequence of returns in the absence of periodic spending withdrawals. That is, the future value calculation is unchanged regardless of whether R_1 and R_2 (or any other two periodic returns) are reversed. Put differently, in the example of +50 percent and −50 percent returns, the ending value after two years is the same regardless of whether the portfolio returns are sequenced with the positive return first or last.

This independence disappears when withdrawals are introduced. Specifically, the sustainability of a portfolio is severely compromised when the initial returns are poor because a portion of the portfolio is being liquidated at relatively depressed values, making less capital available for compounding at potentially higher subsequent returns. If the portfolio in our example were to experience a €10 withdrawal at the end of each year, the portfolio would be worth €60 at the end of two years if the positive return occurs first but only €50 if the negative return occurs first. A fixed withdrawal program can be thought of as the opposite of dollar-cost averaging in which volatility has a positive effect on future accumulations, holding the expected return constant.

Several authors have examined the return-volatility trade-off on portfolio sustainability in the context of asset allocation. Diversification is particularly useful in this context because it reduces volatility without necessarily decreasing return. Not surprisingly, recommendations vary; but equity allocations between 30 percent and 75 percent of total portfolio value seem to maximize portfolio sustainability.

EXAMPLE 5

Core Capital with Monte Carlo Analysis

Sophie Zang is a recent widow, 55-years old, living in Singapore. Upon his passing, her husband's estate and life insurance proceeds provided a total of SGD 2,000,000 to maintain her lifestyle. With no children, Zang has no bequest motives but she has established a charitable remainder trust (CRT) upon which

she will rely to maintain her lifestyle in real terms for the rest of her life, with the balance going to her favorite charity upon her death. Assume the trust's asset allocation conforms to the capital market expectations from Exhibit 3.

1. How much can Zang withdraw from the CRT if she wants to be at least 98 percent certain that the portfolio will last for the remainder of her life?
2. How much can Zang withdraw from the CRT if she is willing to be only 94 percent certain that the portfolio will last for the remainder of her life?

Solution to 1:

The 55-year old retirement age row in Exhibit 3 indicates that Zang's median age at death is approximately 83 years old, or 28 years away. However, she is as likely to live longer than age 83 as she is to die prior to age 83. To be at least 98 percent certain that she does not run out of money, Zang's maximum probability of exhausting her assets should not exceed 2 percent. A spending rate of $2 per $100 of assets has a ruin probability of 1.8 percent. So Zang can withdraw approximately 0.02 × SGD 2,000,000 = SGD 40,000 with 98% certainty that the portfolio will last for the remainder of her life.

Solution to 2:

If Zang can tolerate a 6 percent failure rate, then she can withdraw almost 3 percent from the CRT annually on an inflation-adjusted basis, or 0.03 × SGD 2,000,000 = SGD 60,000, according to Exhibit 3. A spending rate of SGD 3 per SDG 100 of assets has a ruin probability of 6.3 percent, which is very close to the stated failure rate of 6 percent.

4 TRANSFERRING EXCESS CAPITAL

The first generation's core capital implicitly determines their discretionary wealth, or excess capital, which equals their assets less their core capital. For example, if the Websters have €20,000,000 of capital to meet their spending and discretionary needs and their core capital is €9,200,000, then excess capital is €10,800,000. The challenge then becomes developing a plan to transfer this wealth that matches the Websters' goals (e.g., family, philanthropy), accounts for the tax implications, and provides the desired amount of control and flexibility. As Bronson, Scanlan, and Squires (2007) point out, "The possible legal structures for a wealth transfer are necessarily country specific. Timing of wealth transfers, however, involves the more universal principles of tax avoidance, tax deferral, and maximized compound return."

4.1 Lifetime Gifts and Testamentary Bequests

An obvious method of transferring discretionary wealth is to donate it immediately or during one's lifetime through a series of gratuitous transfers. In jurisdictions having an estate or inheritance tax, gifting has the advantage of lowering the value of the taxable estate, thereby lowering estate or inheritance taxes (except where under applicable law the value of the gift is added back to the estate for estate or inheritance tax purposes). To mitigate this tax minimization strategy, jurisdictions that impose estate or inheritance tax typically also impose gift or donation taxes.

4.1.1 *Tax-Free Gifts*

Some gifts can escape transfer tax by falling below periodic or lifetime allowances. South Africa, for example, allows taxpayers to make tax-free gifts of up to ZAR 100,000 per tax year. During their lifetime, UK taxpayers may make gifts up to £312,000 that escape inheritance tax. Germany has gift allowances for gifts to close family members. Each parent may make a €205,000 gift to a child (€410,000 total from both parents) every 10 years, allowing a substantial amount of wealth to be transferred over time.

Other exclusions or relief may apply, as well. In France, for instance, a 50 percent relief applies to gifts from donors less than 70 years old, and a 30 percent relief applies if the donor is between 70 and 80 years old.[18] It is therefore common to be able to transfer some assets by gift in a tax-efficient manner.

Even in jurisdictions with relatively small annual exclusions, a gifting program that is started early and implemented over long periods of time can transfer substantial wealth in a tax-efficient manner. In the United States, for example, a donor's annual gift exclusions are limited to US$14,000 per year as of 2017, per donee (e.g., a parent may annually transfer US$14,000 to each child or US$28,000 from both parents). Exhibit 4 shows that an annual gifting program of transferring US$14,000 per year tax free at the beginning of each year over a 30-year period transfers almost US$580,000 inflation-adjusted dollars at a 6 percent nominal return that is taxed at 25 percent annually with a 2.5 percent inflation rate. These assumptions result in a 4.5 percent nominal after-tax rate of return (i.e., 6% × [1 − 25%]) and a 2 percent real after-tax return (i.e., 4.5% − 2.5%).[19] The dashed line in Exhibit 4 represents the accumulated value of the gifts themselves, excluding investment returns. After 30 years, gifts total US$420,000 = US$14,000 × 30. If the donor had kept this amount, it would have increased the value in his estate and estate tax liability. Any appreciation of the gifted amounts also escapes estate tax. Assuming a 2 percent real after-tax return would add approximately US$159,000 of real appreciation (appreciation after adjusting for inflation), for a total value of US$579,000. A tax-efficient investment strategy that defers the 25 percent tax until the end of the investment horizon increases the accumulated sum to almost US$666,000. Because these figures are based on real inflation-adjusted returns, this sum represents the amount of capital that can be transferred in today's dollars, and can therefore be a sizable proportion of many estates. Obviously, the amount of real wealth that can be transferred without tax increases with the rate of real return and the time horizon.

18 LawInContext Private Banking Helpdesk.

19 Two percent is an approximation. A more precise calculation is 1.045/1.025 − 1 = 1.95%.

Exhibit 4 Inflation-Adjusted Wealth Transferred

The benefit of this strategy is that appreciation on gifted assets is effectively transferred to the donee without gift or estate tax. Importantly, appreciation on the gifted asset is likely still subject to tax on investment returns (e.g., dividends and capital gains) whether it remains in the donor's estate or is transferred to a donee. But if the tax-free gift had not been made and had remained in the estate, the appreciation on it would have been subject to estate or inheritance tax.

In general, the relative after-tax value of a tax-free gift made during one's lifetime compared to a bequest that is transferred as part of a taxable estate is

$$RV_{TaxFreeGift} = \frac{FV_{Gift}}{FV_{Bequest}} = \frac{\left[1 + r_g\left(1 - t_{ig}\right)\right]^n}{\left[1 + r_e\left(1 - t_{ie}\right)\right]^n\left(1 - T_e\right)} \tag{5}$$

where T_e is the estate tax if the asset is bequeathed at death; r_g and r_e are pretax returns to the gift recipient and the estate making the gift; t_{ig} and t_{ie} are the effective tax rates on investment returns on both the gift recipient and the estate making the gift; and n is the expected time until the donor's death at which point the asset would transfer and be subject to estate tax if it had not been gifted. The numerator is the future after-tax value of the tax-free gift. The denominator is the future after-tax value of a taxable transfer by bequest. The ratio is the relative value of making the tax-free gift compared to the bequest.

If the pretax return and effective tax rates are equal for both the recipient and donor, the relative value of the tax-free gift in Equation 5 simply reduces to $1/(1 - T_e)$. For example, consider the value of a €10,000 bequest in today's value subject to a 40 percent inheritance tax, netting €6,000 after tax. If the wealth is instead transferred as a tax-free gift without having to pay the 40 percent inheritance tax, the relative value of the tax-free gift is 1.67 times [i.e., 1/(1 – 0.40)] as great as the taxable bequest, or €10,000 versus €6,000.

In the case of annual exclusions or allowances, individuals have the opportunity to transfer wealth without taxes each year. If these allowances or exclusions expire at the end of a tax year and do not accumulate over time, tax-free gifts not made in a particular tax year are lost opportunities to capture this value. It is, therefore, often beneficial for a family with wealth transfer goals to commence an early gifting program, which takes advantage of annual exclusions, where applicable.

4.1.2 *Taxable Gifts*

Opportunities to add value may even exist when a lifetime gift is taxable. In general, the value of making taxable gifts rather than leaving them in the estate to be taxed as a bequest, can be expressed as ratio of the after-tax future value of the gift and the bequest, or:

$$RV_{TaxableGift} = \frac{FV_{Gift}}{FV_{Bequest}} = \frac{\left[1 + r_g\left(1 - t_{ig}\right)\right]^n \left(1 - T_g\right)}{\left[1 + r_e\left(1 - t_{ie}\right)\right]^n \left(1 - T_e\right)} \quad (6)$$

where T_g is the tax rate applicable to gifts. It is important to note that this model assumes that the gift tax is paid by the recipient rather than the donor. We consider the alternative below.

If the after-tax returns associated with the gift and the asset to be bequeathed are identical, then the value of a taxable gift reduces to $(1 - T_g)/(1 - T_e)$. If the gift tax rate is less than the estate rate, gifting can still be tax efficient. For example, according to Appendix B, lifetime gratuitous transfers over £312,000 in the United Kingdom are taxed at 20 percent, while testamentary gratuitous transfers over £312,000 are taxed at 40 percent. The relative value of each pound of lifetime gift compared to each pound of bequest is therefore 1.33 = (1 – 0.20)/(1 – 0.40). Australia is another example in which the tax consequence of lifetime gifts can be less than the tax consequence of a testamentary bequest.

Opportunities to create value may even exist when the gift and estate tax rates are equal. As an illustration, in the Netherlands lifetime gifts and bequests are subject to the same progressive tax rate schedule, with tax rates ranging from 5 percent for smaller gifts to 68 percent for larger gifts (see Appendix B). Transferring wealth in smaller portions during one's lifetime, rather than transferring wealth in one large transaction when the owner dies, subjects each small transfer to a lower tax rate than one large transfer. Note that some jurisdictions, such as the United States, require a cumulative lifetime gift and estate tax computation that eliminates this benefit.

It is commonly believed that currently gifting assets that are expected to appreciate rather than bequeathing them later is more tax efficient because the future tax liability will be greater at death. If the donee pays the gratuitous transfer tax, however, the present value of the future inheritance tax obligation equals the gift tax. This balance of consideration changes if the donor pays tax, which is discussed in the next section. Similarly, many believe that transferring highly appreciating assets during one's lifetime and bequeathing lower return assets reduces transfer taxes. A valid comparison of the gift versus the bequest, however, requires the risk (and hence return) of the two to be held constant unless the high return asset is somehow valued below its intrinsic value, such as a valuation discount discussed later.

Alternatively, if a wealth manager is able to manage a family portfolio in the aggregate, and considers a family's overall asset allocation without being limited by constraints that dictate which types of assets must be held by which generation, then he or she may be able to place assets tax efficiently. If the return on the transferred assets will be taxed at a lower rate than if the assets were retained in the estate, the aggregate family portfolio can benefit because the numerator in Equation 6 will be greater than the denominator.

For example, consider a Japanese family contemplating a JPY 30 million lifetime gratuitous transfer in 2009. According to Appendix B, JPY 18 million can be transferred free of tax, but the remaining JPY 12 million transfer is subject to a 50 percent tax rate. The same 50 percent rate applies if the gift is delayed and transferred as a bequest, so no tax advantage related to transfer tax rates exists. However, if the recipient of the JPY 12 million gift had a lower marginal tax rate on investment returns (perhaps due to a progressive income tax schedule) of, say, 20 percent compared to the estate's marginal tax rate of, say, 50 percent, the gift can still create a tax advantage. Over a ten year horizon, the advantage for locating an asset with an 8 percent pretax return with the donee rather than the donor would be equal to:

$$RV_{TaxableGift} = \frac{FV_{Gift}}{FV_{Bequest}} = \frac{\left[1 + 0.08(1 - 0.20)\right]^{10}(1 - 0.50)}{\left[1 + 0.08(1 - 0.50)\right]^{10}(1 - 0.50)} = \frac{0.9298}{0.7401} = 1.256$$

That is, the lower 20 percent tax rate associated with the gift recipient will create 25.6 percent more wealth in 10 years than if the asset had remained in the estate and been taxed at 50 percent annually for 10 years.

Another common strategy for wealth managers managing an aggregate family portfolio is to gift assets with higher expected returns to the second generation or, in general, position assets with higher expected returns in the portfolios of the second generation, leaving the first generation to hold assets with lower expected returns. The additional expected growth of their assets escapes estate tax when the older generation passes on. Of course, assets with higher expected returns generally have higher return volatility, as well, so there is no guarantee that the second generation's portfolio will necessarily experience greater growth. But the strategy may nonetheless produce a better after-tax result on average.

Conceptually, the family portfolio can be balanced whether higher return/risk assets are held in second generation or first generation accounts. The wealth manager may need to make an adjustment, however, to ensure the after-tax risk is comparable between the two options. For example, consider a family with €4,000,000. €3,000,000 is held by the first generation (which is subject to a 40% estate tax) and €1,000,000 is held by the second generation (which will escape estate tax). Suppose further that the second generation holds bonds and the first generation holds equity as illustrated in Panel A of Exhibit 5.

Exhibit 5 Simple Example of After-Tax Asset Allocation

Account Type	Estate Tax Rate (%)	Asset Class	Pretax Market Value	Pretax Weights (%)	After-Tax Market Value	After-Tax Weights (%)
Panel A: Bonds with Second Generation						
First Generation	40	Equity	€3,000,000	75	€1,800,000	64.3
Second Generation	0	Bonds	1,000,000	25	1,000,000	35.7
Total Portfolio			€4,000,000	100	€2,800,000	100
Panel B: Bonds with First Generation						
First Generation	40	Bonds	€1,000,000	25	€600,000	21.4
First Generation	40	Equity	2,000,000	50	1,200,000	42.9
Second Generation	0	Equity	1,000,000	25	1,000,000	35.7
Total Portfolio			€4,000,000	100	€2,800,000	100

Panel C: Bonds with First Generation and Asset Allocation Adjustment

Exhibit 5 (Continued)

Account Type	Estate Tax Rate (%)	Asset Class	Pretax Market Value	Pretax Weights (%)	After-Tax Market Value	After-Tax Weights (%)
First Generation	40	Bonds	€1,666,667	41.7	€1,000,000	35.7
First Generation	40	Equity	1,333,333	33.3	800,000	28.6
Second Generation	0	Equity	1,000,000	25	1,000,000	35.7
Total Portfolio			€4,000,000	100	€2,800,000	100

A traditional view of asset allocation based on pretax values suggests the family has €4,000,000 of assets, 75 percent of which are allocated in stocks and 25 percent of which are allocated in bonds. In after-tax terms, however, the first generation's portfolio has a built-in tax liability of €1,200,000 because it will ultimately be subject to 40 percent tax. Therefore, the family portfolio is really only worth €2,800,000 after estate taxes. Moreover, the after-tax equity allocation is only 64.3 percent rather than 75 percent.[20]

Suppose the adviser were to locate equity with a higher expected return in the second generation portfolio so that its greater expected future growth escapes estate tax. The asset allocation may be unaffected based on pretax market values, but the after-tax asset allocation changes. For example, consider placing the €1,000,000 of bonds in the first generation portfolio as in Panel B of Exhibit 5. The pretax asset allocation is still 75 percent equity and 25 percent bonds. However, the after-tax asset equity allocation has increased from 64.3 percent to 78.6 percent because the estate tax decreases the bonds' after-tax value.

To hold the after-tax asset allocation constant, the wealth manager would increase the bond exposure until the after-tax asset allocation returns to its previous level. In this case, the family requires an additional €400,000/(1 – 0.40) = €666,667 of pretax bond exposure.

Long-term after-tax asset allocation is difficult to apply in countries such as France and Germany that regularly modify tax rates, rules, and entities.

4.1.3 *Location of the Gift Tax Liability*

The preceding discussion implicitly assumes that the tax liability associated with the lifetime gratuitous transfer in the numerator of Equation 6 is borne by the recipient. According to Appendix B, examples of jurisdictions that impose gift tax on the recipient include Colombia, Cyprus, Czech Republic, France, Germany, Italy, Japan, Netherlands, Russia, and Spain.

Other jurisdictions, such as Brazil, South Africa, and Switzerland, impose the tax liability on the donor. The distinction can be important for several reasons. First, a cross-border gift could result in both the donor and the recipient being taxed in their respective home countries. Second, if the tax liability is imposed on the donor's taxable estate rather than on the recipient, the tax benefit of the lifetime gift versus the bequest increases. Paying the tax liability from the donor's taxable estate decreases the size of the taxable estate and hence the ultimate estate tax (assuming the recipient's estate will either not be taxed or taxed at a lower rate). Gifting therefore becomes more

20 Horan and Robinson (2008), Reichenstein (1998, 2001, 2006, 2007), and Horan (2007a,b) develop the concept of after-tax asset allocation in more detail.

attractive from a tax perspective when the gift tax is paid by the donor. The relative after-tax value of the gift when the donor pays gift tax and when the recipient's estate will not be taxable (assuming $r_g = r_e$ and $t_{ig} = t_{ie}$) is:

$$RV_{TaxableGift} = \frac{FV_{Gift}}{FV_{Bequest}} = \frac{\left[1 + r_g\left(1 - t_{ig}\right)\right]^n \left(1 - T_g + T_g T_e\right)}{\left[1 + r_e\left(1 - t_{ie}\right)\right]^n \left(1 - T_e\right)} \quad (7)$$

The last term in the second set of parentheses in the numerator, $T_g T_e$, represents the tax benefit from reducing the value of the taxable estate by the amount of the gift tax. In this way, allowing the transfer tax to be deducted from the taxable estate can be viewed as a partial gift tax credit.[21]

The size of the partial gift credit equals the size of the gift times $T_g T_e$. For example, consider Akio and Haruko Tochigi—a couple wishing to transfer JPY 100 million to their child. They have a JPY 500 million estate, most of which is taxable. Exhibit 6 illustrates the after-tax outcomes of a JPY 100 million gift made just prior to death or a JPY 100 million bequest made just after death, both of which would be subject to a 45 percent transfer tax. The gift reduces the size of the taxable estate to JPY 400 million, but the JPY 45 million gift tax further reduces the size of the taxable estate from JPY 400 million to JPY 355 million. Under the gifting strategy, the sum of the after-tax estate and gift is approximately JPY 295 million compared to only JPY 275 million for the bequest. As a result, the gift strategy saves JPY 100 million × 0.45 × 0.45 ≈ JPY 20 million in taxes. The economic impact of this difference grows as the time difference between the gift and bequest grows because of the compounding effect.

Exhibit 6 Illustration of Gift versus Bequest When Donor Pays Transfer Tax

	Gift	Bequest
Gift	100	0
Gift Tax	45	0
Total Disbursement	145	0
Taxable Estate	355	500
Estate Tax	160	225
Net After-Tax Amount	195	275
After-Tax Estate plus Gift	295	275

Note: All amounts are in millions of JPY and rounded to the nearest million.

In some situations, the primary liability for the transfer tax may lie with the donor, but a secondary liability may rest on the recipient if the donor is unable to pay. The United Kingdom, for example, imposes gratuitous transfer tax liability on anyone with a vested interest in the gift. In addition to tax considerations, the location of the tax liability has potential implications for a recipient. For example, a recipient may receive an illiquid asset as a gift or bequest. If the recipient is responsible for the tax liability and has limited access to other liquid assets to pay that liability, then the recipient may face unintended liquidity constraints. In extreme cases, taxing authorities may take possession of the asset if the recipient is unable to pay.

21 Horvitz and Wilcox (2003) demonstrate this in the context of US estate tax law.

EXAMPLE 6

Gift and Estate Taxes

Philippe Zachary is 50 years old and resides in France. He is working with his wealth manager, Pierre Robé, to develop an estate planning strategy to transfer wealth to his second cousin, Etienne. Annual exclusions allow Zachary to make tax-free gifts of €20,000 per year, and gratuitous transfer tax liabilities are the responsibility of the recipient. Zachary notes that the relevant tax rate for bequests from the estate is likely to be 60 percent. He notes further, however, that gifts (in excess of the €20,000 exception mentioned above) made prior to age 70 enjoy 50 percent relief of the normal estate tax of 60 percent, for an effective tax rate of 30 percent. In addition, Etienne enjoys a low tax rate of 20 percent on investment income because he has relatively low income. Zachary, on the other hand, is subject to a 48 percent tax rate on investment income. Zachary is considering gifting assets that are expected to earn a 6 percent real return annually over the next 20 years.

1. Considering the first year's tax-free gift associated with the annual exclusion, how much of his estate will Zachary have transferred on an inflation-adjusted basis in 20 years without paying estate tax?
2. What is the relative value of the tax-free gift compared to the value of a bequest in 20 years?
3. Suppose Zachary wishes to make an additional gift that would be subject to gift tax. What would be the relative after-tax value of that taxable gift compared to a bequest 20 years later?

Solution to 1:

In 20 years, the future value (measured in real terms) equals €20,000 × $[1 + 0.06(1 - 0.20)]^{20}$ = €51,080.56. Note that although the gift was not subject to a wealth transfer tax, its subsequent investment returns are nonetheless taxable at 20 percent.

Solution to 2:

The relative value of the tax-free gift compared to the bequest is

$$RV_{TaxFreeGift} = \frac{FV_{Gift}}{FV_{Bequest}} = \frac{\left[1 + 0.06(1 - 0.20)\right]^{20}}{\left[1 + 0.06(1 - 0.48)\right]^{20}(1 - 0.60)}$$

$$= \frac{2.5540}{0.7395} = 3.45$$

The gift is substantially more tax efficient in this case for three reasons. First, the gift is tax free and the bequest is heavily taxed. Second, if Etienne receives the gift, subsequent investment returns will be taxed at a much lower rate than if it is kept inside the estate. Third, the difference has time to compound over a relatively long period of time since the time horizon is 20 years.

Solution to 3:

In this case, the recipient is responsible for paying the gift tax at 30 percent, or half of the 60 percent estate tax. The relative value of the tax-free gift compared to a bequest subject to inheritance tax is:

$$RV_{TaxableGift} = \frac{FV_{Gift}}{FV_{Bequest}} = \frac{\left[1 + 0.06(1 - 0.20)\right]^{20}(1 - 0.30)}{\left[1 + 0.06(1 - 0.48)\right]^{20}(1 - 0.60)}$$

$$= \frac{1.7878}{0.7395} = 2.42$$

Although the gift is taxed, the after-tax value of the gift relative to the bequest is still quite large because the gift tax rate is low and because the gift is located in a lightly taxed place (i.e., with Etienne) for a long period of time.

4.2 Generation Skipping

Often, high-net-worth individuals have wealth transfer goals that extend beyond the second generation (i.e., their children). In these cases, transferring assets directly to the third generation (i.e., grandchildren) or beyond may reduce transfer taxes where permitted. In jurisdictions that tax gifts or bequests, transfers from the first generation to the second will be taxed. The same capital may be taxed again if it is transferred from the second to the third generation, and the second generation's estate is taxable. Transferring capital in excess of the second generation's needs for spending, safety, and flexibility, directly to the third generation can avoid a layer of this double taxation.

For example, consider Kenichi and Fumiko Kawaguchi, who have JPY 1,000,000,000 of first generation excess capital they would like to transfer to fulfill their goals of securing a sound financial future for their children and grandchildren. Suppose that core capital for their children amounts to JPY 800,000,000, leaving JPY 200,000,000 of excess capital for the second generation that can be transferred to the third generation. According to Appendix B, Japan imposes tax rates up to 50 percent on the recipient of a gift or inheritance. Suppose the second generation excess capital of JPY 200,000,000 is transferred twice—once from the first generation to the second in 10 years, and again from the second to the third generation 25 years beyond that. Its future value at a 5 percent real rate of return (e.g., 8 percent nominal return with 3 percent inflation) will be equal to:

$$\text{JPY } 200{,}000{,}000 \times \left[(1.05)^{10}(1 - 0.50)(1.05)^{25}(1 - 0.50)\right] = \text{JPY } 275{,}800{,}768$$

If the Kawaguchis instead transfer this sum directly to their grandchildren, the transfer is taxed only once and the future value is

$$\text{JPY } 200{,}000{,}000 \times \left[(1.05)^{35}(1 - 0.50)\right] = \text{JPY } 551{,}601{,}537$$

or twice as much as when the capital is taxed twice. In general, the relative value of skipping generations to transfer capital that is excess for both the first and second generations is $1/(1 - T_1)$ where T_1 is the tax rate of capital transferred from the first to the second generation.

In at least one jurisdiction (e.g., the United States), the taxing authorities discourage this strategy by imposing a special generation skipping transfer tax. This tax, in addition to the usual transfer tax, is imposed on transfers to, among others, grandchildren or subsequent generations and is intended to produce the same overall tax effect had the assets passed sequentially through two generations.

4.3 Spousal Exemptions

Most jurisdictions with estate or inheritance taxes (such as South Africa, the United Kingdom, and the United States) allow decedents to make bequests and gifts to their spouses without transfer tax liability. In these jurisdictions, gratuitous transfer tax exclusions also apply to smaller estates. In the case of the United Kingdom, estates less than £312,000 can pass without inheritance tax (see Appendix B). In these situations, it is worthwhile to note that a couple actually has two exclusions available—one for each spouse. As a result, it is often advisable to take advantage of the first exclusion when the first spouse dies by transferring the exclusion amount to someone other than the spouse.

For instance, consider Will and Samantha Quackenbush who have a £700,000 estate. If Will is the first to die and leaves the entire estate tax-free to his wife, Samantha, they have lost an opportunity to transfer £312,000 out of the taxable estate upon Will's death. If the £312,000 was excess capital that would likely be transferred to the next generation anyway, then transferring the £312,000 to the second generation upon Will's death will not trigger additional inheritance tax due to the exclusion and will reduce the taxable value of Samantha's estate to £388,000. In sum, even when assets can be transferred to a surviving spouse without tax consequences, it may be valuable to take advantage of any estate tax exclusions upon the death of the first spouse. Otherwise, the opportunity to use the exclusion to transfer wealth without tax consequences will be lost.

4.4 Valuation Discounts

Gift and estate taxes might also be mitigated by transferring assets that qualify for valuation discounts (or, in appropriate cases, structuring assets to qualify for such discounts). Typically, tax is levied on the fair market value of the asset being transferred, which is a straightforward determination in the case of cash or marketable securities. If shares in a privately held family business are being transferred, establishing fair market value is not obvious and requires a valuation according to some pricing model or models, which, in turn, requires assumptions. In addition to the inputs that must be estimated or forecasted to determine the intrinsic value of an otherwise similar publicly traded company, the valuation of privately held companies is often discounted at a higher cost of capital to reflect the lack of liquidity associated with their shares. Estimates of the average discount for lack of liquidity range from 20 percent to 25 percent of the value of an otherwise identical publicly traded company. The size of the discount tends to be inversely related to the size of the company and its profit margin.[22]

If the shares being transferred represent a minority interest in the privately held company, an additional discount is taken for lack of control associated with a minority interest. This valuation is distinct from, but not independent of, an illiquidity discount because positions of control are more marketable than minority positions that lack control. Minority interest discounts can be very large, ranging between 25 percent and 40 percent, but their interaction with illiquidity discounts is not additive. For example, if a stake in a privately held business warrants a 10 percent illiquidity discount and 15 percent lack of control discount, the combined discount may be a lower figure, such as 18 percent, rather than 25 percent.[23]

Transferring assets subject to valuation discount reduces the basis on which transfer tax is calculated, and hence the transfer tax. For this reason, HNWIs in some jurisdictions may intentionally create illiquidity and lack of control by placing assets in a

22 See, for example, Block (2007).
23 See Horvitz (2008).

family limited partnership (FLP). Rather than gift or bequeath the underlying assets, the first generation transfers minority interests in the FLP, which also is illiquid, to separate individuals. The lack of liquidity and control of an FLP structure may make it eligible for valuation discounts in some jurisdictions. In general, FLPs comprising cash and marketable securities will receive less of a discount than a privately held operating company.

FLPs may have non-tax benefits as well. By pooling the assets of multiple family members together, the family can gain access to certain asset classes requiring minimum investments (e.g., hedge funds, private equity, venture capital), which would be prohibitively large for the individual family members to invest in alone. An FLP also allows participating family members to share in a pro-rata fashion in the gains and losses of family investments. This equitable distribution of gains and losses can be an important consideration in some family dynamics.

4.5 Deemed Dispositions

Rather than impose an estate or inheritance tax on the amount of capital bequeathed at death, some countries treat bequests as **deemed dispositions**, that is, as if the property were sold. The deemed disposition triggers the realization of any previously unrecognized capital gains and liability for associated capital gains tax. The tax is therefore levied not on the principal value of the transfer, but only on the value of unrecognized gains, if any. According to Appendix B, Australia, Canada, and Colombia are examples of jurisdictions with deemed disposition regimes. Australia and Canada impose no gift taxes, making it potentially advantageous to gift highly appreciated assets that are not likely to be liquidated during one's lifetime anyway.

4.6 Charitable Gratuitous Transfers

Most jurisdictions provide two forms of tax relief for wealth transfers to not-for-profit or charitable organizations. First, most charitable donations are not subject to a gift transfer tax. Of the jurisdictions listed in Appendix B, only Belgium and South Africa impose a transfer tax on charitable gratuitous transfers. Second, most jurisdictions permit income tax deductions for charitable donations. Only four jurisdictions with income taxes listed in Appendix B do not offer income tax deductions for charitable donations. Therefore, families with philanthropic aspirations can transfer wealth very tax efficiently.

Charitable organizations may also be exempt from paying tax on investment returns, as well. Therefore, the early structuring of assets into a charitable organization allows investment returns to compound tax free, which has a significant impact on wealth accumulation especially over long time horizons. Therefore, the relative after-tax future value over n years of a charitable gift is compared to a taxable bequest as shown in Equation 8 below:

$$\begin{aligned} RV_{CharitableGift} &= \frac{FV_{CharitableGift}}{FV_{Bequest}} \\ &= \frac{\left(1+r_g\right)^n + T_{oi}\left[1+r_e\left(1-t_{ie}\right)\right]^n\left(1-T_e\right)}{\left[1+r_e\left(1-t_{ie}\right)\right]^n\left(1-T_e\right)} \end{aligned} \tag{8}$$

The first term in the numerator has no deduction for either gift tax or taxes on investment returns. The second term of the numerator represents the additional value created in the estate associated with the income tax deduction. T_{oi} is the tax rate on ordinary income and represents the current income tax benefit associated with a

charitable transfer. The tax advantages of charitable giving allow the donor to either increase the charitable benefit associated with a given transfer of excess capital from the estate, or to use less excess capital to achieve a given charitable benefit.

EXAMPLE 7

Charitable Gifts

Continue with the example of Philippe Zachary in Example 6. France imposes an estate tax at rates of up to 60 percent, but qualifying charitable donations are not subject to inheritance tax. In addition, donations are eligible for income tax deductions at the same income tax rate of 48 percent, which also applies to investment income. What is the relative after-tax value of a charitable donation as compared to a taxable bequest?

Solution:

$$\begin{aligned} RV_{CharitableGift} &= \frac{FV_{Gift}}{FV_{Bequest}} \\ &= \frac{(1.06)^{20} + 0.48\left[1 + 0.06(1 - 0.48)\right]^{20}(1 - 0.60)}{\left[1 + 0.06(1 - 0.48)\right]^{20}(1 - 0.60)} \\ &= \frac{3.5621}{0.7395} = 4.82 \end{aligned}$$

The relative value of the charitable gift is so large because the gift a) escapes estate tax, b) accrues investment returns free of taxes inside the tax-exempt organization, and c) provides Zachary with an income tax deduction.

ESTATE PLANNING TOOLS

5

The gratuitous transfers described above are often implemented through structures that either maximize tax benefit, produce a non-tax benefit, or both. Common estate planning tools include, among others, trusts (a common law concept), foundations (a civil law concept), life insurance, and companies. As noted earlier, partnerships may also be used in some circumstances. The structure of each has implications for how assets are controlled, whether they are protected from potential claims of future creditors, and how they are taxed. The availability of each of these tools and the tax and tax reporting ramifications to their use depends upon the jurisdiction or jurisdictions of relevance in the given case. Note that while foundations may have originated in civil law jurisdictions, they are also available in some common law jurisdictions. Similarly, trusts are recognized by some civil law jurisdictions.

5.1 Trusts

A trust is an arrangement created by a **settlor (or grantor)** who transfers assets to a trustee. The trust is a relationship in which the trustee holds and manages the assets for the benefit of the beneficiaries. As a result, the beneficiaries are considered to be the beneficial, not legal, owners of the trust assets. The terms of the trust relationship

and the principles used by the trustee to manage the assets and distributions to the beneficiaries are outlined in the trust document. It is possible for the settlor of a trust to also be one of the beneficiaries.

Trusts can be categorized in many ways, but two dimensions are particularly important in understanding their character. First, a trust can be either revocable or irrevocable. In a **revocable trust** arrangement, the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets. Under these circumstances, the settlor is generally considered to be the owner of the assets for tax purposes in many jurisdictions. As a result, the settlor is responsible for tax payments and reporting on the trust's investment returns. Additionally, the settlor's revocation power makes the trust assets vulnerable to the reach of creditors having claims against the settlor.

Alternatively, where the settlor has no ability to revoke the trust relationship, the trust is characterized as an **irrevocable trust**. In an irrevocable trust structure, the trustee may be responsible for tax payments and reporting in his or her capacity as owner of the trust assets for tax purposes. An irrevocable trust structure generally provides greater asset protection from claims against a settlor than a revocable trust.[24] In any event, both a revocable and an irrevocable trust structure can result in the transfer of assets to the beneficiaries without the time, expense, potential challenges, and publicity associated with probate because the settlor transfers legal ownership of the assets to the trustee and the transfer of those assets is dictated by the terms of the trust and not the settlor's will.

Second, trusts can be structured to be either fixed or discretionary. Distributions to beneficiaries of a **fixed trust** are prescribed in the trust document to occur at certain times or in certain amounts. For example, Maria Valez, a first generation wealth owner, may wish to make a large *inter vivos* transfer to her son, Conner, who is too young to manage the assets himself. Valez could fund a trust that directs the trustee to hold the assets until Conner's 21st birthday and begin making annual distributions of a specific amount over 10 years, at which time any remaining assets will be distributed to Conner. The trust is said to be fixed because the terms of the distributions are pre-determined in the trust documentation.

In contrast, if the trust document enabled the trustee to determine whether and how much to distribute based on Conner's general welfare and in the sole and uncontrolled discretion of the trustee, the trust would be called a **discretionary trust**. The settlor can make her wishes known to the trustee through language in the trust document and/or through a non-binding letter of wishes.

The legal concept of a trust is unique to the common law. Civil law countries may not recognize foreign trusts because it is a legal relationship, not a legal person. In fact, 12 of the 22 civil law jurisdictions in Appendix A do not recognize trusts.

5.1.1 *Control*

A common motivation for using a trust structure is to make resources available to a beneficiary without yielding complete control of those resources to them. For example, spendthrift trusts can be used to provide resources to beneficiaries who may be unable or unwilling to manage the assets themselves, perhaps because they are young, immature, or disabled. Or perhaps the settlor wishes assets to be used for particular purposes. In any case, the trust relationship can permit a settlor to transfer assets without the expense or publicity associated with probate, yet still retain control of those assets.

---

24 This is true provided the settlor was neither insolvent nor rendered insolvent when he settled the trust, and any such creditor claims arose after the trust settlement date.

5.1.2 *Asset Protection*

In general, creditors are unable to reach assets that an individual does not own. Just as an irrevocable trust can protect assets from claims against the settlor, as outlined above, discretionary trusts can protect assets from claims against the beneficiaries. Under a discretionary trust, the beneficiaries have no legal right to income generated by the trust or to the assets in the trust itself. Therefore, the creditors of the beneficiaries cannot reach the trust assets.

In the example on the previous page, suppose Maria Valez is concerned that Conner's new wife may divorce him and lay a claim on his trust assets in a divorce settlement. If the trust to which Conner is a beneficiary is discretionary, then his wife would be unable to lay claim to them because it is within the trustee's power to avoid making distributions to Conner. It is important to note that these structures must generally be established in advance of a claim, or even a pending claim, to effectively protect assets.

Trusts may also be used in circumstances where forced heirship laws permit the use of lifetime gifts and trusts to avoid the strict application of forced heirship rule. In fact, many countries specifically prohibit the application of forced heirship rules to trusts, making trusts an especially useful tool in this regard.

5.1.3 *Tax Reduction*

Trusts can be used to reduce taxes for either the settlor or the beneficiaries. Continuing the illustration above, suppose Valez creates an irrevocable trust such that she is no longer considered the owner of the assets held in the trust for tax purposes. The income generated by the trust assets may be taxed at a lower rate inside the trust than if they were owned by Valez for several possible reasons. In many countries, income is commonly taxed according to a progressive tax schedule (see Horan and Robinson 2008). A progressive tax rate schedule applied to trust income or beneficiary distributions may allow either the trust or beneficiary to apply taxable income to lower tax brackets unavailable to Valez whose income may be taxed at relative high rates.[25] Moreover, if an irrevocable trust is structured as discretionary, a trustee can consider a beneficiary's tax situation to decide whether or not to make a distribution in a particular tax period to the beneficiary. Alternatively, a settlor may create a trust in a jurisdiction with a low tax rate or even no taxes. As is the case with any trust planning technique, this strategy requires a consideration of the tax systems governing the settlor and beneficiary in their home country, which is discussed in more detail in Section 6.2.

The tax laws of some jurisdictions allow tax planning with the use of a trust in which assets are successfully transferred for estate tax purposes, but not for income tax purposes. That is, the assets are no longer part of the settlor's estate, but the income generated from the assets remains taxable to the settlor. In this way, assets can be successfully transferred from a settlor to a beneficiary under a gifting strategy and avoid estate tax. However, the income generated by the assets would nonetheless be taxable to the settlor, thereby further reducing the size of the settlor's taxable estate over time.[26] Section 4.1.3 discusses the value of locating the tax liability with the donor. A similar concept applies to the location of the income tax liability on trust asset returns.

---

25 In some jurisdictions, however, the progressive rate schedule applicable to trusts may be more compressed than that which applies to individuals. It is therefore important to determine and compare the rate structure that applies to individuals and trusts in the individual case.

26 See Brunel (2002) for a more thorough discussion of these structures.

5.2 Foundations

A foundation is a legal entity available in some jurisdictions. Foundations are typically set up to hold assets for a particular purpose—such as to promote education or for philanthropy. When set up and funded by an individual or family and managed by its own directors, it is called a private foundation. Similar to trusts, foundations survive the settlor, allow the settlor's wishes to be followed after the settlor's death, and can accomplish the same types of objectives as a trust (control, avoidance of probate, asset protection, and tax minimization). A foundation is based on civil law and, unlike a trust, is a legal person. Often, the choice of a trust or foundation depends on a client's residence or nationality.

5.3 Life Insurance

In creating a trust, a settlor divests himself of assets by transferring them to a trustee for the benefit of beneficiaries, creating potential advantages regarding how the assets are controlled, protected, and taxed. Life insurance is another planning tool in which the policy holder transfers assets (called a **premium**) to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy. As is the case with trusts, insurance can produce tax and estate planning benefits. It can be a useful alternative to a trust in circumstances where the trust relationship is not recognized under applicable law or its legal and tax consequences are uncertain, such as some civil law countries common in Europe and South America that do not recognize trusts.

From a tax perspective, life insurance is afforded beneficial tax treatment in many jurisdictions. Death benefit proceeds paid to life insurance beneficiaries are tax exempt in many jurisdictions and, in some cases, no tax reporting consequences arise. In addition, premiums paid by the policy holder are typically neither part of the policy holder's taxable estate at the time of his or her death, nor subject to a gratuitous transfer tax.[27] Therefore, it may be possible to transfer money or other assets through life insurance without tax consequence. Life insurance can also offer income tax advantages in jurisdictions that allow any cash value in the policy to build tax deferred. A life insurance contract can also include provisions that allow a surrender or withdrawal (or partial surrender or withdrawal) of policy value during the policy term, as well as a loan facility, which, in some jurisdictions, can be made with advantageous tax consequences to the policy holder.

Tax authorities in many countries recognize these advantages and typically require that life insurance be properly structured to avoid abuse. For example, most jurisdictions require a certain minimum level of risk before a life insurance policy will be treated as such. Other laws mandate that the policy holder must typically have an insurable interest in the life assured to be a valid life insurance contract.

In addition to possible tax benefits, life insurance effectively allows assets to transfer to the policy holder's beneficiaries without the time, expense, potential challenges, and publicity associated with probate. Premiums paid by the policy holder are no longer part of the policy holder's estate at the time of death, and death benefit proceeds under a life insurance contract pass directly to policy beneficiaries outside the probate process. While this is also true of trusts, insurance is recognized in almost every country and generally regarded with less suspicion by tax authorities.

---

27 In some jurisdictions the value of the policy may attract gratuitous transfer tax exposure to the policy holder, insured, or beneficiaries; it is therefore important in the individual case to determine the tax consequences of life insurance to the parties.

Many wealth owners also use life insurance to help heirs pay inheritance tax triggered by the wealth owner's death. In other words, life insurance is a liquidity planning technique in that it can generate liquidity to pay gratuitous transfer tax. It is, therefore, especially valuable if an inheritance of illiquid assets creates a liquidity crisis for the heir as discussed in Section 4.1.3. In addition, life insurance policies can be used to transfer assets outside forced heirship rules, which normally do not apply to life insurance proceeds.

Life insurance policies can also offer asset protection in their own right or in combination with a trust. Premiums paid for life insurance are generally outside the reach of creditors' claims against the policy holder. Additionally, an insurance policy can assign a discretionary trust as the policy beneficiary. In this way, the use of life insurance in combination with a trust may be useful if the ultimate beneficiaries (i.e., beneficiaries of the trust) are unable to manage the assets themselves (e.g., in the case of minors, disabilities, or spendthrifts).

5.4 Companies and Controlled Foreign Corporations

Companies may also be a useful tool in which to place assets. For example, a **controlled foreign corporation** (CFC) is a company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law. A possible benefit of placing income generating assets in a CFC is that tax on earnings of the company may be deferred until either the earnings are actually distributed to shareholders or the company is sold or shares otherwise disposed. In addition, a CFC may be established in a jurisdiction that does not tax the company or its shareholders.

Many countries have CFC rules designed to prevent taxpayers from avoiding the taxation of current income by holding assets in a CFC. CFC rules can be triggered if a taxpayer owns more than, say, 50 percent of the foreign company's shares, although the ownership threshold will vary from one jurisdiction to the next. CFC rules may also look beyond direct ownership of CFC shares and consider beneficial ownership in a trust, for example, or even ownership attributed to related parties, such as a taxpayer's family members. Therefore, CFC rules may tax shareholders of a CFC on the company's earnings as if the earnings were distributed to shareholders even though no distribution has been made. This treatment of earnings is called a **deemed distribution**.

CROSS-BORDER ESTATE PLANNING 6

Individuals and families with business and personal interests in more than one country face special estate planning challenges. A family with assets located in multiple jurisdictions may have difficulty passing ownership of those assets upon the wealth owner's death. For example, income generated by assets located outside an investor's home country may be taxed in both the country where the income originates and the home country of the wealth owner. Passing ownership of overseas assets upon death may also be difficult and may trigger multiple tax liabilities from both the home country and country in which the asset is located.

Even when assets are located within a single jurisdiction, passing their ownership to heirs located outside the country through a will, gifting technique, or other strategy can be legally complex and may pose certain tax considerations. This section discusses some of these cross-border estate planning issues.

6.1 The Hague Conference

A legal document created in one country may not necessarily enjoy legal recognition in another country. The **Hague Conference on Private International Law** is an intergovernmental organization that works toward the convergence of private international law.[28] Its 69 members consist of countries and regional economic integration organizations, like the European Community (see Exhibit 7). The Conference has developed a series of conventions, or multilateral treaties, that have addressed a variety of international issues, including those related to cross-border transactions. The purpose is to simplify or standardize processes and facilitate international trade. Members of the Conference may or may not ratify a particular convention. Ratification by a country implies a legal obligation to apply the convention within its borders. Non-member countries may participate, as well, by electing to accede to be bound by the treaty, a process that sometimes requires acceptance by states already a party to the convention.

Exhibit 7 Members of the Hague Conference

Albania	The European Community	The former Yugoslav Republic of Macedonia	Serbia
Argentina	Finland	Malaysia	Slovakia
Australia	France	Malta	Slovenia
Austria	Georgia	Mexico	South Africa
Belarus	Germany	Monaco	Spain
Belgium	Greece	Montenegro	Sri Lanka
Bosnia and Herzegovina	Hungary	Morocco	Suriname
Brazil	Iceland	Netherlands	Sweden
Bulgaria	India	New Zealand	Switzerland
Canada	Ireland	Norway	Turkey
Chile	Israel	Panama	Ukraine
China	Italy	Paraguay	United Kingdom of Great Britain and Northern Ireland
Croatia	Japan	Peru	United States of America
Cyprus	Jordan	Poland	Uruguay
Czech Republic	Republic of Korea	Portugal	Venezuela
Denmark	Latvia	Romania	
Ecuador	Lithuania	Russian Federation	
Egypt	Luxembourg		
Estonia			

Source: Hague Conference on International Private Law (www.hcch.net).

Because the typical form of a will can vary substantially from one state to the next, their recognition from one jurisdiction to the next can be especially troublesome. The Hague Convention of the Conflict of Laws Relating to the Form of Testamentary Dispositions addresses this particular issue and has been ratified by 39 countries, including most developed nations, but notably excluding the United States. Under this convention, a will is valid in the participating jurisdictions if it is consistent with the internal law associated with:

- the place the will was made;

28 More detailed information is available at www.hcch.net.

- the nationality, domicile, or habitual residence of the testator; or
- the location of immovable assets covered under the will.

Some participating countries have exceptions, however. Therefore, separate wills for different jurisdictions may be required, especially in relation to real estate.

An important area in which the Hague Conference affects wealth management is in relation to trusts. Common law jurisdictions recognize trusts, but civil law jurisdictions may not. The Hague Convention of the Law Applicable to Trusts and on Their Recognition is designed to harmonize the recognition of the trust relationship. By ratifying or acceding to this convention, a participating country recognizes the existence and validity of trusts with a written trust instrument as long as they have the following characteristics (outlined in Article 2 of the convention):

A The assets constitute a separate fund and are not a part of the trustee's own estate.

B Title to the trust assets stands in the name of the trustee or in the name of another person on behalf of the trustee.

C The trustee has the power and the duty, in respect of which he is accountable, to manage, employ, or dispose of the assets in accordance with the terms of the trust and the special duties imposed upon him by law.

Twelve countries participate in this convention. Nonetheless, a participating country may view ownership and beneficial interests related to trust relationships in various ways, which may limit some of their advantages. It is important for a wealth manager to know whether a trust will be recognized in the way it is intended by authorities in the countries of relevance to the trust relationship.

6.2 Tax System

Taxable claims for a particular country are based on its jurisdiction claim, that is, the conceptual framework that determines the basis for taxing income or transfers. A country that taxes income as a source within its borders is said to impose **source jurisdiction**, also referred to as a **territorial tax system**.[29] This jurisdiction is derived from the relationship between the country and the source of the income. Countries imposing income tax exercise source jurisdiction.

Countries may also impose tax based on residency, called **residence jurisdiction**, whereby all income (domestic and foreign sourced) is subject to taxation. In this case, the jurisdiction is derived from the relationship between the country and the person receiving the income. Most countries use a residential tax system.

According to Appendix B, only three of the 37 jurisdictions surveyed with income taxes have territorial-based systems (Hong Kong, Singapore, and Taiwan).

6.2.1 *Taxation of Income*

Although our primary concern will relate to gratuitous transfer taxes either on or before death for estate planning purposes, the basic concepts relate to income taxes equally well. Persons subject to residence jurisdiction are taxed on their worldwide income. Most countries impose residence jurisdiction on noncitizen residents, but not citizens who are non-resident in the jurisdiction. The United States is a notable exception given that both citizens (regardless of where resident) and residents are subject to US taxation on their worldwide income and estates.

29 Arnold and McIntyre (2002), p. 21. Much of the discussion in this and the following section is based on this reading.

There is no international standardized residency test that applies to individuals. Therefore, residency tests differ between countries. In determining residency, tax authorities may consider subjective standards, such as the extent of an individual's social, familial, and economic ties to the jurisdiction; e.g., whether the individual maintains a dwelling in the country, whether the individual has income producing activities in the country, etc. The tax authorities may also consider objective standards to determine residency, such as the number of days of physical presence the individual has within the country during the relevant tax period. High-net-worth individuals may want to acquire or avoid residency in a particular country, depending on the country's tax burden. It is critical to understand the tax residency rules in the relevant countries to achieve the objectives of such individuals.

For example, UK residents are considered non-domiciled in the United Kingdom if they do not form an intention to permanently remain in the United Kingdom. These resident, non-domiciliaries (RNDs) are taxed only on income sourced in the United Kingdom. Non-UK income is only subject to UK tax when it is remitted (or deemed remitted) to the United Kingdom. The UK RND tax regime is considered to be a very attractive regime for HNW RNDs when compared to tax regimes imposing tax based on residence. RNDs in the United Kingdom may therefore choose to locate assets outside the United Kingdom in countries having advantageous tax regimes, such as Singapore or Hong Kong, and avoid remittances (or deemed remittances) to the United Kingdom.

6.2.2 *Taxation of Wealth and Wealth Transfers*

Like income, wealth and wealth transfers may be subject to tax based on source or residence principles. The source principle taxes wealth economically sourced in a specific country, such as real estate. Eight of the 37 jurisdictions in Appendix B impose a wealth tax beyond that often imposed on real property (Colombia, France, Hungary, India, Mexico, Netherlands, Spain, and Switzerland). The residence principle, should it apply, would tax worldwide wealth with some exceptions, such as real estate situated abroad.

Gifts and bequests may be subject to different tax treatments depending on the tax regime of the donor's country, recipient's country, and the location of the asset being transferred. For example, the source principle would tax assets that are economically sourced or transferred within a particular country, whereas the residence principle would impose transfer tax on all assets transferred by a donor.

Again, the United States is unique in this regard. Not only does the United States impose estate tax on the worldwide assets of its citizens (regardless of where resident) and residents, it also imposes estate tax on non-US individuals holding assets situated in the United States, including US real estate, movable property located in the United States, and security holdings (public or private) of US companies. This may cause some asset transfers to be taxed twice by two different jurisdictions, but many estate tax treaties (discussed below) and, where available, foreign estate tax credits, can eliminate or mitigate this conflict.[30] This illustrates, however, that individuals need to be aware of the wealth transfer tax rules of the countries tied to the assets they hold.

6.2.3 *Exit Taxation*

In an effort to mitigate their income, wealth, and estate taxes, HNWIs may sometimes choose to renounce their citizenship in one country and expatriate to another country. To offset the lost tax revenue from such repatriation, some countries impose a so-called "exit tax" on individuals giving up their citizenship or residency. Seven of the 37 jurisdictions listed in Appendix B impose an exit tax (Australia, Canada, Germany, Israel,

30 See Marcovici (2007).

Netherlands, Sweden, and the United States). Exit taxation is generally not applicable for capital moving between EU countries, but could apply to capital moving outside the EU. In most cases, the exit tax amounts to a tax on unrealized gains accrued on assets leaving the taxing jurisdiction. This approach is called a deemed disposition. The exit tax may also include an income tax on income earned over a fixed period after expatriation, called a "shadow period."

6.3 Double Taxation

The interaction of country tax systems can result in tax conflicts in which two countries claim to have taxing authority over the same income or assets. This conflict can relate to either income tax or estate/inheritance tax and arise in a number of ways. For example, two countries may claim residence of the same individual, subjecting the individual's worldwide income to taxation by both countries. This situation represents a **residence–residence conflict**.

Alternatively, two countries may claim source jurisdiction of the same asset (i.e., **source–source conflict**). This conflict can arise, for example, on income from a company situated in Country A but managed from Country B. Both countries may claim that the company income is derived from their jurisdiction.

In other situations, an individual in Country A may be subject to residence jurisdiction and, therefore, taxation on worldwide income. Some of the individual's assets may be located in Country B, which exercises source jurisdiction on those assets, creating a **residence–source conflict**. For example, a US citizen owning Singapore situated real estate would be subject to US income tax and Singapore income tax on rental income from the property. Residence–source conflicts are the most common source of double taxation and the most difficult to avoid through tax planning without a separate mechanism for relief that can mitigate or eliminate double taxation through either foreign tax credit provisions or double taxation treaties. Because a source country is commonly viewed to have primary jurisdiction to tax income within its borders, the residence country is typically expected to provide double taxation relief if any is provided.

6.3.1 *Foreign Tax Credit Provisions*

A residence country may choose to unilaterally provide its taxpayers relief from residence-source conflicts within its own tax code using one or more of the following methods: credit method, exemption method, or deduction method.

In the **credit method**, the residence country reduces its taxpayers' domestic tax liability for taxes paid to a foreign country exercising source jurisdiction. The credit is limited to the amount of taxes the taxpayer would pay domestically, which completely eliminates double taxation. Under this method the tax liability equals the greater of the tax liability due in either the residence or source country.

$$T_{CreditMethod} = Max[T_{Residence}, T_{Source}] \quad (9)$$

For example, suppose a residence country imposes a 50 percent tax on world-wide income but offers a relief for tax paid on foreign-sourced income via the credit method. If the foreign government taxes the foreign-sourced income at 40 percent, the taxpayer will pay a 50 percent tax rate (e.g., Max[50 percent, 40 percent]). Of the total, 40 percent is paid to foreign authorities and 10 percent is paid to the domestic authorities.

In the **exemption method**, the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, which, in effect, eliminates the residence–source conflict by having only one jurisdiction impose tax. The tax liability under the exemption method is simply the tax imposed at the foreign source, or:

$$T_{ExemptionMethod} = T_{Source} \quad (10)$$

In the previous example, the tax liability would be 40 percent, all of which is collected by the foreign taxing authority. Only the few jurisdictions using territorial-based tax systems (Hong Kong, Singapore, Taiwan, and Thailand) have adopted the exemption method.

Under the **deduction method**, the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income (i.e., provides a tax deduction rather than a credit or exemption). The taxpayer is still responsible for both taxes, but the aggregate liability is less than the sum of the two with the residence country reducing the size of its percentage claim by the product of the two tax rates. The tax rate under the deduction method is therefore equal to:

$$\begin{aligned} T_{DeductionMethod} &= T_{Residence} + T_{Source}\left(1 - T_{Residence}\right) \\ &= T_{Residence} + T_{Source} - T_{Residence}T_{Source} \end{aligned} \tag{11}$$

It is clear from this equation that the deduction method results in a higher tax liability than either the credit or exemption method. Using rates from the previous example, the total tax liability equals 70 percent = 0.50 + 0.40 – (0.50 × 0.40). In this case, the source country receives 40 percent and the residence country receives 30 percent [i.e., 0.50 – (0.50 × 0.40)]. The residence country makes a partial concession recognizing the primacy of source jurisdiction.

The diagonal of double taxation matrix in Appendix C lists jurisdictions that have foreign tax credit relief provisions in their domestic tax code. The small case letters indicate whether the provisions apply to income (*i*), gift (*g*), or estate (*e*) taxes. The United States, for example, provides domestic relief for income and estate taxes, but not gift taxes. Therefore, by way of example, a US resident may choose to delay an *inter vivos* wealth transfer of an asset situated in another country with a gift tax (which would not receive double taxation relief under a double taxation treaty) until the death of the donor at which time it would receive estate tax relief under the United States foreign estate tax credit. France provides foreign tax credit provisions for gift and estate taxes but not for income taxes, whereas Spain provides provisions for all three types of taxes.

It is important to note that the term "foreign tax credit provision" in this context does not imply that the country applies the credit method in providing its relief. It could apply the exemption, deduction method, or some other method. Very few countries, however, have credit provisions based purely on the exemption or credit method.

6.3.2 *Double Taxation Treaties*

Relief from double taxation may be provided through a double taxation treaty (DTT) rather than domestic tax laws (i.e., foreign tax credit, deduction or exclusion provisions). Tax treaties, of which there are over 2,000 in effect, are intended to facilitate international trade and investment by eliminating double taxation. By limiting source jurisdiction, DTTs resolve residence–source conflicts that are the most frequent cause of double taxation. Virtually all modern tax treaties are based on the OECD (Organisation for Economic Co-operation and Development) Model Treaty.[31] The OECD Model Treaty sanctions the exemption and credit method to resolve residence-source conflicts.

With regard to investment income, the OECD Model Treaty endorses the notion that interest income and dividend income have their source in the country of the entity paying the interest or dividend. This type of investment income is taxed through a withholding from the source country. The OECD Model Treaty strongly endorses that withholding tax rates paid to the source country for dividends (paid to other

31 See www.oecd.org/dataoecd/52/34/1914467.pdf.

persons) and interest, be limited to 15 percent and 10 percent, respectively; but higher withholding rates are common. Additional tax may be owed to the residence country if the credit or deduction method is used. These relatively low rates are intended to allow tax revenue sharing between the source and residence country.

By contrast, capital gains are taxed in the seller's country of residence. Gains on immovable property, however, are typically taxed in the source country where the property is located.

In addition to residence–source conflicts, DTTs resolve residence–residence conflicts. A resident is taxable in a particular country "by reason of his domicile, residence, place of management or any other criterion of similar nature."[32] Should these criteria give rise to a "dual resident taxpayer," the OECD model outlines tie-breakers in the following order based on the location of an individual's:

1. permanent home
2. center of vital interests
3. habitual dwelling
4. citizenship[33]

DTTs typically do not resolve source–source conflicts.

A detailed OECD Commentary aids the interpretation of the OECD Model Treaty. The legal status of OECD Commentary and Model Treaty regarding the interpretation of tax treaties is ambiguous. The Vienna Convention on the Law Treaties, which governs the interpretation of all treaties (not just tax treaties), states that supplemental means of interpretation can only confirm meaning that is inferred from the treaty itself and other agreements between the parties unless these agreements produce an absurd result. In this regard, the OECD commentary provides guidance regarding the interpretation of double tax treaties, but is not binding.

As is the case with double taxation relief under domestic provisions, the nature of the relief under a DTT can be either through the credit, exemption, or deduction method, although the OECD model endorses the credit and exemption methods. Switzerland, for example, usually applies the exemption method in its treaties. It applies the credit method, however, for foreign-source taxes in countries with which it does not have a DTT. Appendix C summarizes the DTTs in existence between 37 jurisdictions as of September 2008. The upper-case letters *I*, *G*, and *E*, refer to treaties for income taxes, gift taxes, and estate taxes, respectively, between the entity listed in the row and the entity listed in the column. For example, France has a DTT covering income, gift, and estate taxes with Sweden. The French treaty with Spain covers only income taxes, but because both countries provide foreign tax credit provisions in their domestic tax codes for gift and estate tax (see the small letters down the diagonal), individuals may nonetheless be able to avoid or mitigate double taxation. Most DTTs relate to income taxes partly because many jurisdictions (15 of 37 in this sample) do not have estate taxes, eliminating the need for an estate DTT. In any case, a taxpayer must qualify as a resident under the terms of the treaty to be eligible for its benefits.

EXAMPLE 8

Double Taxation Credit Provisions

Boris Yankevich is a citizen and resident of Country A and has investments in Country B. The tax rates on investment income and bequests for both countries are listed below. Country A has a residence-based tax system and Country B

32 Article 4(1) of the OECD Model Treaty.
33 Article 4(2) of the OECD Model Treaty.

has a source jurisdiction on income generated within its borders. Country A and Country B have a double tax treaty (DTT) to address this residence–source conflict.

	Country A (%)	Country B (%)
Investment Income Tax	25	40
Estate Tax	50	30

1. What is Yankevich's tax rate on investment income under the DTT if it provides for the credit method? How much is remitted to Country A and how much is remitted to Country B?
2. What is Yankevich's tax rate on bequests under the DTT if it provides for the exemption method?
3. What is Yankevich's tax rate on bequests under the DTT if it provides for the deduction method?

Solution to 1:

Under the credit method, $T_{CreditMethod} = \text{Max}[T_{Residence}, T_{Source}]$. Therefore, $T_{CreditMethod} = \text{Max}[0.25, 0.40] = 40$ percent. In this case, 40 percent is remitted to Country B. Nothing is remitted to Country A because it provides Yankevich with a credit for his entire domestic tax liability.

Solution to 2:

Under the exemption method, the resident country relinquishes the tax jurisdiction, so that the tax rate on bequests would be only 30 percent, all of which is remitted to Country B.

Solution to 3:

Under the deduction method, Yankevich receives a home country tax deduction (rather than a credit) for estate taxes paid to Country B. In this case:

$$\begin{aligned} T_{DeductionMethod} &= T_{Residence} + T_{Source} - T_{Residence}T_{Source} \\ &= 0.50 + 0.30 - (0.50 \times 0.30) = 0.65 \end{aligned}$$

Country A receives 35 percent, and Country B receives 30 percent.

6.4 Transparency and Offshore Banking

A wealth management advisor can often create value for a client or family by developing an estate plan that minimizes taxes. In that regard, it must be emphasized that a distinction exists between tax avoidance (sometimes referred to as "tax minimization") and tax evasion. **Tax avoidance** is developing strategies that conform to both the spirit and the letter of the tax codes of jurisdictions with taxing authority. **Tax evasion**, on the other hand, is the practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

International wealth management is occasionally characterized as the practice of placing assets in jurisdictions with bank secrecy laws to avoid detection by taxing authorities in an individual's home country. Income on these "undeclared funds" would therefore escape taxation by the home country that might otherwise impose a tax obligation if the income were reported. Recent private banking scandals have highlighted this practice. Although such behavior is not appropriate, banking secrecy may provide legitimate benefits in the form of security, privacy, intra-family dynamics, and politics. Moreover, offshore banking centers (such as those in London, New York,

Paris, Zurich, Luxembourg, Singapore, and Hong Kong) can be an efficient way to provide financial services to clients residing in other countries. So, offshore banking should not be equated with tax evasion.

Information exchange between tax authorities, however, is becoming increasingly fluid and increasingly exposing tax evasion strategies predicated on bank secrecy.[34] Marcovici (2007) outlines regulatory and other trends that contribute to this growing trend toward transparency. For example, in an effort to enforce the taxation of worldwide income on its residents and citizens, the United States demanded that banks around the globe provide the names of beneficial owners of all US securities whether the owners were US or non-US citizens. Fearing that the United States could share this ownership information with authorities in the home country of their non-US customers, most banks agreed to become Qualified Intermediaries (QIs). In exchange for not being required to categorically supply the names of beneficial owners of US securities, QIs agree to document this information for all their customers and provide information about US customers upon request. In this way, QIs are able to preserve the confidentiality of their non-US customers but are still required to gather information that could be shared with the US authorities.

Similarly, the European Union Savings Directive (EUSD) is a system to collect tax on interest payments made in one EU country for the benefit of an individual in another EU country. Under the EUSD system, EU members agree to automatically exchange information with each other with the exception of Austria, Belgium, and Luxembourg. These countries apply a tax at the source and transfer the respective proportion of the pooled tax revenues to the EU country of residency of the concerned EU national.

Other trends are also contributing to the increasing rate of information exchange between jurisdictions. In some cases authorities collect information from credit card companies about individuals who use credit cards in their country, whether or not they are citizens of that country. This information can then be shared with the individual's home country. Tax treaties not only provide relief from double taxation, but may also provide for far-reaching exchange of information between countries.

In sum, estate planning strategies designed around an understanding of the economics of taxation and law are likely to provide lasting benefit for wealthy individuals and families. Families that build wealth management plans on a foundation of bank secrecy and of "hiding the money" impose archaic and potentially costly structures on subsequent generations, who will likely be operating in a more transparent and compliant legal and tax environment. Moreover, these structures pass on values that may not match subsequent generations' attitudes toward integrity, compliance, and transparency.

SUMMARY

Estate planning is a multidisciplinary endeavor that involves the intersection of tax, law, and finance. An understanding of the primary legal, tax, and financial issues affecting clients can help wealth managers effectively and strategically create tax-efficient wealth transfer strategies that meet clients' needs and objectives. The major points of this reading include:

- Assets in an estate can have ownership transferred by virtue of the type of ownership (e.g., sole versus joint), a will, or a trust.

34 See Marcovici (2007) for a more thorough discussion of the regulatory climate on which this section is largely based.

- Probate is the process by which a will is validated and can be relied on by interested parties.
- A country's legal system can limit the freedom of a testator to dispose of assets as he or she sees fit (e.g., forced heirship, community property rules, etc.).
- The two primary ways of transferring ownership of assets are lifetime gratuitous transfers (i.e., gifts) and testamentary gratuitous transfers (i.e., bequests).
- A wealth transfer strategy involves estimating an individual's or a family's core capital and excess capital.
- Core capital is the amount of capital required to maintain a given lifestyle and provide adequate reserves for unexpected commitments and can be estimated using mortality tables or Monte Carlo analysis.
- Excess capital represents assets above and beyond core capital that can be safely transferred without jeopardizing the first generation's lifestyle.
- Tax-free gifts that fall below periodic or lifetime allowances can be an effective means of minimizing estate tax, especially if a gifting program is developed early.
- Opportunities for tax-efficient gifting programs also exist when lifetime gifts are taxed, especially when the gift tax is paid by the donor rather than by the recipient.
- Transferring capital in excess of a second generation's need for spending, safety, and flexibility directly to the third generation or beyond (i.e., generation skipping) can help to minimize taxes where permitted.
- Taxpayers in jurisdictions with both spousal exemptions and exclusions for smaller estates in effect have two estate exclusions available—one for each spouse.
- Tax efficiencies are possible using valuation discounts and charitable gratuitous transfer strategies.
- Common estate planning tools include trusts, foundations, insurance, and companies, each of which can provide benefits related to asset control, protection from creditors, and taxation.
- The control and protection trusts offer, whether structured as revocable or irrevocable, can provide flexibility as well as legal validity.
- Families with an international footprint face special issues relating to the drafting and recognition of legal documents, such as wills and trusts.
- The taxing authority of a country is determined by its tax system (e.g., source versus residence) and may conflict with the tax authority of another country.
- Jurisdictional claims based on source or residency can conflict with source jurisdictions typically given primacy.
- Double taxation conflicts can be resolved through either foreign tax credit provisions of the home country or double taxation treaties with other countries.
- The ability of locating undeclared funds in offshore savings accounts and other offshore structures to avoid detection by home country tax authorities is being eroded by trends toward an increase in information exchange and transparency across countries; compliant, tailored, tax-efficient strategies are key to meet the needs and objectives of clients and of their successor generations.

PRACTICE PROBLEMS

1 The drawing up of a will is an area of estate planning that requires an individual to have a clear understanding of the tax and succession (or inheritance) laws of any jurisdiction of relevance to the testator. Although an individual may elect to draw up a will, the validity of the will could be subject to various challenges in the probate process. In addition, probate may create sizeable court fees as well as unwelcome publicity and a delay in the distribution of assets. Describe how an individual can attempt to reduce or even avoid the impact of:

A probate.

B forced heirship.

2 After a lengthy career as a metallurgical engineer, Greg Pearsall recently retired at age 70 and is looking forward to spending retirement with his wife Christine, who is 75 years old. Although both Greg and Christine are now retired, they would prefer to maintain their present lifestyle which currently requires annual spending of $75,000 in real terms. Inflation is expected to be 6 percent, and the nominal risk-free rate is 10 percent. The Pearsalls' survival probabilities for the next five years based on their current age are listed in the table below.

	Greg		Christine	
Year	Age	*p*(Survival)	Age	*p*(Survival)
1	71	0.9660	76	0.8235
2	72	0.9371	77	0.7996
3	73	0.9152	78	0.7727
4	74	0.8883	79	0.7208
5	75	0.8544	80	0.6919

A What is the probability that either Greg or Christine will survive over each of the next five years?

B Is it appropriate to use the expected return of the assets used to fund their spending needs when calculating the capitalized value of the Pearsalls' core capital spending needs? Why or why not?

C What is the capitalized value of the Pearsalls' core capital spending needs over the next five years?

3 As part of their estate, Tony and Eleanor Hall currently own a $2.5 million portfolio of equities and bonds that has an average annual pretax return of 10 percent. The Halls' after-tax return on the portfolio is 7 percent (the tax rate is 30 percent). Due to the rapid deterioration in their health, the Halls are considering transferring the $2.5 million portfolio to their eldest grandchild, Joe, during the current financial year. By transferring their investment portfolio directly to their grandson, the Halls are attempting to reduce the transfer taxation effect of their inheritance. Although $1.5 million can be transferred tax free, local jurisdiction requires that the remaining $1 million transfer be subject to a 30 percent tax rate, which is Joe's responsibility as donee. The Halls have consulted with their financial planner as they are uncertain whether the 30 percent tax rate would also apply if their gift to their grandson is delayed and transferred as a bequest five years from today. Their grandson currently pays a marginal tax rate of 25 percent.

© 2011 CFA Institute. All rights reserved.

A Discuss the effectiveness of the Halls' generation skipping strategy.

B Calculate the relative after-tax value of the Hall's $1 million gift (above and beyond the $1.5 million exclusion) to their grandson. Assume the $1 million transfer is subject to 30 percent tax whether it takes place today or is delayed and transferred as a bequest in five years.

C Given that the $1 million transfer is subject to 30 percent tax whether it takes place today or is delayed and transferred as a bequest in five years, is there any advantage in delaying payment of the gift by five years?

4 After five decades of living in Country A, a wealthy entrepreneur, Andrew Lloyd, has recently retired and taken up residency in Country B. Although he now lives in Country B, Lloyd has retained a number of investment properties in Country A. The investment income tax rate is 45 percent and 30 percent in Country A and Country B, respectively.

A Define source and residence tax as two possible primary tax systems of Country A and Country B.

B Discuss three potential double taxation conflicts that could arise due to Lloyd's new residency in Country B.

C Calculate Lloyd's tax rate liability under the following three methods providing for double taxation relief, assuming scenarios where either country claims source or residence jurisdiction:

i. Credit method.

ii. Exemption method.

iii. Deduction method.

SOLUTIONS

1 A There is often a desire to avoid probate as court fees may be sizable, and the process can cause a delay in the transfer of assets to intended beneficiaries. A will can be challenged, and its contents are often a matter of public record, which may concern some wealthy families as it may cause embarrassment or divulge sensitive financial information. Moreover, many problems can arise in probate when multiple jurisdictions are involved. In some instances, probate can be avoided or its impact limited by holding assets in joint ownership (e.g., joint tenancy with right of survivorship), living trusts, retirement plans, or life insurance strategies. Through these structures, ownership transfers without the need for a will, and hence the probate process can be avoided.

B Under civil law, ownership is a precise concept that is tempered by statutes that place certain limitations on the free disposition of one's assets. Under forced heirship rules, for example, children have the right to a fixed share of a parent's estate. This right may exist whether or not the child is estranged or conceived outside of marriage. Forced heirship in civil law countries may reduce or eliminate the need for a will. Wealthy individuals may attempt to move assets into an offshore trust governed by a different domicile to circumvent forced heirship rules. Spouses typically have similar guaranteed inheritance rights under civil law forced heirship regimes. In addition, spouses have marital property rights, which depend on the marital property regime that applies to their marriage. Individuals can attempt to reduce or avoid forced heirship by:

- moving assets into an offshore trust governed by a different jurisdiction;
- gifting or donating assets to others during their lifetime to reduce the value of the final estate upon death; or
- purchasing life insurance, which can move assets outside of realm of forced heirship provisions.

Such strategies, however, may be subject to "clawback" provisions that provide a basis for heirs to challenge these solutions in court.

2 A Greg and Christine Pearsall's joint survival probabilities are equal to the sum of their individual probabilities less the product of their individual probabilities, calculated as follows:

$$\begin{aligned} p(\text{Joint survival}) = {} & p(\text{Greg survives}) + p(\text{Christine survives}) \\ & - p(\text{Greg survives})\,p(\text{Christine survives}) \end{aligned}$$

For each of the next five years, their joint probability of survival is:

Year	Joint *p*(Survival)
1	0.9940
2	0.9874
3	0.9807
4	0.9688
5	0.9551

B It is not appropriate to use the expected return of the assets used to fund spending needs to calculate the capitalized value of their core capital needs, because the risk of the Pearsalls' spending needs is unrelated to the risk of the investment portfolio used to fund those needs. Although the annual spending cash flows are not riskless, a risk-free rate should be used to calculate the present value of the cash flows as their uncertainty is unrelated to market risk factors that would be priced in a normal asset pricing model, making their beta equal to zero.

C The capitalized value of their core capital needs equals the product of the joint probability of survival and the real spending need for each year discounted using the real risk-free rate. The real risk-free rate is calculated as follows:

$$\text{Real risk-free rate} = \left[(1 + \text{Nominal risk-free rate}) \div (1 + \text{Inflation rate}) - 1\right]$$

$$3.7736\% = \left[(1 + 0.10) \div (1 + 0.06) - 1\right]$$

Year	Annual Spending	Expected Spending	Discounted Value
1	75,000	74,550	71,839
2	75,000	74,055	68,767
3	75,000	73,553	65,817
4	75,000	72,660	62,654
5	75,000	71,633	59,522
			$328,599

$$\text{Discounted value} = \frac{\text{Real spending} \times \text{Joint probability}}{(1 + \text{Real risk-free rate})^t}$$

Alternatively, annual spending can be adjusted for inflation and these nominal expected cash flows can be discounted at the nominal risk-free rate.

Year	Annual Spending	Expected Spending	Discounted Value
1	79,500	79,023	71,839
2	84,270	83,208	68,767
3	89,326	87,602	65,817
4	94,686	91,731	62,654
5	100,367	95,861	59,522
			$328,599

$$\text{Discounted value} = \frac{\text{Real spending} \times (1 + \text{Inflation})^t \times \text{Joint probability}}{(1 + \text{Risk-free rate})^t}$$

Greg and Christine Pearsall have core capital spending needs of $328,599 for the next five years.

3 A Transferring their investment portfolio assets directly to the third generation (grandson), the Halls may reduce transfer tax liabilities. In jurisdictions that tax gifts or bequests, transfers from the first generation to the second will be taxed. The same capital may be taxed again if it is transferred from the second to third generation and the second generation's estate is taxable.

Transferring capital in excess of the second generation's needs for spending, safety, and flexibility directly to the third generation can avoid a layer of this double taxation. However, in the United States, taxing authorities discourage this strategy by imposing a special generation skipping tax. This tax, in addition to the usual transfer tax, is imposed on transfers to grandchildren or subsequent generations and is intended to produce the same overall tax effect had the assets passed sequentially through two generations.

B

$$RV_{TaxableGift} = \frac{FV_{Gift}}{FV_{Bequest}}$$

$$= \frac{\left[1 + 0.10(1 - 0.25)\right]^5 (1 - 0.30)}{\left[1 + 0.10(1 - 0.30)\right]^5 (1 - 0.30)} = \frac{1.0049}{0.9818} = 1.02$$

C There is no advantage in delaying payment of the gift because their grandson has a lower marginal tax rate on investment returns compared to the estate's marginal tax rate; the gift still creates a tax advantage if donated today. As their grandson is subject to a lower tax rate of 25 percent, subsequent investment returns will be taxed at a lower rate than if it is kept inside the estate. As the calculation in Solution B indicates, 2 percent more wealth will be created in five years than if the portfolio had remained in the estate and been taxed at 30 percent annually. This analysis assumes that the gratuitous transfer tax is paid by the grandson rather than by the Halls.

4 A *Source tax system*: A jurisdiction that imposes tax on an individual's income that is sourced in the jurisdiction.

Residence tax system: A jurisdiction that imposes a tax on an individual's income based on residency whereby all income (domestic and foreign sourced) is subject to taxation.

B The interaction of countries' taxation jurisdictions can create tax conflicts in which Country A and B can claim to have authority to tax the same investment properties. This conflict can arise in three ways:

- *Residence–residence conflict*: If he were a resident of both countries, Country A and B would both claim residence of Mr. Lloyd, subjecting his worldwide income to taxation by both countries.
- *Source–source conflict*: Both Country A and B may claim source jurisdiction of the same investment properties as income from the investments that are in Country A, but managed from Country B.
- *Residence–source conflict*: Because Lloyd lives in Country B, but has investment properties in Country A, he may be subject to a combination of two taxation jurisdictions. As a resident of Country B he could be taxed on worldwide income; and if Country A exercises source jurisdiction on his assets, he will be taxed on these as well. In this case, the source country (Country A) is commonly viewed to have primary jurisdiction to tax income within its borders and the residence country (Country B) is expected to provide double taxation relief.

C i. In the credit method, the residence country reduces its taxpayers' domestic tax liability for taxes paid to a foreign country exercising source jurisdiction. The credit is limited to the amount of taxes the taxpayer would pay domestically, which completely eliminates double taxation. Under this method the tax liability equals the greater of the tax liability due in either the residence or source country.

If Country A claims source jurisdiction and Country B residence jurisdiction:

$$T_{CreditMethod} = \text{Max}[T_{Residence}, T_{Source}]$$

$$T_{CreditMethod} = \text{Max}[0.30, 0.45] = 45\%$$

In this case, Lloyd remits the entire 45 percent to Country A, which has the source claim.

If Country A were to exercise residence jurisdiction and Country B source jurisdiction, the effective tax rate is the same:

$$T_{CreditMethod} = \text{Max}[T_{Residence}, T_{Source}]$$

$$T_{CreditMethod} = \text{Max}[0.45, 0.30] = 45\%$$

However, Lloyd would remit 30 percent to Country B and apply that remittance toward Country A's 45 percent tax liability, effectively paying Country A 15 percent.

ii. Under the exemption method, the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, which, in effect, eliminates the residence–source conflict by having only one jurisdiction impose tax. The tax liability under the exemption method is simply the tax imposed at the foreign source, so the source tax rate prevails:

If Country A is the source country, Lloyd's tax rate is 45 percent.

If Country B is the source country, Lloyd's tax rate is 30 percent.

iii. Under the deduction method, the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income (i.e., provides a tax deduction rather than a credit or exemption). The taxpayer is still responsible for both taxes, but the aggregate liability is less than the sum of the two taxes individually with the residence country reducing the size of its percentage claim by the product of the two tax rates.

$$T_{DeductionMethod} = T_{Residence} + T_{Source} - (T_{Residence} T_{Source})$$

<u>Country A: Residence jurisdiction and Country B: Source jurisdiction</u> = $0.45 + 0.30 - (0.45 \times 0.30) = 0.6150$

Country A receives 31.50% and Country B receives 30%

<u>Country A: Source jurisdiction and Country B: Residence jurisdiction</u> = $0.30 + 0.45 - (0.30 \times 0.45) = 0.6150$

Country A receives 45%, and Country B receives 16.50%

PORTFOLIO MANAGEMENT
STUDY SESSION

5

Private Wealth Management (2)

The wealth of many individuals and families is often concentrated in a limited number of securities, business holdings, or real estate properties. The sale of concentrated positions to facilitate desired diversification may not be feasible or may create a substantial tax liability.

This study session examines the considerations and risks associated with concentrated single asset positions. Strategies for managing concentrated positions in publicly traded common shares, privately held businesses, and real estate are presented. Coverage on the dynamics of human and financial capital and the challenge of meeting financial goals throughout an investor's lifetime follows. The discussion specifically addresses investment strategies and financial products structured to mitigate the risk of not achieving these goals.

READING ASSIGNMENTS

Reading 11	Concentrated Single Asset Positions by Thomas J. Boczar, Esq., LL.M., CFA, and Nischal R. Pai, CFA
Reading 12	Risk Management for Individuals by David M. Blanchett, PhD, CFP, CFA, David M. Cordell, PhD, CFP, CFA, Michael S. Finke, PhD, and Thomas Idzorek, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

11

Concentrated Single-Asset Positions

by Thomas J. Boczar, Esq., LL.M., CFA, and Nischal R. Pai, CFA

Thomas J. Boczar, Esq., LL.M., CFA, and Nischal R. Pai, CFA, are at Intelligent Edge Advisors (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** explain investment risks associated with a concentrated position in a single asset and discuss the appropriateness of reducing such risks;
☐	**b.** describe typical objectives in managing concentrated positions;
☐	**c.** discuss tax consequences and illiquidity as considerations affecting the management of concentrated positions in publicly traded common shares, privately held businesses, and real estate;
☐	**d.** discuss capital market and institutional constraints on an investor's ability to reduce a concentrated position;
☐	**e.** discuss psychological considerations that may make an investor reluctant to reduce his or her exposure to a concentrated position;
☐	**f.** describe advisers' use of goal-based planning in managing concentrated positions;
☐	**g.** explain uses of asset location and wealth transfers in managing concentrated positions;
☐	**h.** describe strategies for managing concentrated positions in publicly traded common shares;
☐	**i.** discuss tax considerations in the choice of hedging strategy;
☐	**j.** describe strategies for managing concentrated positions in privately held businesses;
☐	**k.** describe strategies for managing concentrated positions in real estate;
☐	**l.** evaluate and recommend techniques for tax efficiently managing the risks of concentrated positions in publicly traded common stock, privately held businesses, and real estate.

© 2013 CFA Institute. All rights reserved.

1 INTRODUCTION

Frequently, the wealth of individuals and families is concentrated in an asset or group of assets that has played a role in their (or their forebears') accumulation of wealth. Wealth managers must be able to assist private clients with decisions concerning such positions. The three major types of "concentrated position in a single asset" (or "concentrated position") examined in this reading are (1) publicly traded stock, (2) a privately owned business, and (3) commercial or investment real estate.

Exhibit 1 shows that ownership interests in privately owned business enterprises constitute much of the wealth of private clients in many countries.

Exhibit 1 Percentage of Global Private Clients Who Derive Their Wealth from a Private Business, by Region

Source: VIP Forum, *Strictly Business: Strategies for Acquiring and Serving High-Net-Worth Business Owners* (Arlington, VA: Corporate Executive Board, 2005).

Concentrated positions sometimes make up a large share of a client's net worth. As the owner of a concentrated position ages, the asset may need to be sold or monetized to fund retirement needs, or for risk management purposes. (In general terms, to **monetize** something is to access its cash value without transferring ownership of it, as would be the case in a sale.)

Private clients often want to compare the potential results of continuing to hold these often illiquid assets with selling or monetizing them and reinvesting the proceeds in other asset classes. Wealth managers who understand their clients' finances and personal long-term objectives are ideally suited to play a key role in assisting them to chart an efficient path in handling their concentrated positions.

Creating a globally relevant reading in this field for generalists presents many challenges. Decisions concerning the treatment of concentrated single-asset positions must always be made in the context of a specific single market and tax code. The available means for attempting to achieve a given objective vary across markets, as do tax codes. We show problems that arise worldwide, but the contexts and questions addressed are often simplified. Frequently, US considerations are mentioned, but other

markets are not ignored. This reading provides a familiarity with various recurring themes. Expertise in the field is needed to address real-life problems of concentrated positions. This reading is organized as follows. Section 2 provides an overview of concentrated positions, including how investors typically acquire these assets and the risks inherent in owning them. Section 3 discusses the general principles associated with managing the risk of a concentrated position. Sections 4, 5, and 6 focus on the range of strategies that are available to the owners of concentrated positions in a single stock, private business equity, and real estate, respectively, and Section 7 summarizes the key points of the reading.

CONCENTRATED SINGLE-ASSET POSITIONS: OVERVIEW

2

There is no universally accepted definition of what is meant by a concentrated position. Practically speaking, a concentrated position is one that makes up a significant portion of a private client's net worth. In practice, many wealth managers and fiduciaries consider 25% of a client's net worth to be a relevant threshold, although many use a higher or lower threshold.

Concentration within asset classes poses problems that need to be managed. For instance, a holding of a highly illiquid stock might constitute only a modest portion of a private client's net worth but might be a large percentage of his or her equity exposure. The equity component of the portfolio would then be undiversified and thus entail certain inherent risks. This type of concentration presents risks that also need to be managed.

A concentrated position is often a position that has been held by the private client for a long period, sometimes for decades, and that has greatly appreciated in value over its original cost (cost basis). It will often present tax, liquidity, or other considerations that make a simple sale problematic.

The three asset classes in which concentration risk most commonly arises are

- publicly traded single-stock positions,
- privately held businesses (including family-owned businesses), and
- investment real estate.

Publicly traded single-stock positions. There are a number of ways an investor can end up owning a concentrated stock position. The investor might have worked at a publicly traded company as an executive, perhaps for many years, and received company stock, options, or some other financial instrument that is convertible into company stock as part of his or her executive compensation.

It is also not unusual for the seller of a privately owned business to receive stock in lieu of cash if the acquirer is a publicly traded company. Under many tax regimes, including Japan, the United Kingdom, and the United States, it is possible to structure a purchase using stock without triggering an immediate taxable event. In these situations, the owner goes from holding a highly appreciated position in a privately held stock to a highly appreciated position in a publicly traded stock.

A concentrated position in a publicly traded stock can also come about because of a successful long-term buy-and-hold investing strategy or as a result of a private company that elects to go public through an initial public offering.

Privately owned businesses. Some successful privately owned businesses have been in existence for many years, with ownership passed down from one generation to the next. In other cases, an entrepreneur may have built a successful business in a much shorter period of time, a situation that is not uncommon in such industries as technology and social media.

Investment real estate. Commercial or industrial real estate often constitutes a significant portion of the value of a private business enterprise. It is also often held as a standalone investment by private clients, as in the case of real estate developers. Typically, real estate is held for a long-term period. It is not uncommon when selling or monetizing a business that the buyer does not wish to purchase the real estate component of the business (because, for example, the buyer may already have sufficient space to accommodate the purchased operations). In that case, the seller is left with a large real estate holding.

Concentrated positions in investment real estate could also be derived from inheritance, from a lack of other investment opportunities in certain jurisdictions (e.g., China in the 1990s and 2000s, when financial markets were still in their infancy), or from rapid price appreciation leading to a bubble (e.g., Japan—especially Tokyo—in the 1980s).

Of course, the holder of each of these types of assets might have received his or her ownership stake in the asset through either gifting or inheritance, which is quite common. Ownership of concentrated positions is not a challenge reserved exclusively for private clients. Entities such as trusts, estates, and foundations often hold concentrated positions as the result of a gift or bequest. Pension funds are sometimes exposed to a heavy allocation of the fund sponsor's company stock. Also, publicly traded companies sometimes hold a significant amount of shares of another publicly traded company for business or investment purposes.

2.1 Investment Risks of Concentrated Positions

The owners of concentrated positions face systematic risk and non-systematic risk, which can be company- or property-specific risk. Exposures to any of these risks may not be consistent with the individual's willingness and capacity to bear risk or may be suboptimal with respect to asset allocation.

This section focuses on describing these risks. However, return consequences of concentrated positions can also be important. Some concentrated positions may not be expected to earn fair risk-adjusted returns, for example. There may be large opportunity costs in holding under-performing company stock or non-income-producing land.

2.1.1 *Systematic Risk*

Systematic risk is the component of risk that cannot be eliminated by holding a well-diversified portfolio. The capital asset pricing model as practically implemented equates systematic risk to equity market risk. More recently developed asset pricing models identify multiple sources of systematic risk; for example, one model based on macroeconomic factors identifies business cycle risk (unexpected changes in the level of real business activity), inflation risk (unexpected changes in the inflation rate), and three other factors, including that part of equity market risk that is unexplained by macroeconomic factors. If the concentrated position has systematic risk exposures that are similar to those of the human capital of the owner of the concentrated position, the individual may be exposed to investment portfolio losses at the same time that job earnings are jeopardized. An example is the founder of a securities firm with a concentrated position in the firm's shares. In a bear market, the firm's earnings and the founder's compensation may be low at the same time that share returns are negative.

2.1.2 *Company-Specific Risk*

With respect to the ownership of a privately held business and publicly traded stock, we call specific risk **company-specific risk**. Company-specific risk is the non-systematic or idiosyncratic risk that is specific to a particular company's operations, reputation, and business environment. To describe it in another way, it is the possibility that the value of the company may decline because of an event that affects that company but not the industry or market as a whole. Having a concentrated position can expose an individual to an unacceptably high level of company-specific risk. A negative corporate event may result in essentially permanent and irrecoverable losses in wealth. All else equal, the level of company-specific risk is positively related to volatility of returns; company-specific risk can range from relatively low to high for small undiversified or unprofitable companies.

The concept and importance of company-specific risk with respect to a publicly traded company can perhaps best be highlighted through a real life example. During the 1990s, Enron Corporation was one of the most admired companies in the United States. A position in Enron shares returned over 27% per year from 1990 through September 2000, compared with 13% for the S&P 500 Index for the same time period. During this period, thousands of Enron employees participated in the company's defined contribution retirement plan and chose to invest in Enron stock. In January 2001, the retirement accounts were valued at US$2 billion, of which 62%, or US$1.24 billion, was invested in Enron shares even though the employees had the option to sell most of those shares tax free within the plan. Between January 2001 and January 2002, Enron's share price fell from about US$90 per share to zero. On the other hand, the S&P 500 Index declined by only 12% in the same time period.

The higher volatility associated with company-specific risk of single-stock holdings significantly lessens the benefit of higher expected capital accumulation over time. For example, Exhibit 2 compares investing a dollar in a single security having a zero cost basis and 40% volatility with the alternative of selling it, paying a 20% capital gains tax, and reinvesting the net proceeds of 80 cents in a diversified portfolio with a volatility of only 17%. Either alternative has an annual expected pretax return of 10%. Exhibit 2 illustrates the comparison at the end of a 20-year horizon.

Exhibit 2 Holding a Security vs. Outright Sale of a Security: Probability Distribution of After-Tax Liquidation Value

A. $1.00 in Single Security with Zero Cost Basis and 40% Volatility

B. $0.80 in Diversified Portfolio with $0.80 Cost Basis and 17% Volatility

Measure	A	B
Expected final value	$5.3	$4.2
Median value	$1.6	$3.3
Probability of $1 or less	39%	2%
Probability of $2 or less	57%	21%

Note: Annual expected return = 10%; dividends on stock = 0; dividends on diversified portfolio = 1.2%; horizon = 20 years; terminal liquidation.
Source: David M. Stein, "Taxes and Quantitative Portfolio Management," in *Developments in Quantitative Investment Models* (Charlottesville, VA: Association for Investment Management and Research, 2001).

Although the expected value (i.e., arithmetic average) is higher for the single stock, the median outcome is much higher for the diversified portfolio. Moreover, the diversified portfolio has a much smaller chance of suffering large losses. The diversified portfolio strategy has only a 2% chance of losing money, versus a 39% chance for the single stock. As this example illustrates, a "tax minimization" strategy may not be optimal.

2.1.3 *Property-Specific Risk*

Property-specific risk is the non-systematic risk that is specific to owning a particular piece of real estate. It is the possibility that the value of that property might fall because of an event that could affect that property but not the broader real estate market.

For instance, a potential environmental liability associated with a particular property might be discovered that significantly reduces the value of that property even though the broader real estate market and similar properties are increasing in value.

As another example, an investor might own a large office building that is leased out to a few investment-grade tenants for a long-term period. If the tenants decide not to renew their leases for an additional term when their lease terms expire, the owner may have a difficult time leasing the entire property to a few large investment-grade tenants. Instead, the owner may have to lease the property to a number of smaller tenants, which could take more time, and therefore, a good portion of the property might sit vacant for some time. Also, the new and smaller tenants might not be investment grade, thus increasing the credit risk that the owner must incur in order to fully lease out the building. These types of changes with respect to the tenants/occupancy could negatively affect the resale value of that property even though the broader real estate market and similar office properties are increasing in value.

GENERAL PRINCIPLES OF MANAGING CONCENTRATED SINGLE-ASSET POSITIONS 3

The following sections review certain basic principles that are germane to managing concentrated positions.

3.1 Objectives in Dealing with Concentrated Positions

The financial adviser should first and foremost help clients identify and define their objectives.

3.1.1 *Typical Objectives*

Irrespective of the form of the concentrated position—whether it is a privately owned business, investment real estate, or a concentrated position in publicly traded stock—there are three objectives that are frequently considered in discussions with the client.

Risk is reviewed and the appropriateness of risk reduction considered. Any adverse results from risk reduction (e.g., loss of control of a business) should be weighed against the benefits. With such qualifications, a frequent (if not universal) objective is to *reduce the risk of wealth concentration*. Psychological considerations are often at work to cause owners to seriously underestimate the riskiness of their concentrated position and significantly overestimate the value of that asset.

Cash flow needs should be identified. An appropriate strategy for monetization and/or risk reduction should be developed. Often, an objective is to *generate liquidity in order to diversify and satisfy spending needs*. Illiquid private business equity, investment real estate, and concentrated stock positions need to be transformed into cash. A replacement source of income then needs to be created to satisfy essential lifetime spending needs. Fulfilling legacy and charitable intentions are also drivers of liquidity needs along with other aspirational desires.

Another typical objective is to *optimize tax efficiency*, which can be accomplished by either structuring transactions involving concentrated positions so as not to trigger an immediate taxable event, or if a taxable event will be triggered, structuring the transaction in a manner that minimizes the tax the owner will incur.

3.1.2 *Client Objectives and Concerns*

There are many objectives that the owner of the concentrated position might wish to achieve. For instance, the concentrated position could be used in conjunction with gifting strategies to satisfy the owner's wealth transfer desires, such as leaving a legacy for the next generation or to satisfy his or her charitable intentions. The previous section indicated that risk reduction and diversification are common objectives. It is important to note that in order to achieve such objectives, it is *not* always appropriate for the owner to reduce or eliminate the concentration risk of a concentrated position.

With respect to concentrated stock positions, examples of objectives consistent with risk retention include the following:

- An executive might have received shares as part of his or her incentive compensation with the expectation or mandate that those shares be held for a long time period to motivate the executive to work hard as part of a team to grow the company and hopefully result in a much higher stock price in the future.
- The owner of a concentrated position might wish to *maintain effective voting control* of the company.
- The owner of a concentrated position might wish to *enhance the current income* of his or her stock position in the short term but in the long term still retain significant upside potential with respect to the stock.

With respect to privately owned businesses, the following are examples of client objectives:

- An entrepreneur might have recently founded a business, and it would be premature to sell that company because its growth phase has just begun.
- The owner of a mature and stable privately owned business might wish to maintain total control of the company.
- In return for years of prior service, the owner might wish to give senior management and other key employees the opportunity to eventually acquire control of the business.
- The business owner might have plans to pass control of the business to the next generation of his family.

With respect to investment real estate, examples of client objectives include the following:

- Maintain control because the property is an essential asset necessary for the successful operation of a business enterprise.
- Retain ownership in order to pass ownership of the real estate to the next generation.
- Benefit from a recent purchase or development through price appreciation.

3.2 Considerations Affecting All Concentrated Positions

Owners of concentrated positions face numerous constraints and obstacles that must be overcome in order for them to meet their primary and secondary objectives.

3.2.1 *Tax Consequences of an Outright Sale*

Concentrated positions are often highly appreciated versus their original cost. Therefore, simply selling the asset outright will usually trigger an immediate and sometimes significant taxable capital gain for the owner.

With respect to taxation, the tax cost basis is generally the amount that was paid to acquire an investment or capital asset. It serves as the foundation for calculating capital gain (or loss), which equals the selling price less the tax cost basis. For example, a share of stock bought for 10 monetary units and sold 20 years later for 100 monetary units would generate a capital gain of 90 monetary units.

In the case of concentrated positions, frequently the asset was acquired a long time ago and has a tax cost basis that is much lower than the current fair market value. The asset may therefore have a significant embedded capital gains tax liability.

The key point is that many, but by no means all, tax regimes throughout the world do impose a tax on capital gains.

Given that most families have accumulated the wealth represented by their concentrated positions through many years of hard work and calculated business risks, the fact that an outright sale of those assets would result in a tax obligation is often not psychologically palatable to the family. Therefore, deferring and, if possible, eliminating the capital gains tax is typically a primary objective for investors who own a concentrated position. There are a number of tools and strategies that can be used in many jurisdictions to achieve these objectives.

3.2.2 *Liquidity*

With the possible exception of concentrated positions in publicly traded stocks, concentrated positions are generally illiquid. This is especially true for the owners of privately owned businesses and investment real estate. Owners of concentrated publicly traded stock positions may also face this illiquidity if the trading volume of the company's shares is small relative to the size of the concentrated position or if the shareholder is an insider and the timing or amount of any sales is restricted by applicable securities laws and regulations.

The sale of private business equity does not resemble the sale of shares of publicly traded stock because the latter trade on established stock exchanges or public trading venues where there are publicly quoted bids and offers and usually many ready buyers and sellers. That is, there is no readily available market for a private company's shares. Rather, a buyer needs to be found for private business equity, and different classes of potential buyers may place a different value on the business. Therefore, the most important factors determining the amount that a business owner will receive when selling his or her business are ultimately the strategy that is employed and who the buyer is.

Direct ownership of investment real estate is also illiquid. A buyer needs to be found for a particular property, and different classes of potential buyers may place different values on that property.

Illiquidity in general acts as a constraint on the choice of strategies for dealing with a concentrated position.

3.3 Institutional and Capital Market Constraints

Various features of the institutional and capital market environment act as constraints on the choice of methods that may be effective in dealing with concentrated positions. Execution of any strategy is dependent on the governing law. The legal relationship that exists between the owners of a business depends on the type of entity that is being used (e.g., sole trader, partnership, limited partnership, or limited company, among other forms, in the United Kingdom), the laws governing that type of entity, and any documentation or agreements those laws require.

3.3.1 *Margin-Lending Rules*

Margin rules also present obstacles and additional complexity. Margin rules determine how much a bank or brokerage firm can lend against securities positions that their customers own. Various margin regimes exist throughout the world. They can be either rule based or risk based.

Under a *rule-based* system, the amount that can be borrowed against a security that the investor owns will depend on strict rules dealing with the use of the loan proceeds. If the purpose of the loan is to buy additional securities, the maximum loan proceeds are usually quite limited. For instance, in the United States, such a "purpose loan" is subject to a maximum of 50% of the value of the stock that is borrowed against even if that stock is completely hedged by a long put.

In contrast, portfolio margining is an example of a margin regime that is *risk based*. If an investor borrows against a stock that is completely hedged by a long put, the dealer will typically lend close to 100% of the put strike to the investor even if the investor wishes to purchase additional equity securities with the loan proceeds.

The implications of "portfolio margining," which is available in the United States and other countries, are powerful, especially for ultra-high-net-worth investors. These rules provide advisers with additional flexibility to achieve the desired economic and tax results.

Certain forms of secured lending, such as a **prepaid variable forward** (collar[1] and loan combined within a single instrument) in the United States, are considered "off-balance-sheet" debt and not subject to the margin rules. Such transactions are considered "sales" for margin rule purposes (so the margin rules do not apply and therefore there are no limitations on the use of proceeds) but are structured to not be sales for tax purposes (so capital gains taxes can be deferred or eliminated).

3.3.2 *Securities Laws and Regulations*

Company insiders and executives must often comply with a myriad of rules and regulations promulgated by governmental authorities. In most countries, such individuals, like any investor, cannot trade on material, non-public information. However, they typically must also comply with certain notice and disclosure/reporting requirements, and there may be specific limitations with respect to the timing and volume of sales or hedging transactions.

3.3.3 *Contractual Restrictions and Employer Mandates*

Beyond restrictions imposed by securities laws and regulations, contractual restrictions, such as initial public offering "lockups," and employer mandates and policies, such as a prohibition of trading during certain "blackout periods" (i.e., periods when insiders cannot sell their shares) can greatly restrict the flexibility of insiders and employees to either sell or hedge their shares. In the case of private companies especially, there might be a right of first refusal, meaning that equity holders cannot sell their investment to a third party without first giving other equity investors the right to buy the interest at the same price and under the same conditions that the third party is offering. In addition to the right held by the investors, the entity may also have a right of first refusal, which further reduces the liquidity of an investment holding.

3.3.4 *Capital Market Limitations*

Certain characteristics of the underlying stock ultimately determine the feasibility of hedging different concentrated positions and in what degree they can be hedged.

---

1 A collar is the combination of a long put (to limit potential losses) and a short call (to cap potential gains) below and above their respective strike prices.

The ability to borrow shares is critical because the dealer needs to manage the risk inherent in being a counterparty to the investor's hedge. Managing this risk is achieved by first locating and borrowing the shares and then selling those shares in the marketplace. Although the investor executing the hedging transaction with the dealer could make its long shares available for the dealer to borrow if the shares were not restricted in any manner, the tax authorities could potentially view the transaction effectively as a sale.

In addition, the *liquidity* of the stock is vital because the dealer will periodically adjust its hedge, either borrowing and shorting additional shares or buying back shares and covering some of its outstanding short position. The average daily trading volume of the stock is important, and the dealer will observe whether the shares have had a propensity to "spike" either up or down. Because of this, most dealers will not execute collars or use other hedging techniques with respect to shares of a company that has recently undergone an initial public offering (IPO) because the dealer wants to be able to observe an established trading history/pattern of the stock prior to entering into such a transaction.

3.4 Psychological Considerations[2]

Various psychological considerations of clients can effectively act as constraints or obstacles to dealing with concentrated positions. Financial advisers hear many different types of rationalizations from their clients for declining to take any action with respect to the concentrated stock positions they own. Following are some common explanations that wealth managers often encounter:

- "It would be terribly disloyal for me to sell the stock after having worked at the company for so many years and the company treated me so well. What would my former colleagues think of me?"
- "My peers will look down on me if I sell the stock."
- "My husband picked and owned this stock for many years and made me promise before he died that I wouldn't sell it."
- "I have a duty to pass on ownership of the business to subsequent generations."

Advisers need to identify the cognitive and emotional biases that are affecting their clients and then communicate effectively with their clients to overcome the sometimes irrational decisions caused by these biases.

3.4.1 *Emotional Biases*

A number of emotional biases can combine to negatively affect the decision making of holders of concentrated positions, including the following:

- Overconfidence and familiarity (illusion of knowledge)
- Status quo bias (preference for no change)
- Naïve extrapolation of past returns
- Endowment effect (a tendency to ask for much more money to sell something than one would be willing to pay to buy it)
- Loyalty effects

2 The discussion within this section draws heavily on the CFA Program Level III readings "The Behavioral Biases of Individuals" and "Behavioral Finance and Investment Processes."

When biases are emotional in nature, simply drawing them to the attention of the investor is unlikely to lead to a positive outcome; the investor may become defensive rather than receptive to considering alternatives.

To overcome emotional biases, it might be helpful to pose the question, if an equivalent sum to the value of the concentrated position were received in cash, how would you invest the cash? Often, the answer is to invest in a portfolio very different from the concentrated position. It may also prove useful to explore a deceased person's intent in owning the concentrated position and bequeathing it: Was the primary intent to leave the specific concentrated position because it was perceived as a suitable investment based on fundamental analysis, or was it to leave financial resources to benefit the heirs? Heirs who affirm the latter conclusion are more responsive to considering strategies to reduce the concentration risk. It should also prove useful to review the historical performance and risk of the concentrated position.

3.4.2 *Cognitive Biases*

A number of cognitive biases can combine to negatively affect the decision making of holders of concentrated positions, including the following:

- Conservatism (in the sense of reluctance to update beliefs)
- Confirmation (looking for what confirms one's beliefs)
- Illusion of control (the tendency to overestimate one's control over events)
- Anchoring and adjustment (the tendency to reach a decision by making adjustments from an initial position, or "anchor")
- Availability heuristic (the probability of events is influenced by the ease with which examples of the event can be recalled)

If cognitive errors are brought to the attention of the investor, he or she is likely to be more receptive to correcting the errors.

EXAMPLE 1

Constraints and the Concentrated Position Decision-Making Process

Zachary Sloan, CFA, serves as investment counsel for the Bailer family. Pierce Bailer was formerly the CEO of ABC Corp., a large public company, for over 20 years. During his tenure as CEO, Bailer accumulated a significant position in ABC Corp. stock. Bailer retired as CEO effective 1 January 2010 and continued to serve as a member of the board of directors until his term expired 31 December 2011. Bailer is currently 55 years old and healthy and has a life expectancy of 87 years. He is married to Brooke, who is also 55 and healthy.

Bailer currently owns a 3 million share position in ABC Corp. At the current market price, the position is worth $60 million and represents 80% of the Bailer family's total investment portfolio, which is worth $75 million. The other 20% of their portfolio is invested evenly in high-quality fixed-income securities and a diversified portfolio of equities. Bailer has owned the ABC Corp. shares for many years, and the shares have increased significantly in value over that time. In addition, the stock has always paid, and continues to pay, a fairly attractive dividend, currently yielding approximately 2%. The dividend covers most of the Bailer family's day-to-day living expenses. The tax cost basis of the ABC Corp. shares is close to zero, and the sale of the entire position would trigger a tax liability of approximately $9 million at a capital gains tax rate of 15%.

While Bailer was CEO, he was required by his employment contract and company policy to maintain a large position in ABC Corp. shares, and although occasional sales were permitted, sales and hedging transactions by executives and other employees were frowned upon and discouraged by the board of directors. In fact, it was company policy to encourage retirees to not sell their shares in order to protect the company against a hostile takeover because collectively the shareholder votes of the former employees might help stave off a takeover. In addition, until Bailer left the board of directors, he was deemed an "insider" and the securities laws and regulations limited the timing and amount of any sales or hedging activity. The country in which the Bailer family resides currently has a long-term capital gains tax rate of 15%. Because of the political situation in that jurisdiction and pending legislation, however, the capital gains tax rate is generally expected to increase significantly, very likely to 23%, effective 1 January of the following year. Also, in this jurisdiction, the shares would qualify for a "step-up" in tax cost basis upon the death of the owner. That is, upon inheritance of the shares, the recipient/beneficiary would receive a new tax cost basis equal to the value of the investment asset on the date of death. This new tax cost basis would then be used to compute any future gain or loss on the sale of the investment asset by the recipient/beneficiary.

Even though he no longer has any formal affiliation with ABC Corp., Bailer remains extremely loyal to ABC Corp., is a big fan of ABC Corp. stock, and follows the stock regularly. Although he has no better access to information about the company than any other investor, Bailer feels that he knows the company much better than other investors. Mrs. Bailer remembers that she and Pierce started their married life with a negative net worth and the family's net worth grew over time as Pierce's ABC Corp. position skyrocketed in value. Mrs. Bailer also realizes that for many years, the dividends paid on their ABC Corp. stake paid for a good portion of their living expenses.

Immediately following the expiration of Bailer's term as a member of the board of directors, Sloan suggested a meeting to discuss an alternative asset allocation framework.

1. Identify primary investment objectives for the Bailer family's concentrated single-asset position.
2. Identify primary constraints that might impede the Bailer family's ability to achieve their primary objectives.
3. On the basis of the information given, discuss what emotional and cognitive biases may affect decision making of Mr. and Mrs. Bailer.

Solution to 1:

The family owns a concentrated position in ABC Corp. shares that constitutes 80% of their investment portfolio. The first objective should be to significantly reduce the concentration risk. The second objective should be to generate liquidity in order to diversify while satisfying spending needs. The third objective should be to achieve the first two objectives in the most tax-efficient manner.

Solution to 2:

The income tax consequences of an outright sale are a primary constraint to fulfilling the primary investment need. If the entire position was sold this year, a capital gains tax of approximately $9 million would be incurred. However, if the position is sold on or after 1 January of the following year, a capital gains tax of approximately $13,800,000 would likely be incurred because of the anticipated increase in the capital gains tax rate—an increase of $4,800,000. Although the tax is a constraint, the fact that the tax will likely be considerably

higher in the near future should be an impetus for Bailer to sell the ABC Corp. position this year and lock in the current capital gains tax before it increases. The step-up in tax cost basis the shares would receive if Bailer held them until his death should also be considered. However, Bailer's fairly long life expectancy of approximately 32 more years implies that the present value of the step-up is fairly low and should be greatly outweighed by the benefits of diversification over that long-term period.

Solution to 3:

The facts indicate that loyalty effects, overconfidence/familiarity (illusion of knowledge), and confirmation bias could be affecting Mr. Bailer, while status quo bias, naïve extrapolation of past returns, and anchoring and adjustment bias could be affecting Mrs. Bailer. Illiquidity is no longer an issue. For many years and until recently, Mr. Bailer was deemed an "insider" for securities law purposes and the timing and amount of any sales and hedging activity was restricted by applicable securities laws and regulations. In addition, for many years, he was bound by his employment contract and company policies to limit the sale and hedging of his ABC Corp. shares. However, these restrictions were completely eliminated when his term as a member of the board of directors ended.

3.5 Goal-Based Planning in the Concentrated-Position Decision-Making Process

Goal-based planning is one way to incorporate psychological considerations into asset allocation and portfolio construction that can be especially helpful for advisers to clients who own concentrated positions because it can highlight the consequences of selecting an asset allocation that is riskier than is appropriate for a particular investor.

A goal-based methodology expands the traditional Markowitz framework of diversifying market risk by incorporating several notional "risk buckets." Asset allocation, including concentrated positions, subsequently occurs within each risk bucket.[3]

The first risk bucket can be referred to as the **personal risk bucket**. Here, the goal is protection from poverty or a dramatic decrease in lifestyle. The desire is to achieve almost certainty of protection. Allocations to this bucket limit loss but yield below-market rates of return. This bucket is where the client would allocate his or her home (primary residence), certificates of deposit, Treasury bills, and other "safe haven" investments.

The second risk bucket can be referred to as the **market risk bucket**. Here, the objective is to maintain the current standard of living—to have a high likelihood of maintaining the current status quo. Allocations to this bucket provide average risk-adjusted market returns. This bucket is where the client would allocate his or her stock and bond portfolio.

The third risk bucket can be referred to as the **aspirational risk bucket**. Here, the goal is the opportunity to increase wealth substantially—to have the possibility of moving upward in the wealth spectrum. Allocations to this bucket are expected to yield above-market returns but with substantial risk of loss of capital. This bucket is where the client would allocate his or her concentrated positions, including privately owned businesses, investment real estate, concentrated stock positions, stock options, and the like.

3 For further reading on goal-based planning, see Ashvin Chhabra, "Beyond Markowitz: A Comprehensive Wealth Allocation Framework for Individual Investors," *Journal of Wealth Management*, vol. 7, no. 4 (Spring 2005) and Jean L.P. Brunel, "Goal-Based Wealth Management in Practice," *Journal of Wealth Management*, vol. 14, no. 3 (Winter 2011).

This type of risk allocation framework gives financial advisers a basis to sit down with a client and identify and highlight the significant risk that owners of concentrated positions are subject to. It may be the most effective way to open the conversation with a client about their concentrated positions because it can highlight when allocations to the personal risk and market risk buckets are not adequate.

In addition, concentrated-position owners need a touchstone for deciding whether to sell or monetize, and one useful metric might be whether the proceeds, when combined with the assets the owner already has outside the concentrated position, are at least sufficient to provide for the owner's lifetime spending needs. We can refer to this amount as the owner's **primary capital**, and it comprises allocations to his or her personal and market risk buckets. Ideally, the sale or monetization will generate even more than the primary capital requirement. We refer to this as the owner's **surplus capital**, which comprises allocations to his or her aspirational risk bucket.[4]

To determine whether the sale or monetization of the concentrated position can achieve financial independence for the owner, the financial adviser needs to work with the owner to answer five key questions:

1. What are the lifetime *spending needs and desires* of the client after the sale or monetization of the concentrated position?
2. How much capital will it take *today* to know that these spending needs and desires will be satisfied throughout the owner's lifetime with little or no chance of the investor running out of money (primary and surplus capital requirements)?
3. What is the current value of the concentrated position? Different strategies may result in significantly different values for the concentrated position.
4. What is the value of liquid and other assets that are available outside the concentrated position today—that is, how much capital does the owner have now outside the concentrated position?
5. Is the current value of the concentrated position under one or more of the monetization strategies that are available to the owner sufficient to "bridge the gap" between the capital the client currently has and his or her primary and surplus capital requirements?

For many concentrated-position owners, it's key to come away from a sale or monetization event with a transaction that has the highest likelihood of meeting at least their primary capital requirement. Generation of surplus capital puts the owner a step ahead.

If wealth managers have a holistic view of their clients' finances, an understanding of their personal long-term financial objectives, and expertise in investment management, they are well situated to assist their clients in determining their primary and surplus capital requirements. Goal-based planning works equally well with clients who own businesses, real estate, and concentrated stock positions. By using this approach, wealth managers can work with clients first to identify and highlight the concentration risk that each client faces and then to create a framework that should prove helpful in determining whether a sale or monetization event would cause the owner of the concentrated position to achieve financial goals. If it would, this approach may give the owner of the concentrated position the impetus to begin dealing with the emotional aspects of selling or monetizing the asset.

4 Similar to "surplus capital" is the concept of "discretionary wealth" in Jarrod Wilcox, "Harry Markowitz and the Discretionary Wealth Hypothesis," *Journal of Portfolio Management* (2003).

EXAMPLE 2

A Business Owner and the Concentrated-Position Decision-Making Process (1)

Bill Wharton is Fred Garcia's financial adviser. Garcia is 60 years old and is CEO of an aircraft parts business that he founded 30 years ago. For over a decade, Garcia's son had taken on increasingly important responsibilities, and Garcia's exit plan was to pass on the business to his son. His son's sudden decision to pursue other career opportunities was a shock to Garcia and provided the motivation for Garcia to consider selling or monetizing his business.

As Exhibit 3 portrays, Garcia owned a business worth $40 million, investment real estate consisting of an office building, warehouse, and land used by the business worth $5 million, a $3 million stock and bond portfolio, $1 million in cash, and an unmortgaged home worth $1 million. Garcia asked Wharton what he thought of his current financial picture.

Exhibit 3 Wealth Distribution Shown in Risk Buckets

"Personal" Risk 4% Protective Assets		"Market" Risk 6% Market Assets		"Aspirational" Risk 90% Aspirational Assets	
Home	$1,000,000	Equities	$1,500,000	Family Business	$40,000,000
Mortgage on Primary Residence	$0	Intermediate- and Long-Term Fixed Income	$1,500,000	Investment Real Estate	$5,000,000
Cash/Short-Term Treasury Bonds and Notes	$1,000,000				
Total	$2,000,000	Total	$3,000,000	Total	$45,000,000

1 Using a goal-based planning framework (i.e., personal, market, and aspirational risk buckets), identify and highlight the significant risk(s) that Garcia is currently facing.

Garcia agreed with Wharton that the current asset allocation seemed very aggressive for someone his age and that it might be time to make some changes. Garcia then asked Wharton what he felt the next step should be in terms of helping to decide whether selling or monetizing his business might make sense.

2 Using a goal-based planning framework, describe the initial step that Wharton should work through with Garcia to help determine whether selling or monetizing his business might make sense.

After carefully considering Garcia's lifetime spending needs, Garcia and Wharton determined that a primary capital requirement of $35 million should be more than sufficient to sustain Garcia's current lifestyle with very little or no risk of running out of capital during his lifetime, even after considering such potential factors as severe market shocks, tax rate increases, inflation, and an unexpectedly

long life span. Later in the reading, after providing the tool set for addressing the problem of obtaining the needed primary capital amount, we will return to Garcia's needs in Example 6.

3 Explain how this knowledge—that the sale or monetization should meet Garcia's $35 million primary capital requirement—should be helpful to Garcia in making a decision as to whether to sell or monetize his business.

Solution to 1:

Garcia currently has 90% ($45 million out of the $50 million) of his wealth allocated to a family-run business and commercial real estate, which falls in his high-risk/high-return aspirational risk bucket. That level would qualify as excessive risk taking for someone over 60 years old, especially now that Garcia's son is no longer interested in taking over the business.

Solution to 2:

Wharton should work very carefully with Garcia to determine his lifetime spending needs. They should establish how much capital it would take today to know that Garcia's spending needs would be satisfied throughout Garcia's lifetime with little or no chance of Garcia running out of money. Put another way, they need to ascertain how much capital would need to be allocated to Garcia's personal and market risk buckets (his primary capital requirement).

Solution to 3:

This knowledge is important because Garcia now understands that the sale or monetization of his business should generate sufficient after-tax proceeds to allocate to his personal and market risk buckets to cover his lifetime spending needs and desires. Put another way, Garcia now knows that the sale or monetization of his business can enable him to achieve financial independence as he has defined it.

3.6 Asset Location and Wealth Transfers

The implications of **asset location** (what type of account an asset is held within) for the holders of concentrated positions should be considered. In most tax regimes, a security's asset class usually determines its tax profile when held in taxable accounts. For instance, interest income on fixed-income securities is often taxed differently from long-term capital gains on stocks.[5] However, the account structure can override the normal tax treatment. Therefore, a relationship exists between deciding what assets to own and in which accounts they should be held. The choice of where to place specific assets is often referred to as the *asset location decision*. It is distinct from the asset allocation decision. The tax regime governing the investor ultimately determines the relative importance of asset location. The concept of asset location and gifting strategies can often be used together to minimize transfer taxes with respect to concentrated positions.

A second tool for addressing concentrated positions is wealth transfers. Undertaking wealth transfer planning *early* in the ownership life of a concentrated position often enables the owner to shift future wealth with little or no transfer tax consequences. Which methods will work depends on the tax regime of the country the owner is subject to, the owner's age and family circumstances, whether he or she is charitably inclined, and whether the planning takes place before or after some value has accumulated.

5 Stephen M. Horan and Thomas R. Robinson, "Taxes and Private Wealth Management in a Global Context," Reading 11 of 2013 CFA Program Level III Curriculum.

Advisers who are able to work with clients *before* the concentrated position has appreciated greatly in value can have the most impact. At this point in time, the simplest strategies, such as direct gifts to family members, direct gifts to long-term trusts, and estate freeze strategies, typically add the most value. With the passage of time, after there has been some run-up in the concentrated position's value, wealth transfer tools tend to be less efficient, more complex, and more costly to implement—which underscores the importance of addressing this subject with the owners of concentrated positions as early as possible.

In addition to direct gifting, a valuable concept in wealth transfer planning is that of an early ownership transfer of an estate, or **estate tax freeze**. Here the goal is to transfer *future* appreciation to the next generation at little or no gift or estate tax cost. An estate tax freeze is a plan usually involving a corporation, partnership, or limited liability company in which the owners transfer a junior equity interest to the children that will receive most or all of the future appreciation of the enterprise. Any gift or wealth transfer tax is based on the current market value of the interest transferred; future appreciation of the equity position transferred will not be subject to gift or transfer tax. Estate tax freezes were initially used by closely held family businesses but were later expanded to include other concentrated positions, including publicly traded stocks and real estate.

The classic corporate estate tax freeze involves recapitalizing a closely held family-owned corporation. The older generation, who owns all of the stock of the corporation, exchanges their existing company stock for two newly issued classes of stock. One class is voting preferred; the other is non-voting common. The non-voting common stock is gifted to the next generation. The transaction is structured so that the value of the voting preferred shares is equal to the value of 100% of the corporation. In addition, the value of the preferred stock should not appreciate greatly because those shares pay a fixed rate and resemble a bond. Therefore, the common stock has only a nominal value and can be gifted to the next generation and trigger little or no gift tax. The future appreciation in the value of the corporation should benefit the common shareholders. None of the appreciation is subject to gift or estate tax until the common shares are passed by gift or bequest to the next generation. The parents retain control because all the voting power is held in the preferred shares. The United States, Canada, and Australia, among others, allow some form of a corporate estate tax freeze. Note that although not all jurisdictions allow corporate estate tax freezes, it is the concept that is important, and other techniques have been developed that accomplish the same objectives as the corporate estate tax freeze.

EXAMPLE 3

A Corporate Estate Tax Freeze

John and Barbara Wilson live in a country that imposes a current gift tax of 40% on the transfer of any property directly (or indirectly through trusts) from parents to children that exceeds $10 million during their lifetimes. The Wilsons have already used the $10 million exemption by making prior gifts to their children. The Wilsons own a business currently worth $10 million, but they believe the business is poised for explosive growth that will begin shortly. Their children are already involved with the business. The Wilsons eventually want to pass control of the business to their children, but at this point, they feel their children don't have the necessary experience to run the business, so the Wilsons would like to retain control. However, they would like the growth

that is expected of the business to directly benefit their children, as contrasted with having that appreciation remain in their estate. Based only on the above information, address the following.

1. Would a direct gift of the company stock from the Wilsons to their children satisfy their objectives?
2. Would a direct gift of the company stock from the Wilsons to a trust set up for the benefit of their children satisfy their objectives?
3. Would a corporate estate tax freeze satisfy the Wilsons' objectives?

Solution to 1:

No. They would give up control of the company, which they don't want to do. Because they've already used their $10 million gift tax exemption, any further gifts would trigger an immediate 40% gift tax.

Solution to 2:

No, for roughly the same reasons stated in the Solution to 1. Although a trust could be set up such that voting control passes on to the children at a later date, a gift tax would still apply.

Solution to 3:

Yes. The Wilsons could recapitalize their company and keep new voting preferred stock (worth the current value of the company) and gift new non-voting common stock (with a current nominal value) to their children with little or zero gift tax due. The Wilsons retain control of the company, and all future appreciation of the company inures to the benefit of their children. Upon the Wilsons's retirement or death, the company can redeem their preferred shares and the common shares can be given voting rights.

Although the greatest opportunities for estate planning and wealth transfer occur before the concentrated position has significantly appreciated, there are techniques the owner can use *after* significant appreciation has occurred to minimize transfer taxes.

A common technique for gifting an interest in a concentrated position is to contribute the concentrated position to an entity such as a family limited partnership. For instance, the parents who own a concentrated position might contribute their concentrated position to a partnership in a manner that does not trigger a current taxable event. The parents retain the general partnership interest and therefore retain control of the partnership and the concentrated position within it. The parents gift the limited partnership interests to their children.

When a limited partnership interest is valued for transfer tax purposes, the value is typically less than a proportionate value of the assets held in the partnership. This discount arises because of two factors. First, there is a *lack of marketability*. Family limited partnership interests are typically restricted and are difficult, if not impossible, to sell outside the family; therefore, an unrelated buyer would very likely not be willing to pay the pro-rata value for the partnership interest. Second, because the general partner retains control, the limited partner's non-controlling *interest* is worth less because he has very little ability to influence management of the partnership and the underlying assets. Because of these two factors, the valuation of a limited partnership interest is often discounted from 10% to 40% of the value of the underlying assets. For instance, assuming a combined discount of 35%, a 20% interest in a $10 million concentrated position would be transferred at a gift tax valuation of $1.3 million (i.e., a 35% discount) instead of $2 million.

In addition to the gift tax savings at the time of transfer, substantial estate tax may be saved if the concentrated position appreciates further between the date of the gift and the date of the parent's death. In the above example, if the $10 million concentrated position appreciates to $30 million by the time the donor dies, the children will hold an interest worth $6 million but only $1.3 million will be subject to transfer taxes.

Finally, if the owner of the concentrated position is charitably inclined, there are a variety of gifting and asset location strategies that the owner might consider using to avoid triggering any tax (i.e., the capital gains tax on the appreciation), as well as any transfer taxes (i.e., gift and estate taxes).

3.7 Concentrated Wealth Decision Making: A Five-Step Process

Working with the owners of concentrated positions can be quite complex. The following five- step process, if applied systematically to each client holding a concentrated position, should help assure that services are delivered to each client using a uniform and consistent methodology with the result that each client should implement the plan of action or strategy that best satisfies their objectives given their particular circumstances.

Step 1 **Identify and establish objectives and constraints.** The objective (or combination of objectives) of the owner of the concentrated position should be identified, established, and put in written form. Constraints should be identified and their impact analyzed.

Step 2 **Identify tools/strategies that can satisfy these objectives.** All the tools and strategies that could be used to satisfy the owner's stated objectives subject to binding constraints need to be identified, while remembering that different techniques can often provide essentially the same economics.

Step 3 **Compare tax advantages and disadvantages.** The tax advantages and disadvantages of each tool/strategy should be compared.

Step 4 **Compare non-tax advantages and disadvantages.** The non-tax considerations of each alternative tool/strategy need to be thoroughly compared.

Step 5 **Formulate and document an overall strategy.** After weighing the tax and non-tax advantages and disadvantages of each alternative tool/strategy, the overall strategy that appears to best position the client to achieve his or her goals is selected.

These steps should be viewed as a dynamic process involving feedback loops so that when an element of the process or circumstance changes, the strategy may need to be adjusted.

4 MANAGING THE RISK OF CONCENTRATED SINGLE-STOCK POSITIONS

Diversification, one of the bedrock investment principles, seeks to balance risk and reward within a portfolio. A portfolio consisting of only a few stocks would not generally be considered prudent because of the risk from the concentrated position. The same reasoning applies to the holder of a concentrated position in a single stock.

To mitigate the risks of any concentrated position, be it publicly traded common stock, ownership of a private business, or ownership of real estate, there are several broad types of tools that can be used:

- Outright sale: Owners can sell the concentrated position, which gives them funds to spend or reinvest but often incurs significant tax liabilities.
- Monetization strategies: These provide owners with funds to spend or re-invest without triggering a taxable event. A loan against the value of a concentrated position is an example of a simple monetization strategy.
- Hedging the value of the concentrated asset: Derivatives are frequently used in such transactions.

Furthermore, a strategy can combine these elements. Exhibit 4 lists the tool set for managing single-stock positions. Selected tools will be discussed in more detail.

Exhibit 4 The Financial Tool Set for Managing a Single-Stock Position

I. Equity derivatives to hedge value:
- **A** Exchange-traded options (sometimes referred to as listed options)
- **B** Over-the-counter (OTC) derivatives
  - **1** Options
  - **2** Forwards
  - **3** Swaps

II. Borrowing to monetize the position:
- **A** Margin loans
- **B** Recourse and non-recourse debt[a]
- **C** Fixed- and floating-rate debt
- **D** Loans embedded within a derivative (e.g., a prepaid variable forward)

III. Other monetization:
- **A** Short sales against the box
- **B** Restricted stock sales
- **C** Public capital market–based transactions
  - **1** Debt exchangeable for common (DEC) offerings
- **D** Rule 10b5-1 plans and blind trusts (United States)
- **E** Exchange funds (United States)

[a] *Note*: Recourse with respect to a debt means there is a right to collect beyond what collateral provides in the event of default against the borrower or some other party.

Please note that the tool set listed above is specific to the United States; investors in other jurisdictions may or may not have access to all of these tools. It is also possible that tools other than those mentioned may be available in other jurisdictions.

4.1 Introduction to Key Tax Considerations

There are a variety of financial tools that investors can use to hedge to achieve a desired economic result. For instance, an investor can synthetically dispose of a stock by shorting the stock directly or, alternatively, by using options, swaps, forwards, or futures.

Although each produces the same economic result, they may not be taxed similarly. Although most tax regimes governing the taxation of financial instruments are comprehensive in nature, they are not always internally consistent.

In most jurisdictions, the basic tax rules applicable to financial products have developed over time in a somewhat piecemeal fashion. The usual process is that investors first innovate and create a new product and the tax authorities later respond. Financial engineers develop a product that begins to trade in the marketplace. Tax authorities soon realize there is no provision in the tax law that currently addresses this particular financial instrument, and they respond accordingly with a tax provision crafted to address this new product.

However, the drafters of such tax laws may not consider that investors might use several different tools to achieve the identical economic objective, so there could be significant differences in the tax treatment among these different tools because of the different provisions that govern them. This is certainly the case in the United States as well as for most other tax regimes.

If there is internal inconsistency of tax codes, there may be an opportunity for well-advised investors to reap substantial tax savings or reduce tax risk by selecting and implementing the *form* of a transaction that delivers the optimal economic and tax result.

4.2 Introduction to Key Non-Tax Considerations

There are certain considerations unrelated to taxation that investors and their advisers need to consider when deciding whether to use an exchange-traded instrument (i.e., options or futures) or an over-the-counter (OTC) derivative (i.e., forward sale or swap).

4.2.1 *Counterparty Credit Risk*

With respect to an OTC derivative, the investor incurs the credit risk of the single counterparty that he or she contracts with. With respect to exchange-traded instruments, because a clearinghouse (that is typically owned and jointly and severally backed by all its members) is the counterparty and guarantees the instrument, the investor incurs significantly less counterparty credit risk.

4.2.2 *Ability to Close Out Transaction Prior to Stated Expiration*

The investor can close out exchange-traded instruments prior to their stated maturity by acquiring exactly offsetting positions with any market participant. With respect to OTC derivatives, the investor can attempt to negotiate an early termination of a particular contract, but the counterparty can and usually does extract a concession in return for permitting early termination.

4.2.3 *Price Discovery*

By their very nature, exchange-traded instruments should achieve robust price discovery. In contrast, an OTC derivative is priced through negotiation with a single dealer, although fiduciaries and advisers should get bids from at least several dealers to ensure that reasonable price discovery has occurred. (Basic financial analysis of derivatives can independently provide a reasonableness benchmark for transaction prices.)

4.2.4 *Transparency of Fees*

Fees and expenses are more transparent in exchange-traded transactions. All commissions and fees must be identified on trade tickets, trade confirmations, and monthly statements. It is much easier for dealers to build their fees into OTC derivative transactions, especially such instruments as prepaid variable forwards, where the collar and loan are combined into a single instrument.

4.2.5 *Flexibility of Terms*

OTC derivatives give the investor maximum flexibility with respect to negotiating the key terms and conditions of any transaction. Exchange-traded instruments do not give investors the same degree of flexibility.

4.2.6 *Minimum Size Constraints*

Exchange-traded instruments typically have a smaller minimum than OTC derivatives. OTC derivatives have a minimum size that is typically around US$3 million.

4.3 Strategies

There are three primary strategies that investors use in the case of a concentrated position in a common stock:

- Equity monetization
- Hedging
- Yield enhancement

4.3.1 *Equity Monetization*

Investors holding a concentrated position can (1) hedge against a decline in the price of a stock, (2) defer the capital gains tax, and (3) generate liquidity (cash), which can be used to diversify, by implementing an equity monetization strategy.

Equity monetization generally refers to the transformation of a concentrated position into cash. Equity monetization usually refers to transactions that are designed to empower an investor to receive cash for their stock position through a manner other than an outright sale in a way that avoids triggering a current taxable event.

In addition to avoiding an immediate tax liability associated with an outright sale, there are other factors that might make the use of an equity monetization strategy attractive to a holder of a concentrated position, such as the following:

- The investor may be subject to a diverse array of securities law restrictions that are applicable to a sale of stock.
- The investor might own a large percentage of outstanding shares of the company and may not wish to cede control of the company or give the opportunity to another investor to acquire a large block of company shares.
- The investor may be subject to contractual provisions, such as an IPO lockup or an employment agreement or policy, that prohibit the sale of shares.

Equity monetization entails a two-step process:

- The *first step* is for the investor to remove a large portion of the risk inherent in the concentrated position. The process of hedging the concentrated stock position could be fraught with complex tax regulations. In the United States, for example, the IRS has been known to scrutinize hedging transactions closely, especially for ultra-high-net-worth individuals and families. Care should be taken in structuring the hedge such that the economic incentives (as well as disincentives) of holding the concentrated stock position are not, for practical purposes, eliminated.
- The *second step* is for the investor to borrow against the hedged position. In most instances, a high loan-to-value (LTV) ratio can be achieved because the stock position is hedged; the loan proceeds are then invested in a diversified portfolio of other investments.

4.3.1.1 Equity Monetization Tool Set The four basic tools an investor can use to establish a short position in a stock are[6]

- a short sale against the box,
- a total return equity swap,
- options (forward conversion), and
- a forward sale contract or single-stock futures contract.

For instance, assume an investor owns 1 million shares of ABC Corp. stock and ABC Corp. shares are currently trading at $100 per share, so the investor is long $100 million of ABC Corp. shares. To establish an exactly offsetting short position in ABC Corp. shares, the investor could use any of the four techniques mentioned above and described below.

A **short sale against the box** involves shorting a security that is held long. In our example, the investor could borrow 1 million shares of ABC Corp. stock from a broker/dealer and then sell those shares in the marketplace, thus establishing a $100 million short position in ABC Corp. stock.

Because the investor is simultaneously long and short the same number of shares of the same stock, any future change in the stock's price will have absolutely no effect on the investor's economic position. Likewise, any dividends or other distributions that are received on the long shares are passed through to the lender of the shares that were sold to open the short position.

Because the long and short positions together constitute a riskless position, the investor will earn a money market rate of return on the $100 million position. The investor has economically transformed the risky ABC Corp. stock position into a riskless asset that will earn a money market rate of return.

Because the short sale against the box creates a riskless (i.e., devoid of price risk) position, margin rules typically allow the investor to borrow with a high loan to value (LTV) ratio against the position. It is usually possible to borrow up to 99% of the value of the stock that is hedged, and there are usually no limitations on the use of the proceeds. The proceeds are typically invested in a portfolio of securities and other investments to achieve diversification. The net cost of borrowing through a short sale against the box is quite low because the interest income earned on the completely hedged stock position greatly offsets the interest expense associated with the margin loan.

The short sale against the box is the least expensive technique that is available to hedge, monetize, and potentially defer the capital gains tax on a concentrated position. It is the "paradigm" among all hedging and monetization strategies. The strategy is less costly than the other tools that enable investors to establish a synthetic short position in a stock (i.e., swaps, options, and forwards/futures, discussed below) because a derivative dealer need not be involved. That is, there are typically fewer dealer fees involved in a short sale against the box versus synthetic short sales.

A **total return equity swap** is a contract for a series of exchanges of the total return on a specified asset in return for specified fixed or floating payments.

In our example, the investor and a derivative dealer could agree to an exchange of cash flows based on a $100 million notional amount of ABC Corp. shares as follows:

- The investor agrees to pay the dealer any appreciation on her ABC shares plus any dividends and other distributions received on her shares.
- In return, the dealer agrees to pay the investor any loss in the value of the ABC shares plus one-month Libor (less a dealer spread).

6 Some of these tools may not be available in practice, depending on the jurisdiction.

Note the similarity to the short sale against the box. The investor is fully hedged and is earning a money market rate of return on the full value of the position. Because a derivative dealer is involved, the money market rate of return earned on the position would likely be slightly less than what would be earned on a short sale against the box position because of the larger dealer spread charged to implement the total return swap. Because the ABC Corp. stock position is completely hedged, monetization with a very high LTV ratio should be possible.

A **forward conversion with options** involves the construction of a synthetic short forward position against the asset held long. This strategy is based on the fact that the payoff of a short forward position is identical to the payoff of a long put and a short call on the same underlying asset.

In our example, the investor could buy ABC Corp. puts and sell ABC Corp. calls with the same strike price (i.e., $100) and the same termination date covering 1 million shares. By doing so, the investor has locked in a price of $100 no matter which way the stock moves. If the stock price goes to zero, the investor would exercise the puts, deliver her shares, and receive $100 from the dealer. If the stock price increased to $200, the calls would be exercised against the investor; she would deliver shares and receive $100 from the dealer.

Because the position created is riskless, a forward conversion should be priced in the marketplace to generate a money market rate of return for the investor. Because the ABC Corp. stock position is perfectly hedged, monetization with a very high LTV ratio should be possible.

An **equity forward sale contract** is a private contract for the forward sale of an equity position.

In our example, the investor could agree today to sell her ABC shares to a dealer three years from now. In return, the investor will receive the "forward price" from the dealer three years from now. A forward contract on an individual stock allows the investor to sell her stock at some future date at a guaranteed price (i.e., the forward price). If the market price is above the forward price at the termination of the contract, the investor will receive the forward price and will not participate in any market increase above that price.

Because the position created is riskless, a forward contract will generate a money market rate of return for the investor, which is reflected in the forward price. Because the ABC Corp. stock position is perfectly hedged, monetization with a very high LTV ratio should be possible.

To summarize, by using any of these four techniques, an owner of a concentrated position accomplishes the following:

- A riskless position is created by establishing a direct or synthetic short position covering the same amount of shares that she is long.
- A money market rate of return is generated on the full value of the long position.
- Borrowing against the hedged position with a very high LTV ratio is possible (it is similar to borrowing against a government bond).
- Borrowing is quite inexpensive because the income generated on the hedged position greatly offsets cost of borrowing.
- The borrowed proceeds can be invested in a diversified portfolio.

4.3.1.2 Tax Treatment of Equity Monetization Strategies Equity monetization strategies allow an investor to transfer the economic risk and reward of a stock position without transferring the legal and beneficial ownership of that asset. Put another way, equity monetization can eliminate concentration risk and generate about the same amount of cash that would be generated by an outright sale. The basic premise in most

tax regimes is that economic gains (including unrealized gains on a stock position) do *not* constitute "income" and are therefore *not* subject to tax unless and until they are "realized."[7]

Historically, the concept of capital gain realization has been tied to the "sale or disposition" of appreciated securities. In the case of monetization transactions, there has been no actual transaction in the appreciated securities themselves. That is, there is no formal legal "connection" between the monetization transaction and the appreciated securities. The investor still owns the securities and, if the securities are viewed in isolation, remains fully exposed to the risk of loss and opportunity for profit associated with the securities. The investor can assert that entering into a monetization arrangement does not, as a matter of legal form, constitute a sale or disposition of the appreciated securities.

The *critical question* is whether an equity monetization strategy will be treated as a taxable event for tax purposes in a particular country. If the tax regime treats the long and short (or synthetically short) position separately for tax purposes, tax on the appreciation of the long position will be deferred. Put more succinctly, if the tax authorities of a country respect legal form over economic substance, which is typically the case, equity monetization techniques should not trigger an immediate taxable event.

A comprehensive comparative tax analysis of how different countries' tax systems deal with equity monetization strategies is beyond the scope of this reading. However, it is important that advisers, irrespective of the country where their client is domiciled, know how to appropriately appraise equity monetization strategies. Exhibit 5 broadly classifies the various tax regimes that exist in the world today. No matter which tax regime is being examined, certain questions should be asked and a certain process followed as investors and their advisers seek to ensure that the strategy that is used is the most tax efficient. Along these lines, working with the client's tax adviser to answer the following questions should help in selecting the tool that minimizes the tax cost to the client.

1. When unwinding or cash settling the hedge, if there is a gain generated by the hedge, is it short term or long term in nature? Long-term gain is generally preferred in many jurisdictions.
2. When unwinding or cash settling the hedge, are potential losses generated by the hedge short term or long term in nature, and is it currently deductible or instead added to the tax cost basis of the shares being hedged? Short-term loss and currently deductible are generally preferred.
3. If the contract is physically settled by delivering shares, is the gain short term or long term in nature? Long-term gain is usually better.
4. Are the carrying costs associated with monetization (i.e., interest expense or the equivalent) currently deductible or instead added to the tax cost basis of the shares being hedged? Current deductibility is preferred.
5. Does the hedge in any way affect the taxation of dividends or distributions received on the shares? No impact is preferred.

7 Paul Hayward, "Monetization, Realization and Statutory Interpretation," *Canadian Tax Journal*, vol. 51, no. 5 (2003).

Exhibit 5 Classification of Income Tax Regimes

Regime	1. Common Progressive	2. Heavy Dividend Tax	3. Heavy Capital Gains Tax	4. Heavy Interest Tax	5. Light Capital Gains Tax	6. Flat and Light	7. Flat and Heavy
Ordinary Tax Rate Structure	Progressive	Progressive	Progressive	Progressive	Progressive	Flat	Flat
Interest Income	Some interest taxed at favorable rates or exempt	Some interest taxed at favorable rates or exempt	Some interest taxed at favorable rates or exempt	Taxed at ordinary rates	Taxed at ordinary rates	Some interest taxed at favorable rates or exempt	Some interest taxed at favorable rates or exempt
Dividends	Some dividends taxed at favorable rates or exempt	Taxed at ordinary rates	Some dividends taxed at favorable rates or exempt	Some dividends taxed at favorable rates or exempt	Taxed at ordinary rates	Some dividends taxed at favorable rates or exempt	Taxed at ordinary rates
Capital Gains	Some capital gains taxed favorably or exempt	Some capital gains taxed favor-ably or exempt	Taxed at ordinary rates	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Taxed at ordinary rates
Example Countries	Austria, Brazil, China, Czech Republic, Finland, France, Greece, Hong Kong, Hungary, Ireland, Italy, Japan, Latvia, Malaysia, Netherlands, Nigeria, Philippines, Poland, Portugal, Singapore, South Africa, Sweden, Thailand, United Kingdom, United States, Vietnam	Argentina, Indonesia, Israel, Venezuela	Colombia	Canada, Denmark, Germany, Luxembourg, Pakistan	Australia, Belgium, India, Kenya, Mexico, New Zealand, Norway, Spain, Switzerland, Taiwan, Turkey	Kazakhstan, Russia, Saudi Arabia (Zakat)	Ukraine

Sources: Stephen Horan and Thomas Robinson, "Taxes and Private Wealth Management in a Global Context" (CFA Institute, 2009). Classification based on information provided in International Business Guides from Deloitte Touche Tohmatsu (available at www.deloitte.com) and online database of worldwide taxation provided by PricewaterhouseCoopers (www.taxsummaries.pwc.com).

4.3.2 *Lock In Unrealized Gains: Hedging*

Hedging is a useful strategy when the holder of a concentrated position would like to protect against downside risk but would also like to capture either unlimited or a significant amount of potential upside with respect to the stock. There are two major hedging approaches investors can consider:

- Purchase of puts
- Cashless, or zero-premium, collar

4.3.2.1 Purchase of Puts Investors holding a concentrated position can purchase put options to (1) lock in a floor price, (2) retain unlimited upside potential, and (3) defer the capital gains tax.

Investors usually buy put options with a strike price that is either at or, more typically, slightly below the current price of the stock (that is, either "at-the-money" or slightly "out-of-the-money" puts). The investor pays an amount, referred to as the premium, to acquire the puts.

Conceptually, this is very similar to the payment of an insurance premium. In return, the investor is fully protected, subject to the credit risk of the counterparty, from any loss resulting from a decline of the stock price below the strike price of the put. The premium paid will vary depending on a number of factors, including the volatility of the stock, the strike price, and the maturity. The investor retains any dividends received and voting rights.

As an example, suppose an investor, Bill, owns shares of ABC Corp. that are currently trading at $100. ABC one-year put options with a strike price of $90 currently trade at $5, and Bill buys these puts. If the stock price has decreased below the $90 strike price at maturity, the puts can be exercised and Bill will deliver his long shares for $90 from the exercise of the puts. His total initial investment was $105—$100 in stock and $5 worth of puts. If ABC closes at or above $90 at expiration, the puts will expire worthless but Bill will have paid $5 for this "wasting" asset, which can be thought of as "term" insurance. The trade will make sense in retrospect only if the underlying stock price declines below $85 per share, assuming that no put was purchased.

The concept of combining a long stock position with a long put position is intuitively extremely appealing: downside protection with unlimited upside price participation. However, the out-of-pocket expenditure necessary to acquire puts can be significant. Therefore, investors often seek to lessen their out-of-pocket costs. Described below are a few ways for investors to accomplish this.

The most common way is to lower the strike price. An at-the-money put will cost considerably more than an out-of-the-money put. With an out-of-the-money put, the investor, in essence, "self-insures" down to the strike price. Of course, the lower the strike price, the greater the downside risk the holder retains.

Along similar lines, puts with a shorter maturity will cost less than puts with a longer maturity because the "term insurance" doesn't last very long.

Another popular strategy is to combine the purchase of put options with the sale of put options with a lower strike price and with the same maturity as the long puts, which is known as a "put spread." The idea is to lessen the cost of the long puts by selling puts to bring in some premium income in order to partially finance the purchase of the long puts. In this case, the investor will be protected from the strike price of the long put down to the strike price of the short put. However, below the strike price of the short put, the investor is fully exposed to further declines in the underlying stock price.

Another, less frequently used way to lessen the cost of put protection is to use a "knock-out" option. A knock-out put is an "exotic" option that can be acquired only through an over-the-counter dealer (i.e., these types of options are not traded on an exchange). This type of put is less expensive than a "plain vanilla" put because the

protection "knocks out" or disappears before its stated expiration if the stock price increases to a certain level. The rationale for using knock-out puts is that once the stock price increases to a certain level, the downside protection of the put is no longer necessary. Such exotic options can be implemented only for fairly large positions (i.e., there is a high minimum size requirement among the OTC dealers).

However, by far the most common way for stockholders to reduce the out-of-pocket expenditure necessary to achieve the desired downside protection is to enter into a cashless, or zero-premium, collar, which is discussed in the next section.

4.3.2.2 Cashless (Zero-Premium) Collars Investors holding a concentrated position can implement what is commonly referred to as a cashless, or zero-premium, collar to (1) hedge against a decline in the price of a stock, (2) retain a certain degree of upside potential with respect to the stock, and (3) defer the capital gains tax while avoiding any out-of-pocket expenditure. The investor retains any dividend income and voting rights.

Cashless collars are a very popular tool that investors around the globe frequently use to hedge their concentrated positions.

When structuring cashless collars, investors buy puts with a strike price that is either at or, more typically, slightly below the current price of the stock. The investor must pay a premium to acquire the puts and in return is fully protected (subject to the credit risk of the counterparty) from any loss should the stock price fall below the strike price of the puts.

Simultaneously, the investors sell calls with the same maturity with a strike price that is above the current price of the stock and in return receives premium income. The strike price of the calls is set at the level that brings in exactly the amount required to pay for the puts. In other words, the sale of the calls fully finances the purchase of the puts.[8] Note that investment risk is reduced but not eliminated.

Therefore, although the investor forfeits some of the upside potential of the underlying stock (i.e., the amount the stock price is above the call strike at maturity), by using a cashless collar, no out-of-pocket expenditure is required, and this is perceived to be a huge advantage by most investors and their financial advisers.

Consider again the investor who owns shares of ABC Corp. that are currently trading at $100. As before, ABC one-year puts with a strike price of $90 currently trade at $5. Suppose now that ABC one-year calls with a strike price of $120 currently trade at $5. The investor simultaneously sells the calls and buys the puts, with the $5 premium received for selling the calls fully financing the $5 premium paid to acquire the puts; therefore, no out-of-pocket expenditure is required.

If the stock price has increased above the $120 strike price at maturity, the calls will be exercised. In this case, Bill could deliver his long shares and receive $120 ($120 from the exercise of the calls plus the $5 call premium received less the $5 put premium paid).

If ABC closes between $90 and $120 at expiration, both the puts and calls will expire worthless and Bill will have paid the $5 put premium and received the $5 call premium. If the stock price decreases below the $90 strike price at maturity, the puts will be exercised. In this case, Bill could deliver his long shares and receive $90 ($90 from the exercise of the puts plus $5 from the sale of the calls less the $5 cost of the puts).

8 When using exchange-traded put and call options to implement a collar, in almost all cases, there will be two contracts involved: one involving the puts and another involving the calls. The purchase and sale of the puts and calls, respectively, can be executed on an option exchange simultaneously pursuant to what is referred to as a "spread order"—that is, without concern that the investor buys the puts without selling the calls (and vice versa). Nonetheless, on almost all exchanges, there will be two separate contracts involved: one for the puts and one for the calls.

The concept of a cashless collar is very appealing to many investors and advisers. Nevertheless, investors often look for ways to increase the upside potential that is retained.

The most common way to accomplish this is to lower the strike price of the put. The lower the strike price, the lower the premium required to pay for the put. Therefore, a call with a higher strike price can be sold to finance the put purchase, resulting in greater upside potential. Of course, the lower the strike price of the put, the greater the downside risk the holder retains.

Another popular strategy is to combine a "put spread" (described above) with the sale of a call of the same maturity. The idea is to lessen the cost of the long put by selling a put to bring in some premium income to partially finance the purchase of the long put. This, in turn, allows a higher strike price call to be sold in order to fully finance the net cost of the put spread. The investor will be protected from the strike price of the long put down to the strike price of the short put. However, the investor is fully exposed to declines of the underlying stock below the strike price of the short put. In return for taking this risk, the investor will have more upside potential than with a plain vanilla cashless collar.

Along the same lines, investors sometimes pay a portion of the put premium "out of pocket," which is often referred to as a "debit" collar. It allows a higher strike price call to be sold in order to finance the net cost of the put.

4.3.2.3 Prepaid Variable Forwards A collar hedges the value of the concentrated position. The value of the concentrated position can concurrently be monetized by means of a margin loan. A prepaid variable forward (PVF) where the hedge and the margin loan are combined in one instrument achieves an identical economic result. The margin loan advanced to the client depends on the precise collar structure and its term. A PVF, in essence, is an agreement to sell a security at a specific time in the future with the number of shares to be delivered at maturity varying with the underlying share price at maturity. For example, an investor holding ABC Corp. shares currently trading at $100 might enter into a PVF requiring the dealer to pay the investor $88 up front in exchange for the right to receive a variable number of shares from the investor in three years pursuant to a preset formula that embodies the economics of a particular collar (e.g., a long put with a $95 strike and a short call with a $110 strike). The formula, in this case, would require the investor to deliver all its ABC Corp. shares if the price of ABC shares in three years is less than $95. If the price of ABC shares is greater than $95 but less than $110, the investor must deliver $95 worth of shares. If the price of ABC shares is above $110, the investor must deliver $95 worth of shares plus the value of the shares above $110.

Alternatively, a PVF can be cash settled. If the price of ABC shares is less than $95 three years from now, the investor will pay the dealer the then-current value of ABC shares in cash. If the price of ABC shares is between $95 and $110, the investor will pay the dealer $95 in cash. If the price of ABC shares is above $110, the investor will pay the dealer $95 plus the difference between the then-current price of ABC shares and $110. The investor could enter into another PVF to get the liquidity to satisfy its obligations under the original PVF. A PVF combines the economics of a collar and a borrowing against the underlying stock within a single instrument.

EXAMPLE 4

Hedging a Concentrated Position

Rachel LeMesurier recently retired from Denton Corp., where she experienced a long and successful tenure as a senior executive. During her 30-year career with Denton Corp., LeMesurier received a considerable portion of her compensation in the form of Denton Corp. shares. She currently owns 100,000 shares of Denton Corp. stock, which are currently trading at $40 per share.

LeMesurier has decided that she would like to hedge the risk of her $4 million position (= 100,000 shares × $40) in Denton stock. LeMesurier has been exploring various hedging alternatives with her financial adviser and feels that a cashless collar will give her the downside protection that she needs while still allowing her to participate to a certain extent should the price of Denton Corp. shares increase.

LeMesurier and her financial adviser know that there are two types of options: exchange traded and over the counter (OTC).

LeMesurier likes the transparency of exchange-traded options, as well as the fact that her counterparty will be a clearinghouse that is owned and guaranteed by all the exchange members as opposed to a single dealer, which means there is less counterparty risk when using exchange-traded options.

Currently, Denton Corp. one-year exchange-traded puts with a strike price of $36 are trading at a premium of $3 per share, and Denton Corp. one-year exchange-traded calls with a strike price of $48 are trading at a premium of $3 per share. Through her financial adviser, LeMesurier submits a spread order to simultaneously sell the calls and buy the puts covering her entire $4 million Denton Corp. stock position, with the $300,000 premium received for selling the calls fully financing the $300,000 premium required to purchase the puts.

The price of Denton Corp. shares traded in a range during most of the one-year period the collar was in place. On the expiration date of the collar, Denton Corp. shares closed at $42, and both the puts and calls expired worthless on that date.

In the country where LeMesurier is domiciled, like many other countries, the tax code does not treat all financial instruments that achieve the same economic result the same. The tax code in her country treats the call premium received on short calls as a current short-term capital gain whereas the premium paid to acquire puts is treated as a deferred long-term capital gain that merely increases the tax cost basis of the shares that were hedged.

1 Can this treatment result in a less-than-optimal tax result?

In the jurisdiction where LeMesurier is domiciled, OTC derivatives, including options, forwards, and swaps, are taxed more favorably than exchange-traded options. For instance, a forward contract or a swap could be used to achieve the same collar-like economics. By their very nature, the embedded call and put premiums are netted, and the economics of a long put/short call structure are built into a single contract, with the premiums automatically netted.

OTC options could also be used to implement a collar. Because the terms of such a collar are negotiated with a single dealer, the transaction could be structured and documented as a single contract, with the premiums effectively

netted out. The trade confirmation for either type of collar will not show the cost of the call and put separately but will instead show a net cost of zero. Most option exchanges do not yet allow collars to be structured as a single contract.

2 Could OTC derivatives deliver a potentially more tax-efficient result than exchange-traded options?

3 Would there have been a cost to LeMesurier if she decided to implement her collar with OTC derivatives in lieu of exchange-traded options?

Solution to 1:

Yes. Because LeMesurier used exchange-traded options, she faces an immediate taxable gain on the expired calls. More specifically, the $300,000 premium LeMesurier received on the sale of the calls will be taxable in the year the options expired as a short-term capital gain.

However, because the tax code does *not* permit LeMesurier to deduct the $300,000 premium paid to acquire the puts in the year the options expired, the put premium instead increases her tax cost basis in her Denton Corp. shares. Therefore, LeMesurier gets the tax benefit of her loss on the puts only when she sells those shares, and she has no plans to sell her Denton Corp. shares.

Solution to 2:

Yes. If LeMesurier had used a collar based on OTC derivatives documented as a single instrument in lieu of exchange-traded options, she could have achieved a more tax-efficient result. Instead of being currently taxed on $300,000 of short-term capital gains and having deferred long-term capital losses of $300,000, which was added to her tax cost basis, LeMesurier could have had no taxable event at all had she used an OTC derivative and documented the collar properly.

Solution to 3:

Yes, the cost to LeMesurier of using an OTC derivatives–based collar in lieu of exchange-traded options is that the non-tax advantages (e.g., lower counterparty risk, transparency in pricing) of exchange-traded options are forfeited. However, many investors in LeMesurier's situation feel this is a fair price to pay for the enhanced tax efficiency that an OTC derivative–based collar documented as a single instrument can deliver in certain jurisdictions.

4.3.2.4 Choosing the Best Hedging Strategy The tax characteristics of the shares or other instrument that is being hedged can help determine which strategy will deliver the optimal result for the client.

To illustrate, it is not unusual for employees to receive compensation in the form of either restricted company shares or various forms of employee options to acquire common shares of their employer in the future. Because these types of instruments are received as compensation for services rendered, tax regimes often tax these types of instruments differently from common shares that have been held as an investment asset for a long-term period by an investor. For instance, restricted shares and employee stock options are often treated in a manner similar to other forms of compensation income, such as salary and bonus. These types of "ordinary income" are often taxed at significantly higher rates than long-term capital gains income.

A key tax issue that arises when hedging restricted shares and employee stock options is the potential tax inefficiency that can result if the instrument being hedged and the tool that is being used to hedge it produce income and loss of a different character. This problem is called a **mismatch in character**.

For example, when an employee exercises employee stock options, any gains are typically treated like cash salary and bonus—that is, as ordinary income. In contrast, most derivative-based hedging tools give rise to capital gains or losses. Therefore, in some jurisdictions, the use of a derivative-based collar to hedge employee stock options can create the potential for ordinary income on one hand (i.e., the employee stock options) and capital losses on the other (i.e., the derivative-based hedge). That is, if the underlying stock continues to appreciate above the strike price of the employee stock option, the investor will have ordinary income on the stock option and a capital loss on the hedge. Unless the employee has capital gains from other sources, the loss may not be currently deductible because capital losses are generally deductible against capital gains, not against ordinary income.

EXAMPLE 5

Mismatch in Character

David Hawk, a senior executive at US-based Garner-Price Corp., receives a large portion of his compensation in the form of stock options. These options will be taxed as ordinary income upon their exercise. Hawk decides to hedge his employee stock options using an option-based collar. During the period the collar is in place, the employee stock options increased in value by $10 million above the strike price of the collar.

1. Taking no account of either potential tax implications or the net cost of the collar, has Hawk benefitted economically from this increase in value?
2. Explain the problem of "mismatch in character" in hedging.
3. Describe the mismatch in character that potentially affects Hawk.

Solution to 1:

Economically and taking no account of potential tax implications, Hawk has not benefited from this increase in value because the $10 million of additional income on his employee stock options is exactly offset by the $10 million loss on the collar.

Solution to 2:

A mismatch in character occurs when the gain or loss in the concentrated position and the offsetting loss or gain in hedge are subject to different tax treatments.

Solution to 3:

When the collar expires and Hawk exercises his employee stock options, he will have an additional $10 million of ordinary income and $10 million of capital losses from the collar, resulting in a mismatch in character between the employee stock option income (ordinary) and the losses on the hedge (capital). Unless he has sufficient capital gains, he won't be able to fully use those losses.

Therefore, while this option-based collar provided the desired economics (downside protection), it also resulted in $10 million of ordinary income in the current year with no offsetting deduction.

In Example 5, Hawk's strategy was subject to a mismatch in character that implied taxes would be payable at ordinary income rates. Is there a possible solution to this dilemma? That is, is it possible to avoid such a mismatch in character? The answer depends on the tax treatment of alternatives to the collar used. In the United States, Hawk could consider a swap that has the optionality of a collar embedded within it.

If the stock price rises above the embedded call strike, the investor will incur a loss on the swap. If the investor makes a payment to the dealer to terminate his obligation under the swap, depending on application of local tax law, the termination payment may or may not be treated as a deduction from ordinary income. With the appreciation of the employee stock options treated as ordinary income, if the loss on the swap is treated as a deduction from ordinary income, no mismatch in character would occur.

The key point is that the tax attributes and characteristics of the shares or other instrument that is being hedged can influence the decisions as to what hedging tool should be used and how the transaction should be documented.

4.3.3 *Yield Enhancement*

Investors can enhance the yield of a concentrated stock position while decreasing its volatility by writing covered calls against some or all of the shares.

Investors typically sell call options with a strike price that is above the current price of the stock and in return receive premium income. The amount of premium received will vary depending on a number of factors, including the volatility of the stock, the strike price, and the maturity. The investor retains any dividends received on the shares and voting rights.

The strategy effectively allows the investor to *establish a liquidation value* (the strike price) for the shares he or she writes call options against. However, the investor does retain full downside exposure to the shares (to the extent the stock price decreases by more than the premium received) and has capped the upside potential (the call strike price plus the premium received).

For example, suppose that Denton Corp. shares are currently trading at $100. Denton Corp.'s one-year call options with a strike price of $120 currently trade at $5, and Rachel LeMesurier sells these call options. If the stock price has increased above the $120 strike price at maturity, the calls will be exercised and LeMesurier will deliver her long shares. In that case, she will receive a total of $125: $120 upon the exercise of the calls and $5 from the initial sale of the calls. If Denton Corp. closes at or below $120 at expiration, the calls will expire worthless and LeMesurier will retain the $5 premium and the long shares. The end result is that LeMesurier is better off so long as the stock price at call expiration is below $125 (i.e., the strike price plus the call premium received).

Covered call writing is often viewed as attractive if the holder believes the stock will be stuck in a trading range for the foreseeable future. Covered call writing can be a good substitute for a structured selling program. Many financial advisers recommend that investors simply set multiple price targets today and sell a fixed number or percentage of their shares if and when the stock price reaches the previously established price targets. Essentially, the same economics can be achieved by entering into a covered call writing program (i.e., by selling call options with staggered maturities and strike prices), but the economics are considerably improved because the investor receives the call premium.

Perhaps the most significant benefit of implementing a covered call writing program, even if only on a portion of the concentrated position, is that it can *psychologically prepare the owner to dispose of those shares.*

4.3.4 *Other Tools: Tax-Optimized Equity Strategies*

Tax-optimized equity strategies seek to combine investment and tax considerations in making investment decisions. They start with the generic concept of tax efficiency and quantitatively incorporate dimensions of risk and return in the investment decision-making process. In the context of managing the risk of a concentrated stock position, these strategies are used in two primary ways: (1) as an index-tracking strategy with active tax management and (2) in the construction of completeness portfolios.

An index-tracking separately managed portfolio is funded by cash, from a partial sale of the investor's concentrated stock position, from the monetization proceeds derived from the hedged stock position, or a combination of any of these. The portfolio is quantitatively designed to track a broad-based market index (e.g., the S&P 500 Index) on a pre-tax basis, and outperform it on an after-tax basis. The goal from an investment-return perspective is not to perfectly replicate the benchmark but to track it closely. Furthermore, these strategies use opportunistic capital loss harvesting and gain deferral techniques that can be used by the holder of the concentrated stock position to sell a commensurate amount of stock without incurring any capital gains taxes.

In contrast, a completeness portfolio incorporates the risk characteristics of the concentrated stock position to build a portfolio such that the combination of the two portfolios tracks the broadly diversified market benchmark to the best extent possible. The completeness portfolio minimizes correlation with the concentrated stock by not including similar industry and sector bets. Capital loss harvesting in the completeness portfolio allows a concurrent sale of the concentrated stock position without a tax liability. Over time, the size of the concentrated stock position is whittled down to zero, whereas the completeness portfolio becomes an index-tracking one.

This strategy is certainly one way for an investor to diversify out of a concentrated position, but it does come with certain risks and costs.

First, and most importantly, this strategy is intended to be implemented over time, so the investor continues to retain the company-specific risk of the remaining, albeit a progressively diminishing, concentrated stock position.

Second, in a perfect world (that is, assuming the concentrated stock position does not decrease precipitously early on during this process and the index proxy manager performs well), the best possible result will be that the client moves from holding a single low-basis stock to holding a diversified portfolio of lower-basis (i.e., not current) stocks. Hence, when this diversified market portfolio needs to be liquidated, there could be a tax associated with it.

4.3.5 *Other Tools: Cross Hedging*

In certain circumstances, it may not be possible for an investor to directly hedge a position. For instance, the derivatives required to accomplish this task may not exist in the marketplace or may be prohibitively costly to execute or the securities laws may preclude an insider or affiliate from executing a hedging transaction. In such a case, the investor might wish to consider an indirect or **cross hedge** by using derivatives on a substitute asset with an expected high correlation with the investor's concentrated stock position.

After a careful analysis of a pool of securities with characteristics similar to the investor's stock position, a security or basket of securities could be selected that have the highest correlation with the investor's concentrated stock position. Another alternative would be to select a broad or targeted index that is investable to serve as the substitute asset.

By using a cross hedge, the investor is at least able to hedge market and industry risk. However, the investor retains all of the company-specific risk of the concentrated position.

Investors considering a cross hedge should probably limit themselves to purchasing puts on the proxy asset even though this will entail an out-of-pocket cost. If a cashless collar or short position is used, the investor is exposed to considerable risk should the concentrated stock position drop in value because of factors specific to that company while the proxy asset or index increases in value. In that case, if the proxy asset or index increases above the call strike or short-sale price, the investor is responsible for that amount when the stock position is down in value.

As always, all else being equal, the investor should use the derivative tool to implement the transaction that should deliver the desired economics in the most tax-efficient manner.

4.3.6 *Exchange Funds*

An exchange fund is an investment fund structured as a partnership in which the partners have each contributed their low-basis concentrated stock positions to the fund. Each partner (contributor to the fund) then owns a pro rata interest in the partnership potentially holding a diversified pool of securities. Participating in the exchange fund is not considered a taxable event; the partners' cost basis in the partnership units is identical to the cost basis of the contributed concentrated stock positions. For tax purposes, each partner must remain in the fund for a minimum of seven years, after which he or she has the option to redeem his or her interest in the partnership and receive a basket of securities at the discretion of the fund manager equal in value to the pro rata ownership of the partnership or continue his or her investment in the fund.

5 MANAGING THE RISK OF PRIVATE BUSINESS EQUITY

As Exhibit 1 depicted, although there is slight variation from region to region throughout the world, a high percentage of private clients derive their wealth from the ownership of a privately owned business. Indeed, owning or controlling a private company can be a very exciting and rewarding experience for its owners. However, as discussed previously, business owners are exposed to a significant degree of concentration risk and illiquidity. Furthermore, they often significantly underestimate the risks inherent in owning and managing their businesses and may overestimate the value of their businesses.

Before a discussion on the risk concentrations of owning a privately held business, it is important to note that sale or divestiture of that business can have many more motivations apart from risk management compared with someone who owns a concentrated stock position, for instance. Some of these other considerations might include the time and effort needed to manage the business, the potential or disposition of heirs to succeed the business owner, and a myriad of other human, emotional, and family issues. It is prudent for an adviser to be cognizant of these non-investment issues before educating the business owner of the risks of his or her concentration.

Business owners are often asset rich but relatively cash poor. That is, many private company owners have most of their personal net worth tied up in their businesses. The owners quite often would like to generate liquidity to diversify in other investments in order to reduce their concentration risk. But there is likely little or no liquidity among the existing shareholders, and in fact, there is likely a prohibition against selling shares to anyone other than the company or its existing shareholders.

As they age and approach retirement, many business owners come to appreciate the high risks they face in continuing to own and operate their businesses and realize they must soon sell or otherwise monetize their private business equity to fund their retirement lifestyles. In many cases, the owner's shares are likely to be highly appreciated versus their tax cost basis, and accessing meaningful liquidity can, and often does, trigger an immediate and sometimes significant taxable event. In addition, generating liquidity can, and often does, result in a loss of control or dilution of one's ownership stake. Exhibit 6 lists major tools for dealing with a concentrated business equity position.

Exhibit 6 The Financial Tool Set for Managing Private Business Equity

Strategies that are available to allow company owners to generate full or partial liquidity include

- Sale to third-party investor:
  - Strategic buyer
  - Financial buyer
  - Other investor
- Sale to insider:
  - Management (management buyout, or MBO)
  - Employees (employee stock ownership plan, or ESOP, in the United States)
  - Sale or transfer to next generation of family
- Recapitalization
- Divestiture of non-core assets (often real estate)
- Personal line of credit against company shares
- Initial public offering (IPO)

These strategies use different *sources of capital* that can include

- Senior debt
- Mezzanine debt (debt that is subordinate to other debt including senior debt)
- Equity

The conduciveness of the market for business sale and monetization transactions varies greatly over time. At any given point in time, many factors determine the attractiveness of the market from the seller's perspective, including

- Valuation level of target companies (at, above, or below historical norms)
- Tax rate applicable to a particular exit strategy
- Condition of the credit markets
- Level of interest rates
- Amount of buying power in the marketplace (strategic and financial buyers)
- Currency valuation

5.1 Profile of a Typical Business Owned by a Private Client

Most businesses owned and managed by private clients can be characterized as "middle-market" businesses. There is no universally accepted definition of the term "middle-market," but these are businesses that are privately owned and worth anywhere from $10 million to over $500 million.

The business often comprises the bulk of the owner's net worth. For instance, the private client might have a liquid portfolio of $3 million but own and manage a business that is worth $30 million. Real estate can often form a significant portion of the assets and value of the business. Alternatively, real estate may be held individually and leased to the business.

The business is typically the owner's primary source of income and a means to fulfill legacy and charitable objectives. It is also usually a source of pride and personal identity for the business owner.

5.2 Profile of a Typical Business Owner

It is very difficult to generalize regarding business owners, but there are some commonalities that are worth noting. The business and personal lives of business owners are usually entangled because of the demands of managing and operating the business. Family members and business partners are often involved. Long-term objectives can vary and often change quickly.

Owners often underestimate the risks inherent in running their businesses. There is also a tendency to overestimate the value of their enterprise. Often the business has been owned and managed by the family for many years or decades. The owner has probably received unsolicited inquiries from potential buyers in the past.

In many cases, a business owner may not have an exit plan in place. The owner may know little about the process that should be used in deciding whether, when, and how to sell, monetize, or otherwise transfer the business. Aging aside, an unforeseen event may trigger the owner into action. Such events can include

- an unsolicited inquiry or offer from a competitor,
- illness of the owner or a family member, or
- the realization that a son or daughter does not wish to work in the business.

5.3 Monetization Strategies for Business Owners

Most business owners and their financial advisers are not familiar with the range of strategies that can be used to monetize their private business equity. Rather, most incorrectly assume that it is a "sell or hold" decision. In addition, most believe it is a one-time decision. It is possible, by using certain techniques, to implement an exit plan that is staged or phased over time to generate liquidity in more than one event. Conditions in the capital markets and the merger and acquisition deal market will ultimately influence the attractiveness of these strategies, and these factors differ greatly over time.

5.3.1 *Sale to Strategic Buyers*

Strategic buyers are competitors or other companies involved in the same or a similar industry as the seller. Most strategic buyers tend to take a long-term view of their investments in other companies. Because of this fact, they will typically pay the highest price for a business because of potential revenue, cost, and other potential synergies.

Strategic buyers are usually quite active in the marketplace, executing "add-on" or "fill-in" acquisitions, many of which involve middle-market companies. Strategic buyers view these types of acquisitions as a low-risk way to enhance revenue and earnings growth and view them as especially attractive in a slow growth environment.

5.3.2 *Sale to Financial Buyers*

Private equity firms are often referred to as **financial buyers** or financial sponsors. Private equity firms typically raise funds from institutional investors which they manage within investment funds known as private equity funds. They are investment advisers. They make direct investments in mature and stable middle-market businesses. They look for companies that provide the opportunity for them to create significant value.

Private equity firms typically will not pay as high a price as a strategic buyer primarily because they do not have the same opportunity as strategic buyers to take advantage of financial and operational synergies. They target earning a high internal rate of return on their invested capital over a fairly short period of time, typically three to five years, at which time the company will ideally either be sold to a strategic buyer or go public. To achieve their return targets, private equity firms have to be careful to not overpay at the outset.

5.3.3 *Recapitalization*

A leveraged recapitalization is a strategy that is especially attractive to middle-market business owners who would like to reduce the risk of their wealth concentration and generate liquidity to diversify but who are not yet ready to exit entirely and have the desire to continue to grow their businesses.

A **leveraged recapitalization** is essentially a leveraging of a company's balance sheet, usually accomplished by working with a private equity firm. The private equity firm generally invests equity and provides or arranges debt with senior and mezzanine (subordinated) lenders.

The owner transfers a portion of her stock for cash and retains a minority ownership interest in the freshly capitalized entity. Doing so allows the owner to monetize a large portion of her business equity (typically 60–80%) and retain significant upside potential (20–40%) from that point forward. Because of the retained stake, the owner should remain highly motivated to grow the business.

From a tax perspective, the owner is typically taxed currently on the cash received. If structured properly, a tax deferral is achieved on the stock rolled over into the newly capitalized company. This strategy should be especially appealing to business owners who are considering cashing out in the near future and are domiciled in jurisdictions where tax rates are either scheduled to increase in the near future (such as Japan, at the time of writing) or viewed as likely to increase in the near future (such as the United States, at the time of writing).

The after-tax cash proceeds the investor receives could be deployed into other asset classes to help build a diversified portfolio.

A recapitalization is an example of a "staged" exit strategy in that it allows the owner to have two liquidity events, one up front and another typically within three to five years, when the private equity firm seeks to cash out its investment (which could be an IPO, a sale to a strategic or financial buyer, or another recapitalization). Because the owner is now partnering with a resource-rich private equity firm, the owner can focus on growing the business and will no longer have to personally guarantee bank debt. The owner does relinquish overall control of the company but may maintain day-to-day operating responsibility for the business and retains his or her title, salary, benefits, and reputation in the community as a successful entrepreneur.

Private equity firms are increasingly investing in middle-market companies. The recapitalization has become their vehicle of choice for doing so. For all these reasons, recapitalization is an attractive alternative to an outright sale to a third-party buyer.

5.3.4 *Sale to Management or Key Employees*

A group of senior managers or employees can acquire control of a business from the company owner through a management buyout (MBO).

For a sale to senior management or a group of key employees, the current owner knows the abilities of the key employees and the employees know the inner workings of the company. However, a serious risk is that these key employees may not, in fact, be successful entrepreneurs. That is, once the risk of owning and running the business is completely on their shoulders, they may not perform as hoped, and this is a huge uncertainty. For this reason, it is usually very difficult for senior managers and key employees to obtain financial backing from private equity firms and financial

institutions; therefore, they usually cannot raise sufficient funds to make a serious cash offer. In most instances, the amount offered by management/employees rarely matches the sum offered by a third party if a third party is bidding.

As a result, in management buyout situations, the owner is often asked to finance a substantial amount of the purchase price in the form of a promissory note with a significant portion of the purchase price therefore deferred and sometimes contingent on the financial performance of the company. The negotiations often end when the owner sees the mix of consideration offered by the employees, typically a very low cash component and a large promissory note, and realizes the considerable risk he or she would be taking by selling to management/employees with unknown entrepreneurial capabilities and then acting as creditor to them.

Another important consideration is that because the owner is negotiating with people who work for him or her, a failed attempt to do an MBO has the potential to negatively affect the dynamics of the employer–employee relationship.

As a general rule of thumb, unless the owner has accumulated sufficient investable assets outside the business to sustain his or her desired lifestyle after the sale of the business, an owner should probably sell to key management/employees only if the pricing, terms, and conditions of their purchase offer matches or exceeds that of a third-party buyer.

5.3.5 *Divestiture (Sale or Disposition of Non-Core Assets)*

If a business owner is not yet ready to retire and wishes to continue to run the business but would like to generate some liquidity now in order to diversify, the owner may wish to sell or dispose of non-core assets. Non-core assets can be broadly defined as those that are not essential to the continued operation or growth of the company. This process is often referred to as a divestiture.

For instance, a company may be considering the possibility of exiting a certain line of business or closing a division that does not fit in with the future growth plans of the company, yet this business line or division may have value to a competitor. As another example, a company may hold real estate used for company operations that has a greater value in an alternative use. For example, agricultural real estate located near population centers may have a greater value when developed as residential or commercial property than in continued agricultural use.

5.3.6 *Sale or Gift to Family Member or Next Generation*

Private company owners can sell or transfer their business, usually through a combination of tax-advantaged gifting strategies, to a family member or members who are typically actively involved in the business.

Family members may not have the necessary capital to buy the business. It is difficult for family members to obtain the financial backing of private equity firms or financial institutions for the same reasons senior management has difficulty obtaining financing to implement an MBO. Family members usually cannot raise sufficient funds to make an acceptable cash offer. If a sale does occur, the owner may carry a significant portion (sometimes all) of the purchase price in the form of a promissory note.

Gifting strategies are often used to transfer ownership to the next generation. However, unless the owner has accumulated sufficient investable assets outside the business to sustain his or her desired lifestyle without regard to the business, gifting might not be feasible.

5.3.7 *Personal Line of Credit Secured by Company Shares*

The owner might consider arranging a personal loan secured by his or her shares in the private company. This option is usually completely overlooked, yet it can be an attractive alternative to the other strategies.

One of the key benefits is that this type of borrowing should not cause an immediate taxable event to the company or the owner if structured properly. This technique basically uses corporate debt capacity (assuming it is available) to avoid a taxable stock sale or dividend.

The transaction is usually structured with a "put" arrangement back to the company to make the lender comfortable. The company can support this put obligation either through its existing credit arrangement or with a standby letter of credit issued for this specific purpose.

The exercise of the put to the company as a source of repayment of the loan would likely be considered a taxable event to the business owner. Also, at some point the debt will need to be repaid.

In the interim, the owner maintains full ownership and control of the company, has access to cash to diversify his or her concentration risk, and avoids triggering a taxable event. In addition, in most jurisdictions, the interest expense paid on the loan proceeds should be currently deductible for tax purposes.

5.3.8 *Going Public through an Initial Public Offering*

An initial public offering (IPO) is possible if the company is in an industry deemed attractive by investors and has a history of steady and significant growth.

The costs associated with going public are significant, although the pricing received in numerous instances more than offsets these costs. Importantly, the privacy and authority that many private business owners find attractive and have come to take for granted are eliminated. The owner will be the CEO and an employee of a publicly traded company and will be subject to significant scrutiny. Any and all decisions are open for the investment community to question. The necessity and pressure to meet short-term quarterly revenue and earnings expectations of the investment community cannot be overstated.

As a general rule, if the owner's objective is to exit from the company in the near term, an IPO is not a viable exit strategy. Rather, an IPO should be viewed as a financing tool that can be used to grow and take the company to a new level, assuming the owner wishes to remain actively involved in the company at least for the foreseeable future.

5.3.9 *Employee Stock Ownership Plan*

In some countries, legislation has been enacted that makes it attractive for a business owner to sell some or all of his or her company shares to certain types of pension plans.

For instance, in the United States, an employee stock ownership plan (ESOP) is a qualified retirement plan (i.e., a form of pension plan) that can be created by the company and is allowed to buy some or all of the owner's shares of company stock.

In a version known as a leveraged ESOP, if the company has borrowing capacity, the ESOP borrows funds (typically from a bank) to finance the purchase of the owner's shares.

US tax rules permit the deferral of the capital gains tax for a sale of stock to an ESOP, which can be an attractive benefit to the owner. However, this deferral benefit is available only to the shareholders of "Subchapter C" corporations, the details of which are beyond the scope of this reading.

The tax deferral benefit, combined with a possible step-up in basis at death (i.e., the elimination of tax on the capital gains), can make this strategy quite compelling for the owners of a Subchapter C corporation.

An ESOP is another example of a staged or phased exit strategy in that the company owner does not have to sell all of his or her shares to the ESOP. By using an ESOP, the owner can partially diversify his or her holdings, in a tax-advantaged manner, and diversify while retaining control of the company and maintaining upside potential in the retained shares.

Despite several potential disadvantages, including setup and maintenance costs, the strategy of selling shares to an ESOP, where it is a feasible strategy, can be attractive.

5.4 Considerations in Evaluating Different Strategies

In evaluating different strategies, the objective should be to maximize the after-tax proceeds that are available to the business owner to re-invest as opposed to simply maximizing the sales price. Astute transactional tax planning and structuring is extremely important and can result in significant tax savings for the owner.

The strategies described above may result in different values for the company that is being sold or monetized. The sale of private business equity differs from the sale of shares of publicly traded stock, where the shares trade on an established stock exchange and there are ready buyers and sellers. Rather, a market needs to be created for private business equity, and the potential buyers discussed above may place different values on the business and different equity interests therein. Therefore, the most important factor determining the amount that the business owner will receive after monetizing the business is the strategy that is ultimately used. As stated previously, a strategic buyer will typically pay the highest amount for a business.

The bulk of the consideration received by the business owner pursuant to a sale or monetization transaction is typically paid up front, but it is not uncommon for a portion of the purchase price, sometimes a significant portion, to be deferred or even to be contingent upon the occurrence of certain future events. For instance, the seller might lend the buyer a portion of the purchase price. Another example is when the seller and buyer agree to bridge the gap between what they each feel the company is worth by using an "earn-out." With respect to an earn-out, the payout is based on the company meeting or exceeding certain milestones, such as revenue or earnings targets. If the targets are met, the seller receives the post-closing payment (which may have been held in escrow). Therefore, when considering the "sale price," one must consider how much is paid up front in cash (or stock) and how much is deferred or contingent (and how likely it is that it will actually be received). As indicated, after-tax amounts are relevant to decision making. Example 6 builds on Example 2.

EXAMPLE 6

A Business Owner and the Concentrated-Position Decision-Making Process (2)

Recall that Fred Garcia had been persuaded by his financial advisor, Bill Wharton, that a sale to a strategic buyer or a recapitalization would satisfy his primary capital requirement of $35 million. Wharton then introduced Garcia to an investment banking firm to explore all exit strategies. The following facts were established:

- The government in Garcia's country is expected to increase the tax rate on capital gains, effective the following year.
- Garcia wants to spend more time with his family.
- Garcia is very attached to his identity as CEO of an aircraft business.
- Garcia believes that if his company had a capital infusion, his company would be positioned to triple its earnings within several years.

The financial data are shown from Exhibit 3, repeated here.

Exhibit 3 Wealth Distribution Shown in Risk Buckets (repeated)

"Personal" Risk 4% Protective Assets		"Market" Risk 6% Market Assets		"Aspirational" Risk 90% Aspirational Assets	
Home	$1,000,000	Equities	$1,500,000	Family Business	$40,000,000
Mortgage on Primary Residence	$0	Intermediate- and Long-Term Fixed Income	$1,500,000	Investment Real Estate	$5,000,000
Cash/Short-Term Treasury Bonds and Notes	$1,000,000				
Total	$2,000,000	Total	$3,000,000	Total	$45,000,000

1 Discuss which factors favor a sale to a strategic buyer and which factors favor a recapitalization.

Suppose that Garcia decides on a recapitalization. Garcia receives 80% of the value of the company in cash from a private equity firm, taxed at the current 15% capital gains tax rate. Investment real estate is included in the transaction. Assume that $10 million of proceeds are added to Garcia's personal risk bucket and the remaining balance of proceeds is added to his market risk bucket. The private equity firm shares Garcia's optimism about the potential growth of the company and is ready to extend debt financing to it on favorable terms.

2 A Calculate the (after-tax) amount monetized by the recapitalization and the value of his stake in the business immediately after recapitalization.

B Explain the meaning of primary capital in this context. Evaluate whether the amount monetized, combined with his existing portfolio, meets Garcia's requirement for $35 million in core capital. Justify your answer.

3 Describe a likely management objective of the recapitalized company.

Solution to 1:

These facts favor a sale to a strategic buyer:

- In a sale, Garcia would be relieved of the day-to-day pressure of owning and running the business and therefore have more time to spend with his family.
- A sale to a strategic buyer would generally realize the highest current proceeds. A sale now would avoid the expected higher tax rate.

These facts favor a recapitalization:

- Garcia would retain his highly valued identity as CEO of his firm.
- A recapitalization could raise capital that would allow the expansion to realize a major increase in earnings and value of the company within a relatively short time frame.

Solutions to 2:

A Sales price × Percent of equity sold × (1 – Tax rate) = $45 million × 0.80 × (1 – 0.15) = $30.6 million, which is the amount monetized. The value of Garcia's 20% stake is $9 million before any possible valuation discounts for the lack of control or limited marketability of the shares.

B Primary capital is the sum of the personal risk bucket and the market risk bucket. Yes, the recapitalization will meet Garcia's primary capital needs. The personal risk bucket becomes $2 million + $10 million = $12 million. That leaves $30.6 million − $10 million = $20.6 million. The market risk bucket is $3 million + $20.6 million = $23.6 million. Primary capital is $12 million + $23.6 million = $35.6 million. Exhibit 7 diagrams the allocation of Garcia's wealth after the recapitalization with some assumed asset allocations of the invested proceeds.

Exhibit 7

"Personal" Risk 27% Protective Assets		"Market" Risk 53% Market Assets		"Aspirational" Risk 20% Aspirational Assets	
Home	$1,000,000	Equities	$6,000,000	20% Interest in Recapitalized Business	$9,000,000
Mortgage on Primary Residence	$0	Intermediate- and Long-Term Fixed Income	$6,000,000		
Inflation Indexed Treasury bonds	$5,000,000	Alternative Investments	$11,600,000		
Cash/Short-Term Treasury Bonds and Notes	$6,000,000				
Total	$12,000,000	Total	$23,600,000	Total	$9,000,000

Note how Garcia's risk allocations have changed: 27% to personal risk, 53% to market risk, and only 20% to aspirational risk based on the new after-tax portfolio value of $44.6 million. Note also, however, that Garcia's net worth on paper has declined 10.8%, from $50.0 million to $44.6 million, as a result of gains realization and portfolio realignment decisions.

Solution to 3:

With the capital the private equity firm may add through a debt infusion, if growth expectations are realized, the private equity firm may seek to exit from its investment by either going public or selling out to a strategic buyer several years down the road. This second exit could be very profitable for Garcia.

EXAMPLE 7

Short Sale against the Box

Sam Smith, age 73, is the founder and 100% owner of ScreenTime, Inc., a technology company. The investment banker of Peak Products, Inc., a publicly traded competitor, has approached Smith with a two-pronged offer to buy. Smith engages the investment banker, Beverly Capital (BC), to evaluate Peak's offer. Other pertinent facts are as follows:

- One offer is $300 million, all cash, for all of Smith's shares.
- A second offer is $350 million in Peak shares in exchange for all of Smith's shares, with no cash consideration.
- The capital gains tax rate is 25%.
- BC advises that, as structured, the second offer qualifies as a tax-free stock swap (i.e., a type of business sale transaction that does *not* trigger an immediate taxable event). The tax cost basis that Smith has in ScreenTime shares, essentially zero, would become his tax cost basis in Peak shares transferred to the Peak shares.
- Although referred to as a tax-free stock swap, the actual result is a deferral of the capital gains tax. That is, a taxable gain would occur if and when Smith sold his Peak shares.
- Smith is domiciled in a country where the current tax regime allows for a stepped-up basis in shares held at the time of the investor's death. That is, upon Smith's death, the Peak shares received by Smith's estate or beneficiaries would receive a tax cost basis equal to fair market value on the date of Smith's death. Thus, at death, accrued gains permanently escape income taxation.
- Smith is unwilling to bear the risk of holding Peak shares. Suppose that if Smith accepts a tax-free stock swap, he is able to sell the Peak shares short against the box. He would realize 99% of the value of the Peak shares with no limitations on the use of proceeds. The after-tax cost to access the proceeds would be locked in at 30 bps per year. Smith would be able to keep the position in place indefinitely.

1. Discuss the implication of Smith's unwillingness to bear the risk of the Peak shares.
2. Determine the value of the all-cash offer.
3. Determine the value of the tax-free stock swap offer with immediate sale of the Peak shares.
4. Determine the value of the tax-free stock swap offer with a short sale against the box.
5. Recommend a strategy to Smith.

Solution to 1:

The implication is that Smith needs to consider the all-cash offer, the tax-free stock swap offer with immediate sale of Peak shares, or the tax-free stock swap offer along with a long-term hedging strategy to remove the risk of Peak shares.

Solution to 2:

The all-cash offer is worth $300 million × (1 − 0.25) = $225 million.

Solution to 3:

The tax-free stock swap offer with immediate sale of Peak shares is worth $350 million × (1 − 0.25) = $262.5 million (assuming the block of stock can be sold without any adverse price impact and ignoring the cost to sell the Peak shares).

Solution to 4:

This strategy monetizes 0.99 × $350 million = $346.5 million at a cost of 0.0030 × $346.5 million = $1.04 million per year.

Solution to 5:

The tax-free stock swap offer in exchange with short selling against the box realizes the greatest value for Smith. The 25% capital gains tax will be indefinitely deferred, and if the shares are held until death, the capital gains tax will be eliminated because the Peak shares will receive a step-up in basis upon Smith's death. At that point, Smith's estate could close the short position, and no tax would be due. With Smith well into his 70s, the present value of the step-up in basis should be fairly high.

6 MANAGING THE RISK OF INVESTMENT REAL ESTATE

Real estate can constitute a significant portion of the value of a business. It can also be held as a stand-alone investment. Real estate can also constitute a significant portion of a private client's net worth.

Real estate owners are often exposed to a significant degree of concentration risk and illiquidity. In addition, real estate owners may underestimate those risks and overestimate the value of their properties.

Real estate owners may want to generate liquidity to diversify and reduce their concentration risk. Especially as they age and approach retirement, real estate owners may better recognize the risks inherent in owning real estate and the benefits of selling or otherwise monetizing their property to fund their retirement.

The owner's property is likely to have been held for a long period and to be highly appreciated versus its original tax cost basis. Accessing meaningful liquidity may trigger recognition of a tax liability.

Various forms of debt and equity financing are the primary capital markets tools that investors use to facilitate monetization events involving their real estate investments. Mortgage financing can be recourse or non-recourse and can be either fixed rate or floating rate. The conduciveness of the market for investment real estate sale and monetization transactions varies over time. At any given time, numerous factors determine the attractiveness of the market from the seller's perspective including the following:

- Current valuation of real estate relative to historical levels and future expectations
- Tax rate applicable to a particular property and transaction
- Condition of the credit markets and lending conditions
- Level of interest rates

6.1 Monetization Strategies for Real Estate Owners

As for private businesses, the strategies that real estate owners can use to monetize their properties include exit plans that are staged or phased to generate liquidity in more than one event. Real estate monetization decisions should never be motivated solely for tax reasons. The business or investment rationale for the transaction needs to make sense. If it does, then the next step is to explore the most tax-efficient execution.

6.1.1 *Mortgage Financing*

Besides an outright sale, which is the most common strategy, the use of mortgage financing is the next most common technique investors use to lower concentration in a particular property and generate liquidity to diversify asset portfolios without triggering a taxable event.

Consider an investor who owns a high-quality, income-producing property with a fair market value of $10 million. Suppose that the property has a tax cost basis close to zero. An outright sale of the property, given a capital gains tax rate of 25%, would result in the investor receiving $7.5 million in after-tax proceeds from the sale. The investor would have no further benefit if the property increased in value in the future.

As an alternative to an outright sale, the owner might obtain a fixed-rate mortgage against the property. He could seek to set the LTV (loan to value) ratio at the point where the net rental income generated from the property equaled the fixed mortgage payment (composed of interest expense and amortization of the loan principal). Assuming this cash flow–neutral LTV ratio is 75%, the investor could monetize $7.5 million of the real estate's value with no limitations on the use of the loan proceeds. The proceeds could be invested in a liquid, diversified portfolio of securities. The loan proceeds will not be taxed because they are not "income" for tax purposes. In addition, the net rental income derived from the property exactly covers the cost of servicing the debt and other expenses of the property, so the net income from the real estate is zero. Therefore, there are no income tax consequences from the transaction. If the value of the real estate increases over time, the investor will be able to borrow more against the property without triggering a taxable event.

If the investor is able to structure the borrowing as a *non-recourse loan* (meaning that the lender's only recourse upon an event of default is to look to the property that was mortgaged to the lender), the investor has economically acquired the equivalent of a put issued by the lender with a strike price of $7.5 million that has been 100% monetized, thereby reducing her concentration risk in the property.

Borrowing against appreciated, income-producing real estate, especially on a non-recourse basis, can be an attractive technique to effectively "realize" unrealized real estate gains. In lieu of selling the asset outright to realize the gain and trigger an immediate taxable event, the owner can often borrow against the property to access the same or a similar amount of proceeds that a sale would have generated but without paying any tax—and often with a net cost of carry close to zero—while capturing 100% of any increase in the property's value.

6.1.2 *Real Estate Monetization for the Charitably Inclined*

The implications of asset location for taxable investors can be significant. Asset location is not a concept that is applicable only to securities. Rather, asset location is important for concentrated positions, including real estate. For instance, financial advisers serve many clients who are charitably inclined, and there are many tools and techniques that can be used under different tax regimes to achieve their philanthropic goals that involve asset location.

In the United States, if a client would like to build a significant endowment fund over the next few years and allow the assets to grow tax free until grants are made, the use of a **donor-advised fund** (DAF) can deliver a very attractive result. For example,

suppose an investor owns a rental property that is worth $2 million. The investor wants to endow a named professorship at the university from which he graduated several years ago. The amount needed to fund the professorship is $3 million. Especially if the investor believes that the property's growth prospects are less compelling than those of some other asset classes (e.g., publicly traded securities), the investor might decide to contribute the property directly to a DAF. If the property is then sold by the DAF to be invested in those more promising investments, there will not be an immediate taxable event. The appreciation forever escapes taxation. Nor are the accumulated depreciation deductions taken by the investor ever "recaptured." Therefore, the full $2 million would be available to invest and manage. Importantly, those proceeds grow tax free because the DAF qualifies as a charitable organization. In addition, the investor would qualify for an immediate $2 million charitable contribution deduction with a potential value of $700,000, given an applicable 35% income tax rate.[9] When the target of $3 million is reached, the DAF could then fund the professorship at his alma mater.

Similarly, in most common law jurisdictions, a tax-exempt charitable trust would achieve the same purpose as a DAF. The trust would have a defined and charitable purpose, the contributor would receive a tax deduction from the donation to trust, and the trust would not be taxed on property sale proceeds or investment income emanating from the property.

6.1.3 *Sale and Leaseback*

A **sale and leaseback** is a transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rental rate and lease term that is acceptable to the new owner and on financial terms that are consistent with the marketplace. In a typical transaction, a corporation will sell its real estate asset(s) to another party, which could be a real estate investment trust (REIT) or an institutional or private investor, and then lease the property back at a rental rate based on current market conditions.

The primary goal of a sale and leaseback is to raise capital or free up the owner's equity (that is invested in the property) for other uses while retaining use of the facility. When credit markets tighten (as they did throughout the world in 2008), sale and leasebacks may still be available for raising capital for business owners who are occupants of office buildings, manufacturing facilities, and industrial warehouse facilities.

The potential benefits of a sale and leaseback include the following:

1. It provides a source of capital to distribute to shareholders.
2. It provides 100% of the value of the asset compared with traditional mortgage debt financing, which rarely exceeds 75% unless the tenant is investment grade from a credit perspective. However, a taxable event is triggered and the after-tax proceeds will be less than 100% unless the company has a capital loss that can shield the gain from taxation.
3. The owner can redeploy the capital into the core focus of the business, and doing so may yield greater returns than would be generated by real estate investment.
4. Any debt that was associated with the real estate is removed from the balance sheet.
5. There is typically complete rental payment deductibility for tax purposes, meaning that rental payments under a sale and leaseback structure are typically 100% deductible against the company's taxable income, versus only the interest expense component of a mortgage payment. Sale and leasebacks have flexible lease terms—usually 10–20 years with built-in renewal options.

9 Any unused deduction can be carried forward for an additional five years.

In sum, for individuals who wish to monetize their real estate assets to fund a liquidity event for shareholders, to invest the capital in their core business, or to use it for other strategic purposes, a sale and leaseback can be an attractive financing alternative to traditional lending sources.

6.1.4 *Other Real Estate Monetization Techniques*

There are many real estate monetization techniques that are available but are outside the scope of this reading, including joint ventures, condominium structures, and sales of buildings with the seller retaining control through a long-term ground lease. In the United States, it is possible to implement what is referred to as a "monetizing tax-free exchange," which effectively allows a holder of an appreciated property to hedge, monetize, and defer and eventually eliminate the capital gains tax.[10]

EXAMPLE 8

Refinancing or Sale Leaseback?

Albert Lee is the owner of a medium-size business and is seeking to raise capital to facilitate the growth of the business. Lee wishes to either (1) sell and leaseback or (2) refinance his free and clear warehouse to raise capital. The warehouse is worth $5 million. Assume the following facts:

- By refinancing, Lee can achieve an LTV ratio of 75% and raise $3.75 million. By using a sale and leaseback, Lee can raise, on a pre-tax basis, 100% of the value of the warehouse, or $5 million.
- The warehouse is owned by Lee, not by the business, and is not key to the success of the business.
- Lee has $5.0 million of capital losses to carry forward, resulting in a deferred tax asset of $1.5 million related to capital loss carryforwards.
- The capital gains tax rate is 25%.

State and justify two reasons in favor of a sale and leaseback (to the corporation) rather than a refinancing.

Solution:

(1) Lee can realize $1.25 million more through a sale and leaseback. (2) The warehouse is not a key business asset.

If Lee refinances the warehouse, he can deduct the interest expense and defer the payment of any taxes. However, the maximum amount he can raise is $3.75 million = $5 million × (1 − 0.25). If the sale and leaseback is used, without any capital loss carryforwards, Lee would monetize $3.75 million, but he would also have to pay the capital gains tax. However, the $1.5 million in capital loss carryforwards could be used to fully offset the 25% capital gains tax of $1.25 million. Thus, a sale and leaseback would realize $5 million. Note that with a sale and leaseback, Lee can deduct the annual lease payment. If the warehouse was a key business asset, that would be a point in favor of refinancing, which would leave Lee with full ownership and control over the property. However, that is stated not to be the case.

10 In the United States, a variation of the traditional 1031 tax-free exchange, a "*monetizing* 1031 exchange," can be attractive for investors who wish to hedge, monetize, and defer and possibly eliminate the capital gains tax on their real estate investment.

SUMMARY

Much of the wealth owned by private clients throughout the world is held in the form of concentrated single-asset positions (concentrated positions), which include concentrated positions in publicly traded stock, privately owned businesses, and investment real estate.

- Owners of concentrated positions can face significant investment risks, including systematic, company-specific, and property-specific risk. Concentrated positions are also typically illiquid.
- There are three primary objectives that concentrated position owners should address. The first is to reduce the risk of wealth concentration by diversifying asset holdings. The second is to generate sufficient liquidity within a portfolio to meet current and future spending needs. The third is to optimize tax efficiency.
- Investors face many constraints when managing a concentrated position, including the income tax consequences of an outright sale, the inherent illiquidity of concentrated positions, and psychological considerations, such as the existence of any cognitive or behavioral biases.
- The concept of asset location and gifting strategies can often be used together to minimize transfer taxes for concentrated positions. Advisers able to work with clients *before* the concentrated position has appreciated greatly in value can have the most impact. With the passage of time, after there has been some increase in the concentrated position's value, wealth transfer tools, while still useful, tend to be less efficient, more complex, and more costly to implement, which underscores the importance of planning the management of an owner's concentrated positions as early as possible.
- There are often several economically equivalent ways to hedge or monetize a concentrated single-stock position. Because tax regimes governing the taxation of financial instruments differ, the tax results might be disparate. Investors can reap substantial tax savings or reduce tax risk by selecting and implementing the *form* of a transaction that delivers the optimal tax result.
- When hedging a concentrated single-stock position, investors can use either exchange-traded instruments (i.e., options or futures) or over-the-counter (OTC) derivatives (i.e., options, forward sales, or swaps). Each has its own advantages and disadvantages.
- Equity monetization refers to the transformation of a concentrated stock position into cash. Equity monetization usually refers to transactions designed to generate cash through a manner other than an outright sale in a way that avoids triggering a current taxable event.
- Equity monetization entails a two-step process. The first step is to remove most of the risk of the concentrated position. That is, the investor establishes a nearly riskless position in the stock. The second step is for the investor to borrow against the hedged position. In most instances, a high loan-to-value (LTV) ratio is achieved because the stock position is hedged and the loan proceeds are then invested in a diversified portfolio of other investments.
- The four basic equity monetization tools are (1) short sales against the box, (2) total return equity swaps, (3) forward conversion with options, and (4) forward sale contracts or single-stock futures contracts.
- Most tax regimes respect the legal form of a transaction over economic substance, and therefore, equity monetization techniques, if structured properly, do not typically trigger an immediate taxable event.

- Investors who wish to hedge their concentrated single positions but want to retain some upside potential can consider the use of long puts and cashless collars.
- The economics of a collar can be achieved through a variety of derivative tools, including exchange-traded options, OTC options, forwards, and swaps. Because these tools may be taxed differently, the investor should use the tool that delivers the most tax-efficient result, which often involves avoiding a mismatch in character.
- Business owners may be asset rich but cash poor because many private company owners have most of their personal net worth tied up in their businesses. The owners often want to generate liquidity to diversify into other investments in order to reduce their concentration risk, but there is typically little or no liquidity among the existing shareholder base.
- The common assumption of business and real estate owners that the monetization decision is a "sell or hold" decision and a "once and done" decision is not correct; exit plans can be staged or phased over time to generate liquidity in more than one event.
- Different business monetization strategies often result in different values for the company that is being sold or monetized. Strategic buyers may place higher values on the business compared with financial buyers. Selling to employees is also a possibility, although usually the seller will have to finance a portion of the sale price.
- In business and real estate sale and monetization transactions, the objective should be to maximize the after-tax proceeds that are available to re-invest.
- In a leveraged recapitalization, a business owner partners with a private equity firm and transfers his or her stock for cash and a minority ownership interest in a freshly capitalized entity. The owner monetizes a large portion of his or her business equity (typically 60–80%) and retains significant ownership (20–40%) from that point forward. Because of the retained stake, the owner should remain highly motivated to grow the business.
- Borrowing against appreciated, income-producing real estate, especially on a non-recourse basis, can be an attractive technique to effectively "realize" unrealized real estate gains. In lieu of selling the asset outright to realize the gain and trigger an immediate taxable event, the owner can often borrow against the property to access a large fraction of the proceeds that a sale would have generated but without paying any tax. However, with borrowing, the investor still bears the economic risk of the underlying property.

PRACTICE PROBLEMS

John C. Hill, sole owner of JCH Equipment Leasing Co. (JCH), is evaluating a future sale of his company and approaches Mary Keller, a wealth adviser, for advice. Three discussions from their most recent meeting are shown in Exhibit 1.

Exhibit 1 Selected Discussions from Hill–Keller Meeting

Discussion Number	Speaker	Discussion
1	Hill:	I would like to sell JCH in three to five years and use the proceeds to fund my retirement. Up to this point, I have reinvested the majority of the profits back into the business and have not accumulated any meaningful wealth outside the business.
	Keller:	The first thing we need to consider is the cyclical nature of the equipment leasing industry. Although the economy is expanding today, the stage of the business cycle three years from now is uncertain.
2	Hill:	I have several good employees, but I make all of the strategic operating decisions for the company. I take great pride in the stellar reputation of the company and have been reluctant to cede any meaningful control. I have started the process of looking for a person to assist with the day-to-day operations of the company.
	Keller:	Because you are the sole owner and chief operator of the business, you are exposed to the consequences of a negative corporate event that may result in essentially permanent losses in wealth.
3	Hill:	I believe the operating enterprise is worth $45 million. There is a good chance that a large acquirer would not want the real estate associated with it.
	Keller:	I am concerned about the rural location, size, tailored nature of the structure, and the old fuel tanks located behind the warehouse.

1 For each discussion, **identify** what type of investment risk is being discussed by Hill and Keller. **Justify** each choice. *Answer Question 1 in the Template provided below*.

© 2013 CFA Institute. All rights reserved.

Template for Question 1

Discussion	Investment Risk (circle one)	Justification
1	systematic non-systematic	
2	systematic non-systematic	
3	systematic non-systematic	

The following information relates to Questions 2–11

Hill refers his friend, Richard Morrison, the former CEO of Masury Bridge and Iron (MBI), to Keller to discuss his wealth goals. Keller meets with Morrison and gathers the following information:

- Richard Morrison is 50 years old and his spouse, Meredith, is 49 years old. Both are healthy and both expect to live at least an additional 40 years.
- The Morrisons have a 20-year-old son and would like to transfer 5% of their wealth to him during their lifetime.
- Richard Morrison retired two years ago and intends to spend his time serving on philanthropic boards; Meredith does not work.
- The Morrisons own 2 million shares of MBI, currently valued at $50 million, representing approximately 90% of their wealth.
- MBI is a large, publicly traded company, and the Morrisons' position equals approximately 1% of the total market capitalization.
- The Morrison family depends on dividends from MBI for their day-to-day living expenses.
- The cost basis of their MBI shares is close to zero, and the capital gains tax rate is 15%.

- Richard Morrison is loyal to MBI, follows the stock closely, believes he knows the company better than other investors, and expects the company to continue to be a good investment in the future just like it has been in the past.
- The Morrisons' *key objective* is to maintain their current standard of living during retirement.

2 **Identify** and **describe** *three* primary objectives Keller would typically discuss with clients in the Morrisons' position.

3 **State** and **discuss** *two* constraints on the Morrisons' ability to achieve their primary objectives using an outright sale of MBI shares.

4 **Explain** *three* emotional biases that may affect Richard Morrison's decision making.

Keller realizes that the Morrisons' decision making is influenced by psychological considerations and decides to use a goal-based planning approach. Keller constructs Exhibit 2 to simplify the discussion at their next scheduled meeting.

Exhibit 2 Morrison Family Wealth Distribution

Personal Risk Bucket	Market Risk Bucket	Aspirational Risk Bucket
3% of Assets	**7% of Assets**	**90% of Assets**
Home: $1,110,061 Cash/Short-term Investments: $556,606	Equities: $1,850,505 Fixed Income: $1,800,404 Commodity: $237,980	MBI Stock: $50,000,000
Total: $1,666,667	Total: $3,888,889	Total: $50,000,000

5 **Describe** Keller's use of goal-based planning to highlight the consequences of the Morrisons' selecting an asset allocation that is too risky.

6 **Determine** if the current wealth distribution is consistent with the Morrisons' stated key objective. **Justify** your response.

Keller tells the Morrisons:

> "Diversification is a bedrock investment principle, and there are several tools that can be used to mitigate the risk of a concentrated single stock position."

7 **Identify** and **describe** *three* tools Keller is referring to in the above statement.

Keller and Richard Morrison discuss several hedging techniques and Morrison makes the following statement:

> "I like the strategy that allows me to lock-in a floor price and retain unlimited upside potential."

8 **Identify** and **discuss** the hedging tool that Morrison is *most likely* referring to in the above statement.

9 **Explain** *one* drawback of this hedging strategy.

Keller also discusses a yield enhancement strategy and asks Morrison to establish a liquidation value at which he would be willing to sell 10% of his position in MBI.

10 **State** and **discuss** the tool Keller is *most likely* recommending to Morrison.

11 **Explain** *two* drawbacks to this strategy.

Keller and John C. Hill, the sole owner of JCH Equipment Leasing Co. (JCH), meet to further consider alternate strategies to achieve his objectives of selling JCH, diversifying his single asset concentration, minimizing taxes, and retiring within a 3–5 year time period. Hill believes that tax rates are likely to increase in the near future. In the course of a discussion with Hill, Keller recommends that Hill meet with a reputable "middle market" private equity firm to discuss a leveraged recapitalization strategy.

12 **Describe** a leveraged recapitalization strategy and **determine** if this strategy will accomplish Hill's objectives.

13 **Explain** *two* disadvantages to this exit plan.

SOLUTIONS

1

Template for Question 1

Discussion	Investment Risk (circle one)	Justification
1	systematic non-systematic	Discussion 1 best describes systematic risk. Systematic risk is the component of risk that cannot be eliminated by holding a well-diversified portfolio. Systematic risk includes macroeconomic factors such as unexpected changes in the level of real business activity and unexpected changes in the inflation rate. Given the cyclical nature of the equipment leasing business and 3 to 5 year target horizon to sell the company, Hill's concentrated position in JCH is exposed to systematic risk.
2	systematic non-systematic	Discussion 2 best describes non-systematic risk, or company-specific risk. This type of risk is specific to a particular company's operations, reputation, and business environment. Hill is the sole owner and chief operator of JCH (key person); therefore, his concentrated position exposes him to a decline in value of the company should he become unable to run the day-to-day operations. Such a negative corporate event may result in essentially permanent losses in wealth.
3	systematic non-systematic	Discussion 3 best describes non-systematic risk, or property-specific risk. It is the risk that the value of a particular property might fall in value because of an event that could affect that property, but not the broader real estate market.

2 The typical objectives Keller would discuss include reducing the risk of wealth concentration, generating liquidity to diversify and satisfy spending needs, and achieving the prior objectives in a tax-efficient manner.

3 Two constraints that may inhibit the Morrisons from achieving their primary objective are the tax consequences of a sale and the attachment of Mr. Morrison to his company as an investment. With a cost basis of nearly zero, an outright sale in the current year would result in the Morrisons incurring a capital gains tax of approximately $7.5 million.

4 A number of emotional biases can negatively affect the decision-making of holders of concentrated positions. Specifically, Richard Morrison's decision to diversify may be negatively affected by loyalty effects, overconfidence/familiarity, and status quo/naïve extrapolation of past returns. The facts indicate that Mr. Morrison is extremely loyal to MBI (loyalty effect); he believes he knows

the company better than other investors (overconfidence/familiarity); and he expects the company to continue to be a good investment as it has been in the past (status quo/naïve extrapolation of past returns).

5 Goal-based planning allows the adviser to incorporate psychological considerations into the asset allocation and portfolio construction process. This approach highlights the consequences of selecting an asset allocation that is riskier than is appropriate for a particular investor. A goals-based methodology extends the Markowitz framework of diversifying market risk by incorporating several notional "risk buckets." The first bucket is the *personal risk bucket*, which includes assets such as a personal residence, certificates of deposit, treasury securities, and other safe investments. The goal of this bucket is protection from poverty or a decrease in lifestyle. The second bucket is the *market risk bucket*, which includes assets such as stocks and bonds. The goal of this bucket is to maintain the current standard of living. The third bucket is the *aspirational risk bucket* and includes assets such as a privately owned business, commercial and investment real estate, and concentrated stock positions. The goal of this bucket is the opportunity to increase wealth substantially. This type of risk allocation framework would give Keller a basis to sit down with the Morrisons and identify the significant risk they face from their concentrated position and highlight that their allocations to the personal risk and market risk buckets are inadequate.

6 The Morrisons' current distribution of wealth is inconsistent with their stated objective of maintaining their current standard of living. The Morrison family portfolio has 90% of their wealth allocated to MBI stock, which falls into the high risk/high return aspirational risk bucket, and only 10% allocated to the personal risk and market risk buckets. A significantly greater allocation to the personal risk and market risk buckets combined with diversification of the single asset concentration (MBI) would be consistent with the stated goal of maintaining their current standard of living into retirement.

7 The three tools for addressing a concentrated position in a publicly traded common stock include outright sale, monetization, and hedging. With an outright sale, owners can sell the concentrated position, which gives them funds to meet a spending need or reinvest. An outright sale typically results in significant tax liabilities. Monetization strategies provide the owners with funds to spend or reinvest without triggering a taxable event. A loan against the value of a concentrated position is an example of a monetization strategy. The owner of a concentrated position can hedge the value of the concentrated position with derivatives. A long put position is an example of a hedge.

8 The hedging tool Morrison is most likely describing is a protective put position. The strategy is the combination of a long stock position and a long put position, which would provide downside protection (lock in a floor price) with unlimited upside participation. Morrison would buy put options equivalent to the number of shares to be hedged. The put options would have a strike price that is either at or, more typically, slightly below the current stock price. Morrison would pay an amount, referred to as the option premium, to acquire the puts. Conceptually, this is similar to the payment of an insurance premium. If the price of MBI falls below the strike price during the term of the option, the put option could be exercised at the strike price, providing downside protection. If the share price is above the strike price at maturity, Morrison would let the option expire and retain the upside.

A zero-premium collar would not accomplish Morrison's goal to lock in a floor price and retain unlimited upside potential. A cashless collar is established by buying puts and selling calls on the shares to be hedged. The long put protects

the owner of the shares from any loss below the strike price of the puts. However, the investor forfeits some of the upside potential of the underlying stock. Like a cashless collar, a prepaid variable forward (PVF) would not accomplish Morrison's goal. A PVF combines the economics of a collar and borrowing against the underlying stock within a single instrument.

9 There are two potential drawbacks with this hedging strategy. The strategy requires an out-of-pocket expenditure to purchase the put options, which can be significant depending on a number of factors, including the volatility of the stock, the strike price, and maturity. Another potential drawback is the credit risk of the counterparty. Counterparty risk is greater for an over-the-counter (OTC) derivative because the investor incurs the credit risk of a single counterparty. With respect to exchange-traded instruments, because a clearinghouse is the counterparty and guarantees the instrument, the investor incurs significantly less counterparty risk.

10 Keller is most likely recommending writing covered calls against 10% of Morrison's shares in MBI. Morrison would sell call options with a strike price that is above the current price of MBI and in return receive premium income (yield enhancement) from the sale of the call options. The strategy effectively allows the investor to establish a *liquidation value* (the strike price) for the shares he/she writes call options against. If the stock price increases above the strike price at maturity, the calls will be exercised and Morrison will deliver his long shares. He would receive a total sum equal to the strike price of the calls and the premium from the initial sale of the calls. If MBI closes at or below the strike price at expiration, the calls will expire worthless and Morrison will retain the option premium and the long shares. One of the most significant benefits of implementing a covered call writing program is that it can psychologically prepare the owner to dispose of his/her shares.

11 There are two potential drawbacks with this strategy: The investor retains full downside exposure to the shares (to the extent the share price decreases by more than the premium received), and the upside potential is limited (the call strike price plus the premium received).

12 A leveraged recapitalization is a strategy that involves retooling a company's balance sheet in partnership with a private equity firm. A recapitalization strategy is a "staged" exit strategy, which allows the owner to have two liquidity events, one up-front and a second typically within a 3 to 5 year timeframe, when the private equity firm cashes out of the investment. The private equity firm generally invests equity capital and arranges debt with senior or subordinated lenders. The owner transfers his/her stock for cash and an ownership interest in the newly capitalized entity. This allows the owner to monetize a significant portion of his/her business equity (typically 60% to 80%) and retain significant upside potential with the remaining ownership (typically 20% to 40%). The after-tax proceeds the investor receives could be deployed into other asset classes to help build a diversified portfolio. Additionally, the retained stake motivates the owner to grow the business.

From a tax perspective, the owner is taxed currently on the cash received and typically receives a tax deferral on the stock rolled over into the new entity. This strategy would be appealing to a business owner considering selling a private business in the near future and residing in a jurisdiction where tax rates are scheduled to increase.

A leveraged recapitalization strategy appears to be appropriate to meet Hill's objectives. The strategy would allow Hill to reduce the risk of his wealth concentration, generate liquidity to diversify his single asset concentration, minimize his tax liability before tax rates increase, and retire in a 3–5 year time period.

13 There are two potential disadvantages to employing a leveraged recapitalization strategy. Private equity firms are financial buyers and, as such, they typically will not pay as high a price as strategic buyers because they do not have the same opportunity as strategic buyers to take advantage of financial and operating synergies. A second potential disadvantage is that the owner relinquishes control of the company.

CUSTOMER SERVICE

68

READING

12

Risk Management for Individuals

by David M. Blanchett, PhD, CFP, CFA, David M. Cordell, PhD, CFP, CFA, Michael S. Finke, PhD, and Thomas Idzorek, CFA

David M. Blanchett, PhD, CFP, CFA, is at Morningstar Investment Management LLC (USA). David M. Cordell, PhD, CFP, CFA, is at the University of Texas at Dallas (USA). Michael S. Finke, PhD, is at The American College (USA). Thomas M. Idzorek, CFA, is at Morningstar (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** compare the characteristics of human capital and financial capital as components of an individual's total wealth;
☐	**b.** discuss the relationships among human capital, financial capital, and net wealth;
☐	**c.** discuss the financial stages of life for an individual;
☐	**d.** describe an economic (holistic) balance sheet;
☐	**e.** discuss risks (earnings, premature death, longevity, property, liability, and health risks) in relation to human and financial capital;
☐	**f.** describe types of insurance relevant to personal financial planning;
☐	**g.** describe the basic elements of a life insurance policy and how insurers price a life insurance policy;
☐	**h.** discuss the use of annuities in personal financial planning;
☐	**i.** discuss the relative advantages and disadvantages of fixed and variable annuities;
☐	**j.** analyze and critique an insurance program;
☐	**k.** discuss how asset allocation policy may be influenced by the risk characteristics of human capital;
☐	**l.** recommend and justify appropriate strategies for asset allocation and risk reduction when given an investor profile of key inputs.

© 2016 CFA Institute. All rights reserved.

1 INTRODUCTION

Risk management for individuals is a key element of life-cycle finance, which recognizes that as investors age, the fundamental nature of their total wealth evolves, as do the risks that they face. **Life-cycle finance** is concerned with helping investors achieve their goals, including an adequate retirement income, by taking a holistic view of the individual's financial situation as he or she moves through life. Individuals are exposed to a range of risks over their lives: They may become disabled, suffer a prolonged illness, die prematurely, or outlive their resources. In addition, from an investment perspective, the assets of individuals could decline in value or provide an inadequate return in relation to financial needs and aspirations. All of these risks have two things in common: They are typically random, and they can result in financial hardship without an appropriate risk management strategy. Risk management for individuals is distinct from risk management for corporations given the distinctive characteristics of households, which include the finite and unknown lifespan of individuals, the frequent preference for stable spending among individuals, and the desire to pass on wealth to heirs (i.e., through bequests). To protect against unexpected financial hardships, risks must be identified, market and non-market solutions considered, and a plan developed and implemented. A well-constructed plan for risk management will involve the selection of financial products and investment strategies that fit an individual's financial goals and mitigate the risk of shortfalls.

In this reading, we provide an overview of the potential risks to an individual or household, an analysis of products and strategies that can protect against some of these risks, and a discussion regarding the selection of an appropriate product or strategy. Following the introduction, Section 2 provides an overview of human and financial capital. Section 3 addresses the process of risk management, the financial stages of life for an individual, the economic (or holistic) balance sheet, and individual risks and risk exposures. Section 4 discusses the types of products relevant to financial planning, including insurance and annuities. Section 5 contains an insurance program case study and insights on implementing risk management solutions for individuals. Section 6 summarizes the key points of the reading.

2 HUMAN CAPITAL AND FINANCIAL CAPITAL

To better understand the financial health of an individual—and how to manage the risks faced by that individual—we can use an **economic balance sheet** (or **holistic balance sheet**). We discuss the economic balance sheet in more detail later in the reading, but it is important to note here that an individual's assets are made up of two primary components, **human capital** and **financial capital**, which present unique risk management challenges.

Ibbotson, Milevsky, Chen, and Zhu (2007) define human capital as the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Financial capital includes the tangible and intangible assets (outside of human capital) owned by an individual or household. For example, a

home, a car, stocks and bonds, a vested[1] retirement portfolio, and money in the bank are all examples of an individual's financial capital (or financial assets). In this section, both human capital and financial capital are explored in greater detail.

2.1 Human Capital

Advances in human capital theory have revolutionized how economists view the household risk management process. Conceptually, future wages or earnings can be thought of as analogous (in a rough sense) to future interest or dividend payments that flow from an individual's work-related skills, knowledge, experience, and other productive attributes that can be converted into wage income—or human capital. Because human capital provides a significant stream of income over decades, its present value is a significant part of most working households' total wealth portfolio. In fact, human capital is often the dominant asset on a household's economic balance sheet. From a risk management perspective, it is critical to understand the approximate total monetary value of an individual's human capital, the investment characteristics of the individual's human capital (i.e., whether the capital is more stock-like or bond-like), and how the approximate value of an individual's human capital relates to the value of the individual's financial capital. Here, we focus on estimating the approximate monetary value of an individual's human capital.

Given that future earnings for many workers are relatively stable over time, earnings can often be compared with the income one might receive from a bond. This analogy is useful because, similar to the way a financial analyst estimates the present value of a bond by discounting future cash flows, we can estimate human capital by discounting the expected future cash flows generated from wages or other income sources. Conceptually, individuals rent out or lease their human capital in the marketplace in exchange for an ongoing income that is a function of the state of the labor market. Some professions will receive a higher rental value (wage rate or salary) than others. Similarly, some professions will see their rental value fluctuate more with changes in the labor market environment.

Estimating the value of human capital is a complex process because the true value cannot be known. One simple approach is to use a discount rate that reflects the risk associated with the future cash flows (i.e., wages). Government employment and teaching are examples of professions that generally lead to relatively stable growth of future cash flows; in these cases, the human capital value would be estimated using a lower discount rate (to reflect the higher degree of certainty). Conversely, investment banking and racecar driving are examples of professions that may experience unstable and less secure future cash flows, so the value of human capital of investment bankers and racecar drivers would be based on a higher discount rate (to reflect the additional risk associated with their professions).

Equation 1 can be used to estimate the value of an individual's human capital today, at Time 0 (HC_0), where w_t is the income from employment in year t, r is the appropriate discount rate, and N is the length of working life in years. Working life

1 Vesting refers to ownership of retirement or pension benefits. Once benefits are vested, they belong to the beneficiary. Benefits that are not fully vested can be forfeited or reduced if the individual does not meet future conditions (e.g., if the individual terminates employment before the required number of years of service to the organization).

typically ends at retirement, although it could also be based on the number of years an individual can potentially work (e.g., a 70-year-old may be retired but still have some remaining human capital that could be traded for income in the labor market):

$$HC_0 = \sum_{t=1}^{N} \frac{w_t}{(1+r)^t} \tag{1}$$

This simple model in Equation 1 can be expanded using Equation 2, where we define the wage in time period t as a product of the wage in period $t - 1$ and the sum $(1 + g_t)$. That is, the wage in a given period is equal to the previous year's wage increased by g percent (the annual wage growth rate, in nominal terms). We can also modify the discount rate to be the sum of the nominal risk-free rate r_f and a risk adjustment y based on occupational income volatility. Similar to our example earlier contrasting the overall stability of labor income for government workers and teachers to that of investment bankers and racecar drivers, this adjustment recognizes the fact that the income from different professions can vary significantly. The risk adjustment should consider the inherent stability of the income stream as well as the possibility that the income stream will be interrupted by job loss, disability, or death that may be completely unrelated to the type of employment. Additionally, we incorporate mortality, where $p(s_t)$ is the probability of surviving to a given year (or age). Equation 1 uses a simplifying assumption that $p(s_t) = 1$ for each year until retirement (i.e., the individual will survive to retirement with certainty). Using these additional factors, Equation 2 can be restated as:

$$HC_0 = \sum_{t=1}^{N} \frac{p(s_t)w_{t-1}(1+g_t)}{(1+r_f+y)^t} \tag{2}$$

EXAMPLE 1

Estimating Human Capital

Identify the key assumptions required to estimate an individual's human capital.

Solution:

Human capital can be calculated by using the following formula:

$$HC_0 = \sum_{t=1}^{N} \frac{p(s_t)w_{t-1}(1+g_t)}{(1+r_f+y)^t}$$

where

$p(s_t)$ = the probability of surviving to year (or age) t
w_t = the income from employment in period t
g_t = the annual wage growth rate
r_f = the nominal risk-free rate
y = occupational income volatility
N = the length of working life in years

Estimating the Present Value of Human Capital

Using Equation 2, we briefly demonstrate how to estimate the present value of an individual's human capital. John Adam is 60 years old and plans on retiring in 5 years. Adam's annual wage is currently $50,000 and is expected to grow 2% per year. The risk-free rate is 4%. Adam works in a job with a moderate degree of occupational risk; therefore, we assume a risk adjustment based on occupational income volatility of 3%. There is a 99% probability that Adam survives the first year, a 98% probability that he survives the second year, and probabilities of 98%, 97%, and 96% for the following years, respectively. Given this information and using Equation 2, what is the present value of Adam's human capital?

Risk-free rate	= 4%
Income volatility adjustment	= 3%
Total discount rate	= 7%

Year	Wages (2% annual growth)	Present Value of Wages[a]	Probability of Survival	Probability Weighted Wages[b]
1	$51,000	$47,664	99%	$47,187
2	$52,020	$45,436	98%	$44,527
3	$53,060	$43,313	98%	$42,447
4	$54,122	$41,289	97%	$40,050
5	$55,204	$39,360	96%	$37,786
		Total value of human capital		**$211,997**

[a] This column illustrates "Wages" discounted by 7% as indicated by the discount rate shown. For example: $47,664 = $51,000/1.07; $45,436 = $52,020/$1.07^2$; and so on.
[b] The calculation for this column is as follows: $47,187 = $47,664 × 99%. A similar calculation is used for the following years.

How would the estimated value of Adam's human capital change if the wage growth rate were changed to 0%, the risk-free rate decreased to 2%, and the risk adjustment for occupational income volatility also decreased to 2% (using the same base wage and mortality estimates)?

Risk-free rate	= 2%
Income volatility adjustment	= 2%
Total discount rate	= 4%

Year	Wages (No Growth)	Present Value of Wages	Probability of Survival	Probability Weighted Wages
1	$50,000	$48,077	99%	$47,596
2	$50,000	$46,228	98%	$45,303
3	$50,000	$44,450	98%	$43,561
4	$50,000	$42,740	97%	$41,458
5	$50,000	$41,096	96%	$39,453

(continued)

Year	Wages (No Growth)	Present Value of Wages	Probability of Survival	Probability Weighted Wages
		Total value of human capital		**$217,371**

Reality is typically more complicated than models. Growth rates, nominal risk-free rates, risk adjustments, and mortality are not easily estimated. Additionally, wages do not tend to increase at a constant rate over an individual's lifetime, mortality and disability risk can reduce the value of human capital, and the average growth rate within occupations or even within the overall economy is unknown. In other words, the future payout on human capital, like the future payout on many financial assets, is uncertain. The potential loss of human capital, particularly early in the life cycle, represents an important risk that must be considered. Life and disability insurance, which we discuss later in the reading, are examples of financial instruments that can be used to protect against a random loss in household earnings. As human capital diminishes later in the life cycle, other risks that threaten financial capital and increase spending needs rise in importance. Accordingly, strategies that reduce investment risk and protect against long-term health care expenses and long-life spending needs increase in importance.

Viewing human capital as an asset with its own risk and return characteristics allows us to develop a holistic investment strategy that includes tangible and intangible assets. A total wealth perspective combines human capital with financial capital and incorporates the concept of life-cycle planning (also discussed later) to develop a strategy that maximizes household welfare.

2.2 Financial Capital

Financial capital can be subdivided into various components besides tangible and intangible, such as personal assets and investment assets. Investment assets can be further differentiated into many subtypes with distinctive marketability, tax, and standalone risk characteristics. The relationships between the value of the various components of an individual's financial capital and the value of his or her human capital are important in investment and risk management decision making.

The approach used in financial accounting provides an excellent template for classifying the different financial assets owned by an investor. In financial accounting, the balance sheet includes a summary of all the assets owned by an entity, whether an individual or organization, at a given point in time. Assets are defined broadly as either current or non-current. Current assets are expected to be consumed over the following year; money in a checking account, for example, would be considered a current asset. For an individual, non-current assets—that is, all assets not classified as current assets—include such items as automobiles, real estate, and investments (such as stocks and bonds). Non-current assets differ for a company because they include such items as property, plant, and equipment, as well as intangible assets, such as goodwill.[2]

The financial accounting approach to segmenting assets has important implications when assessing an individual's financial capital because different assets have different roles and each may be exposed to various types of risk. Broadly speaking, an individual's

2 Goodwill is defined as the amount by which the purchase price of an acquired company exceeds the value of the net assets acquired.

assets can be described as "personal" assets or "investment" assets; personal assets are consumed whereas investment assets are held for their potential to increase in value and fund future consumption. Some assets, such as real estate, can act as both a personal asset (shelter, as an alternative to renting) and an investment asset (to help fund retirement) for an individual.

EXAMPLE 2

Comparing Financial and Human Capital

Describe human capital and financial capital.

Solution:

Human capital is commonly defined as the mortality-weighted net present value of an individual's future expected labor income. Financial capital includes the tangible and intangible assets (outside of human capital) owned by an individual or household. For example, a home, a car, stocks, bonds, a vested retirement portfolio, and money in the bank are all examples of an individual's financial capital (or financial assets).

2.2.1 *Personal Assets*

Personal assets are assets an individual consumes (or uses) in some form in the course of his or her life. Such assets may include automobiles, clothes, furniture, and even a personal residence. In many cases, personal assets are not expected to appreciate in value, and they are often worth more to the individual than their current fair market value.

As mentioned earlier, some assets, like real estate, could be considered a "mixed" asset with both personal and investment characteristics. Another potential example of a mixed asset is collectibles (such as jewelry, wine, stamps, and artwork), which will be discussed separately in a later section. Mixed assets can be especially desirable because they enable individuals to derive satisfaction (i.e., utility) from their current value as well as having the potential to increase in value over time.

Classifying Private Accrued Defined Benefits and Government Retirement Benefits

When separating an individual's total wealth into human capital and financial capital, accrued defined benefits from private pension and government retirement plans—such as the Canada Pension Plan and Old Age Security Pension, the Age Pension in Australia, the mandatory state pension in Germany, and Social Security in the United States—can potentially be classified as either human capital or financial capital. Some practitioners note that accrued defined benefits and government pension benefits are typically a form of deferred labor income, and thus, they prefer to classify these benefits as human capital. Others find it more intuitive to think of accrued defined benefits and social security as a form of human capital that has been converted into a financial asset. In this reading, we classify accrued defined benefits and government pension benefits as components of financial capital.

2.2.2 *Investment Assets*

Investment assets are the components of an individual's wealth that are often the easiest to identify and typically receive the majority of the attention from financial planners and investment professionals. Investment assets extend beyond relatively tangible investment assets (such as a liquid portfolio) to include less tangible assets (such as an accrued defined benefit pension).

One criterion for subdividing investment assets is marketability, which describes how easy it is to trade an asset. We subdivide marketable assets into publicly traded and non-publicly traded segments, and we define non-marketable assets as those without any ready market (e.g., human capital).

Traditional portfolio construction generally focuses entirely on publicly traded marketable assets, like stocks and bonds, with optimization determining the weights allocated to marketable assets. This approach often ignores the existence of marketable assets that are not publicly traded as well as other non-marketable assets "owned" by the individual (e.g., human capital). In reality, each asset has important risk characteristics that should be considered. In the absence of a generalized framework that can estimate the risk and return of all of the components of an individual's total wealth and their correlations, one must understand the inherent risk and return characteristics of the non-marketable assets and make informed judgments when constructing a holistic portfolio. We will explore this concept more fully later in the reading.

2.2.3 *Publicly Traded Marketable Assets*

Traditional balance sheets tend to emphasize publicly traded marketable assets because their value and risk characteristics are generally easier to estimate than those of non-publicly traded assets. Publicly traded marketable assets include money market instruments, bonds, and common and preferred equity.

2.2.4 *Non-Publicly Traded Marketable Assets*

Non-publicly traded marketable assets include real estate, some types of annuities, cash-value life insurance, business assets, and collectibles.

2.2.4.1 Real Estate Real estate—or direct real estate, as it is sometimes called to distinguish it from real estate investment trusts (REITs)—is typically among the largest assets owned by an individual. In many countries, home ownership is common, although the level of home ownership varies materially by country. For example, in Germany, approximately half of households own a home, whereas in China, the number is closer to 90%. To purchase a home, many individuals obtain a mortgage loan. It is common for the home buyer to contribute some percentage of the home's value (e.g., 20%) as a down payment to mitigate some of the risk to the lender. The term of the mortgage loan can vary (e.g., 15 years, 30 years), as can the mortgage's interest rate (which can be either fixed or floating). Mortgage payments are often the largest fixed obligation of homeowners, especially during the early years of a mortgage loan. Mortgages present a unique risk for homeowners because they create a leveraged exposure in a home. For example, a 20% down payment (80% mortgage loan) implies that for any given change in the value of the home, the change in the equity (value less the mortgage loan) of the home will be five times greater than the change in the value of the home. Mortgage loans are either recourse or non-recourse, and the status varies by region. With recourse mortgages, if the borrower defaults on the mortgage, the lender has the right to recover from the borrower any amount due on the loan, whereas non-recourse loans prevent the lender from recovering any further amount from the borrower. Non-recourse loans are thus riskier for lenders because the only available collateral for the loan is the home. As a result, non-recourse loans generally have higher interest rates and/or higher borrower credit standards than recourse loans.

2.2.4.2 Annuities Annuities are effectively a private defined benefit pension for which an insurance company has guaranteed, or will guarantee, income for life or over some fixed period for the beneficiary (called the annuitant). The estimated balance sheet value of an annuity is comparable to that of a defined benefit pension with a discount for potential insolvency risk, which is difficult to eliminate through diversification or a market hedge. Annuities will be discussed in more detail later in the reading.

2.2.4.3 Cash-Value Life Insurance A variety of types of life insurance are available, including cash-value life insurance, for which the policy not only provides protection upon a death but also contains some type of cash reserve. This form of insurance usually combines life insurance protection with some type of cash accumulation vehicle. Some insurance policies allow the purchaser to invest in relatively aggressive investments, such as equities, although more conservative investments, such as bonds, are generally more common. Life insurance products will also be discussed at greater length later in the reading.

2.2.4.4 Business Assets Business assets can represent a significant portion of the total wealth of an individual, especially a self-employed individual. A variety of unique considerations are involved in investing for business owners because their total capital may be very closely tied to the overall performance of the business (i.e., if the business does poorly, it affects not only the value of the business, but also the owner's earnings as well). The value of business assets may best be estimated through recent sales of comparable private businesses within the same industry—often as a multiple of net income or net income with various adjustments (e.g., EBITDA). The value of business assets may vary based on market conditions and will often correlate with other financial assets within a household portfolio. This potential correlation is an important consideration in the risk management process for individuals, particularly small business owners.

2.2.4.5 Collectibles Collectibles include such items as stamps, paintings, wine, and precious metals (e.g., coins). The value of these assets is often set by auction markets or specialized dealers and involves substantial transaction costs. Collectibles may also provide a flow of utility for the owner. For example, in addition to benefiting from the potential price increase of a painting, the owner is able to display the painting in his or her home and view it daily.

2.2.5 *Non-Marketable Assets*

The most significant non-marketable financial assets are pensions, whether from a private employer or from a governmental organization. In this section, we consider both types of pensions.

2.2.5.1 Employer Pension Plans (Vested) There are a variety of retirement plan types across the globe. These accounts can generally be described as either employee-directed savings plans, in which contribution amounts and investments are controlled by the individual (and not guaranteed), or traditional pension plans, which guarantee some level of retirement benefits, typically based on past wages. We include only vested pension benefits as financial assets, because unvested pension benefits are typically contingent on future work and are thus considered to be part of human capital.

The value of a vested traditional defined benefit pension from an employer can be estimated by determining the mortality-weighted net present value of future benefits. The mortality-weighted net present value at Time 0 (now), $mNPV_0$, can be estimated using Equation 3, which is reasonably equivalent to Equation 1. Equation 3 is based on the future expected vested benefit (b_t), the probability of surviving until year t [$p(s_t)$],

and a discount rate (r). The discount rate should vary based on the relative riskiness of the future expected benefit payment—that is, the rate will be higher for riskier future benefit payments—and should reflect whether the benefit is in nominal or real terms:

$$mNPV_0 = \sum_{t=1}^{N} \frac{p(s_t)b_t}{(1+r)^t} \tag{3}$$

Estimating an appropriate discount rate to use in valuing a pension can be quite complex, although it is generally less complex than estimating the discount rate to use in valuing an individual's human capital. There are a number of factors to consider in determining the pension discount rate. As a starting point, one should consider the health of the plan (e.g., its funding status, where the value of the plan's liability is estimated using an appropriate market-based discount rate), the credit quality of the sponsoring company, and any additional credit support. If the company in question has long-term bonds, the yield on the bonds can provide a proxy for an appropriate discount rate. As one example of credit support, the Pension Protection Fund (PPF) was established in the United Kingdom as part of the Pensions Act 2004 to guarantee continued payment of most UK defined benefit pension plans should the employer become insolvent. The existence of PPF insurance helps to decrease the payout risk (and accompanying discount rate) for eligible UK pension plans.

2.2.5.2 Government Pensions Government pensions are similar to employer pension plans but are generally more secure (in those countries with a high degree of creditworthiness). As with employer pension plans, the vested or accrued benefit amount can be estimated by calculating the mortality-weighted net present value. Given the guaranteed nature of these benefits, government pensions can be considered relatively bond-like. For example, in the United States, retiree government pension benefits (called Social Security retirement benefits) can be thought of as a government bond with benefits indexed to inflation (because Social Security retirement benefits usually increase annually based on inflation). This inflation adjustment is consistent with securities called Treasury Inflation-Protected Securities (TIPS).

Regardless of the domicile, one should consider the financial health of the government entity sponsoring the defined benefit plan as well as the legal framework and any accompanying political risk at the country level.

2.2.6 *Account Type*

Financial capital is often held in account types that have different tax attributes. Although these account types (and the potential tax benefits surrounding them) vary materially by country, the accounts can generally be described as taxable, tax-deferred, or non-taxable. A taxable account is one for which taxes are due annually on the realized gains, dividends, and/or interest income. A tax-deferred account is one for which taxes on any gains are deferred until some future date, such as when a withdrawal is made from the account. A non-taxable account is one for which taxes are never due, no matter how much the account grows.

2.3 Net Wealth

An individual's *net worth* consists of the difference between traditional assets and liabilities that are reasonably simple to measure, such as investment assets, real estate, and mortgages. **Net wealth**, however, extends net worth to include claims to future assets that can be used for consumption, such as human capital and the present value of pension benefits. When we refer to net wealth in this reading, we refer to the more holistic accounting of resources that can be used to fund future consumption for the purpose of financial planning over the life cycle.

A FRAMEWORK FOR INDIVIDUAL RISK MANAGEMENT 3

This section contains an overview of the important considerations when developing an effective risk management plan for an individual. First, a risk management strategy for individuals is introduced. Next, the primary financial stages of the life of an individual are discussed. We then incorporate the human capital and financial capital concepts developed in Section 2 into an individual's economic (or holistic) balance sheet, explaining how key components of that balance sheet develop over time. Finally, we identify some of the primary risks to an individual and how they evolve during an individual's lifetime.

3.1 The Risk Management Strategy for Individuals

In general, *risk management* for individuals is the process of identifying threats to the value of household assets and developing an appropriate strategy for dealing with these risks. The risk management strategy provides a framework that allows a household to decide when to avoid, reduce, transfer, or self-insure those risks. There are typically four key steps in the risk management process:

1. Specify the objective.
2. Identify risks.
3. Evaluate risks and select appropriate methods to manage the risks.
4. Monitor outcomes and risk exposures and make appropriate adjustments in methods.

3.1.1 *Specify the Objective*

The overarching objective of individual risk management is to maximize household welfare through an appropriate balance of risk and safety. Risk represents a possible decrease in future spending caused by unexpected events, such as a market crash, a physical disability, the premature death of a primary earner, or health care expenses. As with investments, this objective is achieved by deciding how much risk a household is willing to bear in order to achieve its long-run spending goals.

3.1.2 *Identify Risks*

Households face a significant number of risks, including earnings, premature death, longevity, property, liability, and health risks. These risks will be discussed at length in subsequent sections. Each of these risks is associated with a potential loss of financial and/or human capital, and individuals should address each of them to determine how best to address the possibility of loss.

3.1.3 *Evaluate Risks and Select Appropriate Methods to Manage the Risks*

The existence of a risk exposure does not necessarily require the purchase of an insurance product. The appropriate risk management strategy considers the magnitude of the risk and the range of options available to address that risk. Section 5.1 will explain the choice among the four techniques of risk avoidance, risk reduction, risk transfer, and risk retention. *Risk avoidance* involves avoiding a risk altogether. For example, one way to avoid the risk to human and financial capital from riding a motorcycle is to simply not own or ride one. *Risk reduction* involves mitigating a risk by reducing its impact on an individual's welfare, either by lowering the likelihood that it will occur or by decreasing the magnitude of loss (for example, by wearing a helmet when riding a motorcycle). *Risk transfer* involves transferring the risk: The use of insurance and annuities to transfer risk to insurers will be discussed later in

the reading. *Risk retention* involves retaining a risk and thus maintaining the ability to finance the cost of losses; when funds are set aside to meet potential losses, the individual is said to *self-insure*.

3.1.4 *Monitor Outcomes and Risk Exposures and Make Appropriate Adjustments in Methods*

Once the appropriate risk management method has been selected, risks must be monitored and updated as the household moves through its life cycle. It is advisable to annually review an insurance/risk management program, including all the ongoing risk exposures and risk management methods. As an individual's goals and personal and financial situation change, these changes will affect risk exposures and optimal risk management strategies. In addition to an annual review, every life change—such as a birth, marriage, inheritance, job change, relocation, divorce, or death—should trigger a review of the risk management plan.

3.2 Financial Stages of Life

Individuals tend to follow a predictable pattern during their lifetimes: They invest in education early in life, embark on a career, start families, accumulate assets, fund growing household expenses, transition into retirement, and ultimately pass on wealth through bequests. In each of these life-cycle stages, the household faces unique goals and risks that require appropriate investment and risk management strategies.

Defining financial stages of life in clear and concise terms does pose a challenge because all individuals are different; however, financial stages are a useful construct when thinking about risk management and the optimal forms of insurance and other products to consider at different ages. Therefore, we divide the financial stages of life for adults into the following seven periods:

- Education phase
- Early career
- Career development
- Peak accumulation
- Pre-retirement
- Early retirement
- Late retirement

3.2.1 *Education Phase*

The education phase occurs while an individual is investing in knowledge (or human capital) through either formal education or skill development. In theory, the education phase could begin as early as when an individual starts primary school, but this phase typically involves the period when the individual starts developing more specific human capital by attending college or trade school or undertaking an apprenticeship. In some cases, an individual in the education phase may be largely financially dependent on his or her parents or guardians and have little, if any, accumulated financial capital. There is generally little focus on savings or risk management at this point; however, some individuals in this phase may already have families and could benefit from products, such as life insurance, that hedge against the risk of losing human capital.

3.2.2 *Early Career*

The early career phase normally begins when an individual has completed his or her education and enters the workforce. This stage may begin as early as age 18 (16 in some countries) or as late as the late 20s (or even early 30s), depending on the level

of education attained, and generally lasts into the mid-30s. During this period, the individual often marries, perhaps has young children, may purchase a home, and usually begins to save for their children's college expenses. Sometimes, a career-related relocation occurs that could have negative short-term financial implications. Significant family and housing expenses may not allow for much retirement savings. Insurance may be especially valuable during this phase because human capital represents such a large proportion of total wealth and family members are highly dependent on the human capital of one or two individuals to fund expected future consumption.

3.2.3 *Career Development*

The career development phase normally occurs during the 35–50 age range and is often a time of specific skill development within a given field, upward career mobility, and income growth. This phase often includes accumulation for the children's college educations as well as expenditures for college. Concern intensifies about retirement income planning and financial independence. Higher earners will begin building wealth beyond education and retirement objectives and may make large purchases, such as a vacation home, or travel extensively. Retirement saving tends to increase at a more rapid pace during this phase compared with the early career phase.

3.2.4 *Peak Accumulation*

In the peak accumulation phase, generally during the ages of 51–60, most people either have reached or are moving toward maximum earnings and have the greatest opportunity for wealth accumulation. This phase may include accumulating funds for other goals and objectives, but it is usually a continuation of retirement income planning, coordination of employee benefits with investment and retirement strategies, and travel. Investors following a life-cycle portfolio strategy will begin to reduce investment risk to emphasize income production for retirement (particularly near the end of this period) and become increasingly concerned about minimizing taxes, given higher levels of wealth and income. There is also potentially more career risk in this phase because if an individual were to lose his or her job, it might be relatively difficult for that individual to find another job with similar pay.

3.2.5 *Pre-retirement*

The pre-retirement phase consists of the few years preceding the planned retirement age, and it typically represents an individual's maximum career income. Many people in this phase continue to restructure their portfolios to reduce risk and may consider investments that are less volatile. There is further emphasis on tax planning, including the ramifications of retirement plan distribution options.

3.2.6 *Early Retirement*

The early retirement phase in the cycle is generally defined as the first 10 years of retirement and, for successful investors, often represents a period of comfortable income and sufficient assets to meet expenses. For individuals who are forced to retire because of injury or unemployment, this time may be one of shifting expectations and may involve changing to a lifestyle more commensurate with the individual's savings. This is generally the most active period of retirement and is when an individual is less likely to suffer from cognitive or mobility limitations. The primary objective of the retiree is to use resources to produce activities that provide enjoyment. Some retirees seek a new career, and many will look for a job (part time or full time) that has less stress. It is important to note that upon entering retirement, the need for asset growth does not disappear. For many households, the length of retirement could exceed two decades; given this potential horizon, it is important to continue taking an appropriate level of investment risk in retirees' portfolios.

3.2.7 *Late Retirement*

The late retirement phase is especially unpredictable because the exact length of retirement is unknown. This uncertainty about longevity for a specific individual is known as longevity risk, which is the risk that retirement could be very short or very long. Physical activity typically declines during this phase, as does mobility. Although many individuals live comfortably and are in good health until their final days, others experience a long series of physical problems that can deplete financial asset reserves. Cognitive decline can present a risk of financial mistakes, which may be hedged through the participation of a trusted financial adviser or through the use of annuities. Annuities will be discussed in more detail later in the reading.

Two additional concerns may be appropriate to any financial stage. First, depending on the family situation, the need to provide for long-term health care may become apparent. Second, some people may need to devote resources to care for parents or a disabled child for an extended period of time.

EXAMPLE 3

Financial Stages of Life

From a personal financial planning standpoint, what are typical characteristics of someone in the "peak accumulation" phase?

Solution:

An individual in the peak accumulation phase of the life cycle would typically have the following characteristics:

- Approximate age of 51–60
- Maximum earnings and opportunity for wealth accumulation
- Increased interest in retirement income planning
- Greater emphasis on stability and less emphasis on growth in the investment portfolio
- Greater concern about tax strategies
- Increased concern about losing employment because it may be more difficult to find new employment

3.3 The Individual Balance Sheet

A traditional balance sheet includes assets and liabilities that are usually easy to quantify. Our purpose in developing an individual balance sheet is to more comprehensively represent the assets available to fund life-cycle consumption and for wealth preservation and transfer bequests. The primary value of a balance sheet in this context is to illustrate the magnitude of risk exposures for an individual. This perspective is particularly important for individuals who are in life-cycle stages during which human capital is a significant share of overall wealth and for individuals who hold claims on pension assets that grow in value later in the life cycle.

In this section, we attempt to provide a more complete picture of an investor's wealth through the use of an economic balance sheet (or holistic balance sheet), which we initially mentioned in Section 2. Such a balance sheet provides a useful overview of the individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth and expanding liabilities to include consumption and bequest goals. These additional liabilities are important because they often represent leverage created in order to gain access to assets, such as the cost of

education to create human capital. They also represent regular payment obligations that may influence the optimal amount of portfolio liquidity and investment risk. Human capital and pension wealth are important because they represent expected income flows that can be drawn on to fund future consumption.

3.3.1 *Traditional Balance Sheet*

The simplest balance sheet for an individual investor includes recognizable marketable assets and liabilities. Assets include any type of investment portfolio, retirement portfolio (or plan), real estate, and other tangible and intangible items of value. Liabilities include mortgage debt, credit card debt, auto loans, business debt, and student loans. An example of a simple balance sheet (or statement of net worth) is shown in Exhibit 1, where the assets are netted against the liabilities to determine the net worth of the individual.

Exhibit 1 Traditional Balance Sheet as of 31 December 2014

Assets		Liabilities	
Liquid Assets		**Short-Term Liabilities**	
Checking account	€35,000	Credit card debt	€25,000
Certificates of deposit	€100,000	Total short-term liabilities	€25,000
Total liquid assets	€135,000		
Investment Assets		**Long-Term Liabilities**	
Taxable account	€750,000	Car loan*	€25,000
Retirement plan	€600,000	Home mortgage	€500,000
Cash value of life insurance	€25,000	Home equity loan	€90,000
Total investment assets	€1,375,000	Total long-term liabilities	€615,000
Personal Property			
House	€2,200,000		
Cars	€160,000		
House contents	€150,000		
Total personal property	€2,510,000		
Total Assets	€4,020,000	Total Liabilities	€640,000
		Net Worth	€3,380,000

* *Note*: A portion of the car loan would likely be short term, but to simplify, we included the entire loan as a long-term liability.

The net value of an asset, or its equity, is calculated by subtracting liabilities associated with that asset from the gross value. For example, an individual may own a home worth £1 million, but if that individual has a £900,000 mortgage, the equity in the home would be only £100,000 (ignoring any additional intangible benefits associated with home ownership).

It should be noted that this traditional balance sheet includes those assets that can be valued easily but ignores other individual assets that are material, such as human capital and pension benefits. For individuals in the earlier life-cycle stages, human

capital is larger than other assets on the balance sheet. For those who are eligible to receive a guaranteed retirement income stream, the present value of these assets is significant and can be of great value to older individuals. Although non-marketable and difficult to value precisely, human capital and retirement benefits are extremely important when planning the optimal use of assets and the repayment of liabilities over a life cycle.

3.3.2 *Economic (Holistic) Balance Sheet*

The primary goal of an economic (holistic) balance sheet is to arrive at an accurate depiction of an individual's overall financial health by accounting for the present value of all available marketable and non-marketable assets as well as all liabilities. This view allows an individual to map out the optimal level of future consumption and non-consumption goals (such as bequests or other transfers) given the resources that exist today and those that are expected in the future. Although a traditional balance sheet provides information about marketable assets that exist today, it offers limited insight into how these assets should be used to maximize the expected lifetime satisfaction of the individual (a concept economists call "utility"). An economic balance sheet allows an individual to anticipate how available resources can be used to fund consumption over the remaining lifetime.

Exhibit 2 provides a simplified example of an economic balance sheet, which is an expanded version of the traditional balance sheet in Exhibit 1. The traditional assets and liabilities are condensed from the traditional balance sheet in Exhibit 1, with the present value of human capital and pensions added as assets and the present value of lifetime consumption and bequests added as liabilities. For further simplification purposes, we assume that all the assets and liabilities in Exhibit 1 are already calculated at their present value.

Exhibit 2 Economic (Holistic) Balance Sheet as of 31 December 2014

Assets		Liabilities	
Financial capital	€4,020,000	Debts	€640,000
Liquid assets		Credit card debt	
Investment assets		Car loan	
Personal property		Home mortgage	
		Home equity loan	
Human capital	€1,400,000	Lifetime consumption needs (present value)	€4,200,000
Pension value	€500,000		
		Bequests	€400,000
Total Assets	€5,920,000	Total Liabilities	€5,240,000
		Net Wealth	€680,000

An economic balance sheet that includes the present value of non-marketable assets (e.g., human capital and pensions) and liabilities (e.g., consumption needs and bequests) provides a much more accurate baseline from which to maximize the expected utility of future consumption. Assessing pension and human capital value

can also be useful when setting consumption or bequest goals because these assessments provide a more accurate estimation of the future trade-offs an individual will make. Younger households with greater human capital, in addition to spending more to protect the value of this human capital early in the life cycle, will be able to plan for more generous retirement savings goals than households with comparatively lower human capital.

The total economic wealth of an individual changes throughout his or her lifetime, as do the underlying assets that make up that wealth. The total economic wealth of younger individuals is typically dominated by the value of their human capital because younger individuals have not had as much time to save and accumulate financial wealth. As individuals grow older, they are likely to save some of their earnings and will accumulate financial capital. The total value of human capital and the total value of financial capital tend to be inversely related over time as individuals attempt to smooth consumption through borrowing, saving, and eventual spending. When human capital is depleted, an absence of financial capital would result in no wealth to fund an individual's consumption needs. Although some people may live with family or friends at older ages out of necessity, most would prefer to have financial independence in retirement—something that typically requires individuals to save throughout their prime working years.

Although the net wealth in the hypothetical economic balance sheet was equal to €680,000, it is possible for an individual to have either a surplus or a shortfall. For example, if the individual is not saving enough to adequately fund the lifestyle he or she will want at retirement, that individual may have a shortfall. Alternatively, if the individual is saving more than enough to fund lifestyle needs and has no bequest goals, he or she may have a surplus. In either case, an economic balance sheet provides some perspective about the overall financial situation of an individual based on his or her holistic wealth.

EXAMPLE 4

Traditional vs. Economic Balance Sheet

Contrast a traditional balance sheet with an economic balance sheet.

Solution:

A traditional balance sheet includes assets and liabilities that are generally relatively easy to quantify. An economic balance sheet provides a useful overview of one's total wealth portfolio by supplementing traditional balance sheet assets with human capital and pension wealth and including additional liabilities, such as consumption and bequest goals.

3.3.3 *Changes in Net Wealth*

To provide some context for how the relative value of various household assets changes over a lifetime, we will use the hypothetical example of a British individual at age 25. This 25-year-old is assumed to make £40,000 a year in after-tax income. Over his or her lifetime, real wages are expected to grow at a constant rate of 1% per year, the annual savings rate is 10%, the nominal discount rate is 8%, and the rate of expected inflation is 3%. The value of human capital is estimated using Equation 2. Financial capital at age 25 is assumed to be £10,000, and it is expected to grow at an annual real rate of return of 3% per year. The assumed need from the portfolio is £20,000 for the first year of retirement (age 65) and is increased annually by inflation throughout retirement.

We further assume that at age 30 the individual purchases a home that costs £100,000 in today's currency. The home is purchased with a 10% down payment (which comes from financial capital), with the remainder financed by a 30-year mortgage at a fixed nominal interest rate of 5%. The real growth rate of the value of the home is assumed to be 1%. Total pension benefits of £20,000 per year (in today's currency, at age 25) are assumed to commence at age 65, and the real discount rate for pension retirement benefits is 5%. We assume the benefits are accrued throughout the employment of the individual.

Exhibit 3 shows the values of the assets in the individual's economic balance sheet and how they are expected to change over time. To simplify the concept, we demonstrate graphically how the sample inputs reflect the allocation in the exhibit.

Exhibit 3 Life-Cycle Economic Balance Sheet Allocation

Traditional balance sheet assets, such as investments in marketable securities, real estate, and businesses, vary in importance from one life-cycle stage to the next. In general, tangible assets, such as real estate and personal goods, which provide great value to a young family, dominate a household's portfolio early in the life cycle. As households age, they accumulate financial assets that must be managed efficiently to provide the greatest expected later-life consumption for the amount of risk the household is willing to take. Non-traditional balance sheet assets, such as employer pensions, increase in importance later in the life cycle, providing an important source of stable consumption and affecting the optimal allocation of securities within an investment portfolio. To illustrate, Exhibit 4 provides the relative weights for the various assets included in Exhibit 3.

Exhibit 4 Relative Weights of Economic Balance Sheet Allocation

In Exhibit 4, we see that for the typical individual, an investment portfolio represents a significant portion of wealth at age 65 but is still less than 50% of the total economic wealth when home equity, pension wealth, and human capital are also considered. As that individual proceeds through his or her retirement years and funds consumption, the relative share of the investment portfolio declines. In the early retirement stage, total economic wealth is dominated by pension wealth (i.e., the remaining mortality-weighted net present value of benefits) and the value of real estate (i.e., the individual's personal residence). For wealthier individuals, the value of defined benefit pension wealth will likely represent a low percentage of the total wealth portfolio in retirement. To the extent that defined benefit pension wealth has very low credit risk (for example, because of the low default probability of National Insurance in the United Kingdom), a retiree's optimal investment portfolio allocation will be affected. As discussed earlier, one must consider the financial health of both the plan and the sponsor providing the defined benefit pension.

In a related manner, a 65-year-old with £2 million in pension wealth will have a higher level of expected remaining lifetime consumption than a retiree with £1 million in pension wealth and the same traditional balance sheet net worth. Both individuals will need to consider means to safeguard the value of the pension wealth as part of the financial planning process. For example, a pension from a private employer may be subject to company-specific risk. The risk of employer insolvency might be hedged in financial markets by positions in securities and derivatives (if available) that have a negative correlation with the value of the company. As mentioned previously, guarantees of benefit payments may exist, such as the Pension Protection Fund in the United Kingdom that protects many private defined benefit schemes.

The allocation of the different asset types will affect the optimal financial asset allocation decision. A 45-year-old individual in Germany with €1 million in human capital and €500,000 in investment assets should invest differently than a 45-year-old with €3 million in human capital and an identical €500,000 in investment assets. The

volatility in the investment portfolio of the individual with lower human capital will have a much greater impact on variation in expected consumption if both individuals have a 40-year planning horizon. Assume that the first 45-year-old with €1.5 million in combined human and financial capital expects to spend approximately €38,000 each year until age 85. The other 45-year-old with €3.5 million in net wealth expects to spend €88,000 each year. All else being equal, a 40% loss in the first individual's portfolio (0.4 × €500,000 = €200,000) will lead to a 13.2% loss in expected spending per year [(€200,000/40 years)/€38,000] whereas a 40% investment loss to the second individual's portfolio will lead only to a 5.7% decrease in expected consumption [(€200,000/40 years)/€88,000]. For this reason, portfolio recommendations will be less conservative for the investor with high human capital than for the investor with low human capital if both have the same level of risk tolerance.

EXAMPLE 5

Changes in Human and Financial Capital

Describe how the relative values of human capital and financial capital change over an individual's lifetime.

Solution:

The total value of human capital and the total value of financial capital tend to be inversely related over time as individuals attempt to smooth consumption through borrowing, saving, and eventual spending. When human capital becomes depleted, without financial capital, an individual will have no wealth to fund his or her lifestyle. Human capital is generally largest for a younger individual, whereas financial capital is generally largest when an individual first retires.

3.4 Individual Risk Exposures

Managing risks to financial and human capital is an essential part of the household financial planning process. In this section, we provide an overview of the risks faced by individuals and discuss how they relate to human and financial capital. In future sections, we introduce financial products that could be used to manage many of these risks.

3.4.1 *Earnings Risk*

Earnings risk, within the context of personal risk management, refers to the risks associated with the earning potential of an individual—that is, events that could negatively affect the individual's human and financial capital. As noted previously, health issues can affect earnings, and some health risks are a function of the occupation itself. For example, a construction worker is likely to face higher health-related earnings risk than the average worker. Aside from health issues, unemployment and underemployment represent major factors in earnings risk. Sometimes, an employee's job performance or a poor "fit" may lead to job loss, but many people find themselves without a job through no fault of their own.

The risk associated with unemployment for reasons other than disability is rather difficult to characterize. In some cases, such as government employees and union members with seniority, the likelihood of unemployment may be very low. Smaller, younger companies may be riskier employers because of dynamic business conditions or cash flow issues. But even large, well-established companies have been known to go out of business or to close unprofitable divisions or locations. In such cases, even an offer to transfer to another location may be undesirable for someone late in his

or her working life, for someone with a working spouse and/or children in school, or for someone who strongly prefers to remain in the same location for a variety of other reasons. Some industries are cyclical and are prone to layoffs, whereas other industries are subject to competitive pressures that may lead to permanent terminations. Self-employed individuals and even some professionals are prone to variability in their earnings. Of course, the cost is the loss or reduction of earnings and may also include the loss of employer contributions to one's retirement fund as well as other benefit programs. A lengthy period of unemployment may itself create more risk because employers are sometimes hesitant to hire people who have been out of work for an extended period of time. If the individual finally finds a job, it may be at a dramatically lower compensation level.

Obviously, the loss of income represents a reduction in both human and financial capital, and this reduction is exacerbated if job opportunities are few, especially in a poor economy or in a region or industry that is particularly affected. For individuals who lose a job as they approach retirement age, it could be very difficult to find another job, even if there are regulations against age discrimination. Aside from the stress on the family budget, unemployment can be psychologically devastating to the individual and his or her family. With earnings risk, as well as health risk (which is discussed in further detail later), an implication in estimating the total value of human capital is that individuals who work in dangerous occupations or in jobs that have a high likelihood of variability or disruption in earnings have either lower future expected earnings or a higher discount rate or both. Financial capital may also be affected by earnings risk because assets will be needed to make up for any loss of income. Furthermore, there may be a need to seek additional training or education to acquire requisite skills, and this retooling can be very expensive.

3.4.2 *Premature Death Risk*

The term **premature death risk**, which is sometimes referred to as mortality risk, relates to the death of an individual earlier than anticipated whose future earnings, or human capital, were expected to help pay for financial needs and aspirations of the individual's family. These needs include funding day-to-day living expenses, such as food, housing, and transportation, as well as paying off debts, saving for a child's education, and providing for a comfortable retirement for the surviving spouse. An individual's death may also lead to a reduction in the income of the surviving spouse because some family responsibilities of the deceased individual must now be performed by the surviving spouse (assuming the spouse does not remarry). For a young family, the effect can be especially tragic because the increase in household lifestyle that might have accompanied the career of the deceased may never occur (again, if there is no remarriage).

A risk to consumption needs also occurs if a non-earning member of the family dies. The loss can be estimated as the discounted value of the services provided by the deceased family member plus any out-of-pocket death expenses. If a household's primary caregiver dies, the rest of the family can help with that member's responsibilities, but often additional, paid help is required to replace the primary caregiver's duties. This scenario will mean a dramatic change in lifestyle, compounding the incalculable emotional effect of the death. It could even have a negative impact on the career of the surviving spouse, who may feel drained by the added responsibilities.

Besides the obvious reduction in human capital that the death of an income earner represents, there are also effects on financial capital. Death expenses (including funeral and burial), transition expenses, estate settlement expenses, and the possible need for training or education for the surviving spouse are among the financial costs that may be incurred.

3.4.3 *Longevity Risk*

Longevity risk within the context of financial planning relates to the uncertainty surrounding how long retirement will last and specifically the risks associated with living to an advanced age in retirement (e.g., age 100). An extended retirement period may deplete the retiree's resources to the point at which income and financial assets are insufficient to meet post-retirement consumption needs. A common question posed to financial planners is, "How much money do I need to have when I retire?" The answer is dependent on the lifespan of the individual, and longevity is a key variable that can only, at best, be estimated. Other important variables include the nominal rate of return on the portfolio, the rate of inflation, additional sources of income (and whether those sources are adjusted for inflation), and the level of spending. Determining how large a fund an individual will actually have at retirement depends on the amount and timing of contributions, the nominal rate of return, and the amount of time until retirement.

When calculating the sum needed at retirement, financial planners often run a Monte Carlo simulation that is based on an assumed asset allocation to calculate the probability that the funds will last for a specified number of years. Another approach for the time variable is to use a mortality table, adjust for health factors, and add years to be conservative. For example, Friedrich is retiring at age 65, and the mortality tables in his country indicate that a 65-year-old man has an expected lifespan of 20 years. But Friedrich is healthy, exercises regularly, eats well, and has had annual physical examinations, and his parents lived until their late 80s, which was past life expectancy at that time. Friedrich might assume that his retirement will last only 20 years (his life expectancy), but the mortality tables indicate a 50% chance that he will live beyond the forecasted period, which is why it is common to add years to be conservative (e.g., plan for retirement to last 30 years, or until age 95). The decision regarding the additional number of years is obviously subjective. The only way to minimize the likelihood of living beyond the forecasted retirement period would be to use extremely advanced ages (e.g., age 110).

Longevity risk can have a significant impact on the lifestyle of an individual. Even in countries that provide significant pension benefits, income may be inadequate to support the hoped-for lifestyle, and insufficient assets may exacerbate the situation. Making matters worse, many pension programs do not consider inflation. Furthermore, some pension programs, even those sponsored by governmental entities, are unlikely to have sufficient assets to pay future expected liabilities without significant changes to the pension structure. Relying on a pension thus entails its own set of risks.

Longevity risk affects human capital in the sense that an individual who is concerned about "living too long" may choose to work longer than someone else might. Indeed, all else being equal, the person who is concerned about outliving his or her money and who intends to work longer has more human capital, but at the possible expense of a less desirable (i.e., longer) retirement stage.

3.4.4 *Property Risk*

Property risk relates to the possibility that a person's property may be damaged, destroyed, stolen, or lost. There are, of course, many different possible events relating to property risk. A house may catch fire, an automobile may be involved in a collision or be damaged in a hailstorm, or a valuable necklace may be lost. In the context of property risk, *direct loss* refers to the monetary value of the loss associated with the property itself. For example, a house fire may cause €50,000 of damage. If the repair process requires that the family live elsewhere while the damage is repaired, the expenses incurred are considered an *indirect loss*. If the family is renting a room to a boarder, the income lost during construction would also be considered an indirect

loss. Similarly, if a driver damages his or her automobile by running into a curb, the damage to the automobile is a direct loss and the cost of renting a replacement automobile is an indirect loss.

Because property represents a financial asset, property risk is normally considered to be associated with a potential loss of financial capital. But property used in a business to create income is rightfully considered in a discussion of human capital. That is, this type of business property can be considered a tool that helps drive future earnings, and to the extent that such property is at risk, human capital is also at risk. Business owners should be especially conscious of the fact that in the absence of insurance or other risk management techniques, both financial and human capital is at risk.

3.4.5 *Liability Risk*

Liability risk refers to the possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury. In general, one may be *liable* if because of one's action—or inaction when one is legally responsible for taking action—bodily injury, property damage, or other loss is incurred by another person or entity.

For individuals, the most common cause of legal liability involves driving an automobile. An automobile accident may cause bodily injury leading to medical costs, lost income, and even the necessity for long-term care. For the vast majority of people, the potential liability of a major automobile accident exceeds not only their financial capital but also their human capital as well. For example, in some jurisdictions, a liability judgment may result in the confiscation (often termed garnishing) of the wages or other income of the person found liable. Note, though, that the person who is found liable—for example, in an automobile accident—may also have suffered an injury that may affect the individual's financial and/or human capital.

As an example of liability risk, assume that a driver causes an automobile accident in which a passenger in the other car is injured and the other driver's automobile is heavily damaged. In many jurisdictions, the individual who caused the accident is deemed responsible for the repair or replacement of the damaged automobile and the medical expenses and lost income of the victim. As another example, in many countries, a homeowner or even an apartment renter may be deemed legally liable for an accident that causes injury or property damage to a visitor. For example, a guest may accidentally slip on some steps, be seriously injured by the fall, and become incapable of gainful employment. Even if the visitor was careless, laws may specify that the owner or renter of the property is liable.

3.4.6 *Health Risk*

Health risk refers to the risks and implications associated with illness or injury. Direct costs associated with illness or injury may include coinsurance, copayments, and deductibles associated with diagnostics, treatments, and procedures.[3] In some countries, health care costs for individuals can be significant. Obviously, the risk associated with these costs varies considerably both across and within countries

3 In the context of health insurance, the term *coinsurance* means that the insured must share some of the costs of the specific health care provided. For example, an insurance company may be obligated to pay 80% of the cost of a medical procedure and require that the insured pay the other 20%. *Copayments* refer to the requirement that the insured pay a specified amount of money for a medical service, typically treatment by a physician. For example, a copayment, or "copay," of US$30 may be required for a visit to a primary care physician and US$45 may be required for a visit to a specialist. The remainder of the actual expense is paid by the insurance company. A *deductible* is an amount that the insured is required to spend on health care approved by the insurance company during the plan year before the insurance company pays for anything. For example, there may be a US$500 deductible per person and a US$1,500 total deductible for a family. Insurance companies contend that coinsurance, copayments, and deductibles discourage frivolous use of the health care system, thereby keeping insurance premiums lower.

and must be considered as a risk to financial capital. Health factors typically have a significant impact on the premiums individuals pay for life, disability, and long-term care insurance.

Health risks manifest themselves in different ways over the life cycle and can have significant implications for human capital as well as for financial capital. For example, if a worker becomes disabled as a result of an accident or health incident, he or she may be unable to work while health expenses are incurred, resulting in a loss to both current assets and future earnings. The impact of a negative health event on human capital can be approximated by using the discounted cash flow framework and estimating the decline in projected cash flows along with an increase in the discount rate arising from increased earnings uncertainty. Illness and injury can also obviously have an adverse impact on life expectancy, potentially resulting in death before planned retirement. Furthermore, health issues involving non-earning members of the family can also be costly. There may be a need for special medical services, housing improvements, specialized vehicles, and other health-related expenses. In the case of the special needs of a child, the financial obligation could continue well beyond the parents' working lives, or even their actual lives.

Although long-term care is a part of the national health care system in some countries, such as Germany and Japan, in others, such as the United States, the cost of long-term care can represent a significant burden on financial capital. In countries where long-term care expenses are incurred by the individual, policies that provide insurance to protect against the cost of long-term care should be considered. Long-term care insurance is designed to cover a portion of the cost of necessities, such as home care, assisted living facilities, and nursing homes.

The risk and cost of long-term care may be considered both a health issue and an issue of insufficient assets at an advanced age—the latter being a component of the aforementioned longevity risk. The risks may also go beyond the immediate family unit. For example, one may have a parent who is not financially capable of paying for long-term care. An added risk is that inflation in long-term care costs (i.e., medical costs) has historically been higher than base inflation.

EXAMPLE 6

Individual Risk Exposures (1)

Describe premature death risk with respect to financial and human capital.

Solution:

Within a personal financial planning context, premature death means that an individual dies before fully providing for his or her financial needs (and, if applicable, those of the family). By definition, at that point human capital is eliminated because the deceased individual can no longer generate income. To a lesser degree, there may also be an impact on financial capital. In addition to expenses associated with a funeral and burial, there may be a need for significant transitional funds or even a requirement to settle certain debts or business obligations upon the individual's death. Funds may also be required for education and/or training of the surviving spouse to generate income.

EXAMPLE 7

Individual Risk Exposures (2)

Describe longevity risk within the context of personal financial planning, and explain how it relates to human and financial capital.

Solution:

Longevity risk refers to the possibility that an individual may live long enough to deplete his or her resources—to outlive one's money. Longevity risk relates primarily to financial capital—that is, spending one's retirement portfolio. But there is also an aspect of human capital in that one may address longevity risk, in part, by retiring later, thus expanding one's retirement portfolio and reducing the number of years to draw it down while increasing one's human capital.

INSURANCE AND ANNUITIES

4

An individual's balance sheet provides a comprehensive overview of the asset categories held to fund current and future spending. Each of these categories involves some risk of a random loss. Managing these risks involves assessing possible loss exposures and considering market and non-market solutions to both address the possibility of and reduce the magnitude of a loss. We review the range of products that can be used to reduce these risks and present a strategy for analyzing the value of possible treatment options.

What are the consequences of risk? Effective risk management for individuals addresses the trade-offs between expected total wealth and security. Individual life-cycle planning involves assessing expected available resources and planning an optimal earning and spending path over a lifetime. But life does not always unfold as expected. A negative event can threaten the value of assets, and a loss in this value will cause total wealth (and expected future consumption) to fall. For each risk exposure, a solution exists to reduce that risk, whether through an altered portfolio allocation, a change in behavior, or the purchase of financial and/or insurance products. Each of these solutions involves a cost that generally results in a lower expected level of consumption over time. Shifting assets from risky to risk-free securities results in the loss of a risk premium. In the case of financial products, purchasing insurance trades a reduction in expected lifetime consumption for an increase in the stability of expected spending after a loss. In this section, we discuss the various types of insurance that individuals may use in financial planning. We then turn our attention to annuities, another financial product available to individuals.

4.1 Life Insurance

Life insurance protects against the loss of human capital for those who depend on an individual's future earnings. In this section, we provide an overview of the key uses of life insurance, the primary types of life insurance, the basic elements of a life insurance policy, how a life insurance policy is priced, and how to determine the appropriate amount of life insurance to purchase, if any.

4.1.1 *Uses of Life Insurance*

Life insurance provides a hedge against the risk of the premature death of an earner. A family's need for life insurance is related to the risk of the loss of the future earning power of an individual less the expected future spending of that individual. In each case, the risk associated with premature death can be mitigated by transferring the risk to a third party (i.e., by purchasing life insurance). The optimal amount of insurance to purchase is a function of both the expenses of the insurance hedge and the magnitude of the difference in expected lifetime utility with and without that family member.

Life insurance can also be an important estate-planning tool. A life insurance policy can provide immediate liquidity to a beneficiary without the delay involved in the legal process of settling an estate (i.e., distributing assets to beneficiaries) following the death of an individual. This liquidity can be particularly valuable if the estate contains illiquid assets or assets that are difficult to separate and distribute equitably among heirs.

Another possible use of life insurance is as a tax-sheltered savings instrument, notably in the United States. As mentioned previously in this reading, cash-value policies invest a portion of the premium in a tax-advantaged account that represents the difference between the current cost of providing insurance coverage and the premium. The mortality charge is the cost of providing life insurance, which increases with age (as does mortality risk). As mortality risk increases, the accumulated excess premium can be used to pay the increasingly higher costs of providing insurance protection. These excess premiums can be invested in a variety of instruments that can grow over time sheltered from taxation and can eventually be cashed out without paying for older-age life insurance protection.

4.1.2 *Types of Life Insurance*

There are two main types of life insurance: temporary and permanent. For the purposes of this reading, both types of life insurance are assumed to be non-cancelable: The policy lapses only at the end of the term (for temporary life insurance) or upon death (for permanent life insurance).

Temporary life insurance provides insurance for a certain period of time specified at purchase. This type of coverage is commonly referred to as "term" life insurance. If the individual survives until the end of the period (e.g., 20 years), the policy will terminate unless it can be automatically renewed. Generally, premiums for term life insurance either remain level over the insured period (e.g., 20 years) or increase over the period as mortality risk increases. The cost of term insurance is less than that of permanent insurance, and the cost per year is less for shorter insured periods (e.g., 10 years versus 20 years), again because of increasing mortality risk.

Permanent life insurance provides lifetime coverage, assuming the premiums are paid over the entire period. Policy premiums for permanent life insurance are usually fixed, and there is generally some underlying cash value associated with a permanent insurance policy. There are several types of permanent life insurance that vary by region. Here, we will discuss the two most common types of permanent life insurance: *whole life insurance* and *universal life insurance*.

Whole life insurance remains in force for an insured's entire life (hence the name). Whole life insurance generally requires regular, ongoing fixed premiums, which are typically paid annually, although monthly, quarterly, and semiannual payment options also exist. Failure to pay premiums can result in the lapse of the insurance policy. There is generally a cash value associated with a whole life insurance policy that may be accessed if the insured chooses to do so. The non-cancelability of whole life insurance can make this type of policy appealing to purchase at younger ages, when an individual is typically healthier. Whole life insurance policies can be participating or non-participating. Participating life insurance policies allow potential growth at a

higher rate than the guaranteed value, based on the profits of the insurance company. A non-participating policy is one with fixed values: The benefits will not change based on the profits and experience of the insurance company. Universal life insurance is constructed to provide more flexibility than whole life insurance. The policy owner, generally the insured, has the ability to pay higher or lower premium payments and often has more options for investing the cash value. The insurance will stay in force as long as the premiums paid or the cash value is enough to cover the policy expenses of the provider.

Many permanent life insurance policies have a "non-forfeiture clause," whereby the policy owner has the option to receive some portion of the benefits if premium payments are missed (i.e., before the policy lapses). The scenarios permitted by a non-forfeiture clause generally include a cash surrender option (whereby the existing cash value is paid out), a reduced paid-up option (whereby the cash value is used to purchase a single-premium whole life insurance policy), and an extended term option (whereby the cash value is used to purchase a term insurance policy, generally with the same face value as the previous policy).

In addition, a number of potential "riders" can be added to both temporary and permanent life insurance policies. Riders are modifications that add some risk mitigation beyond the basic policy. One example of a common rider is an "accidental death" rider (also referred to as accidental death and dismemberment, or AD&D), which increases the payout if the insured dies or becomes dismembered from an accident. Other common riders include an accelerated death benefit (which may allow insured parties who have been diagnosed as terminally ill to collect all or part of the death benefit while they are still alive), guaranteed insurability (which allows the owner to purchase more insurance in the future at certain predefined intervals), and a waiver of premium (whereby future premiums are waived if the insured becomes disabled). The value of the rider will depend on the level of protection against an unexpected decline in consumption not otherwise provided by a basic policy. An additional way for life insurance policyholders to access the value of the policy is the option to sell the policy to a third party, which is often called a viatical settlement. After purchasing the policy, the third party becomes responsible for paying the premiums and will receive the death benefit when the insured dies.

4.1.3 *Basic Elements of a Life Insurance Policy*

The basic elements of a life insurance policy include

- the term and type of the policy (e.g., a 20-year temporary insurance policy),
- the amount of benefits (e.g., £100,000),
- limitations under which the death benefit could be withheld (e.g., if death is by suicide within two years of issuance),
- the contestability period (the period during which the insurance company can investigate and deny claims),
- the identity (name, age, gender) of the insured
- the policy owner,
- the beneficiary or beneficiaries,
- the premium schedule (the amount and frequency of premiums due), and
- modifications to coverage in any riders to the policy.

In addition, for a life insurance policy to be valid, the policy owner generally needs to have an insurable interest in the life of the insured. Thus, the presence of an insurable interest is a basic element of an insurance policy as well.

The insured, the policy owner, the beneficiary (or beneficiaries), and the insurer are the four primary parties involved in any life insurance policy. The insured is the individual whose death triggers the insurance payment. The policy owner is the person who owns the life insurance policy and is responsible for paying premiums. The beneficiary is the individual (or entity) who will receive the proceeds from the life insurance policy when the insured passes away. The actual beneficiary of a jointly owned life insurance policy may be determined by the order of death of the prospective beneficiaries (e.g., a husband and a wife). Lastly, the insurer is the insurance company that writes the policy and is responsible for paying the death benefit. The amount payable to the beneficiary is typically referred to as the "face value" of the life insurance policy.

For most life insurance policies, the policy owner and the insured are the same person. In certain instances, however, a policy owner may choose to obtain insurance to protect against a loss in economic value from the death of another individual. For example, as part of a divorce, one ex-spouse may purchase life insurance on the other ex-spouse. Similarly, a business may purchase life insurance on a key executive under the assumption that the business would be negatively affected by that executive's death.

When the insured is not the policy owner, the policy owner must have an "insurable interest" in the life of the insured. Insurable interest prevents individuals from gambling on the lives of strangers and removes any incentive to hasten the insured person's demise. An insurable interest means that the policy owner must derive some type of benefit from the continued survival of the individual that would be negatively affected should that individual pass away. For example, a spouse has an insurable interest because he or she relies on the income or household services of the other spouse. A business has an insurable interest in key executives who are essential to the ongoing operations of the business.

Life insurance benefits are payable to the beneficiary upon the death of the insured. Usually, some form of documentation or proof of death is required by the life insurance company, such as a death certificate, before benefits are paid to the beneficiary. Death benefits from a life insurance policy can be paid in various forms, such as a lump sum or an annuity, although lump sums are generally more common.

There may be certain situations in which a life insurance company would not be required to pay a benefit. For example, if the insured commits suicide within some predetermined period after purchasing the policy (e.g., two years), or if the insured made material misrepresentations relating to his or her health and/or financial condition during the application process, benefits may not be payable. There is often a maximum contestability period during which the insurer has a legal right to contest the death benefit, after which the insurer cannot deny the claim even if it involves suicide and/or material misstatement.

EXAMPLE 8

Elements of a Life Insurance Policy

Describe the concept of insurable interest for life insurance.

Solution:

An insurable interest means that the policy owner must derive some type of benefit from the continued survival of the insured that would be negatively affected should the insured pass away. For example, an individual may rely on a spouse for his or her financial well-being. If the spouse dies, income is no longer generated, leading to financial problems. Another example is a business that may have an insurable interest in a key employee who generates large sales

volumes. The purpose of an insurable interest is to prevent individuals from gambling on the lives of others or from having a financial reason to arrange the death of the insured.

4.1.4 *How Life Insurance Is Priced*

There are a number of factors that determine how an insurer prices life insurance, and there are many different types of life insurance policies. Although the details of the actuarial calculations are beyond the scope of this reading, it is useful to understand the basic concepts of life insurance pricing.

In general, there are three key considerations in the pricing of life insurance: mortality expectations, a discount rate, and loading.

4.1.4.1 Mortality Expectations One of the most important factors in determining the price for life insurance is the expected mortality of the insured individual (i.e., how long the person is expected to live). Actuaries at insurance companies estimate mortality based on both historical data and future mortality expectations. Generally speaking, life expectancies in most regions of the world have been increasing. Certain attributes, such as age and gender, are obvious factors in evaluating life expectancy. Whether the applicant is a smoker (or has other health risks) is another important factor because smoking is associated with deadly diseases. Exhibit 5 shows an example of the probability of men and women (both smokers and non-smokers) dying at various ages, although these numbers will vary considerably in different countries.

Rather than use a generalized mortality table, life insurance company actuaries typically make adjustments to consider additional factors. The underwriting process serves to categorize applicants according to their perceived riskiness, consistent with the actuaries' specifications. The resulting customized tables consider applicants' health history, particularly conditions that are associated with shorter-than-average life expectancy, such as cancer and heart disease. If an applicant's parents or siblings died at a relatively early age from certain diseases, that applicant may be considered a bigger risk. Excess weight is another health issue leading to shorter life expectancies. Certain activities, such as scuba diving and flying personal aircraft, are deemed to increase mortality risk also. All of these underwriting factors can be collected on a typical life insurance application, and the salesperson who gathers this information can be considered the first level of the underwriting process.

For larger policies, insurance companies may require a physical examination, performed by an insurer-paid nurse or physician, and the examination could include blood pressure, cholesterol and other blood analysis, an electrocardiogram, and other tests. All of these factors can be used to categorize applicants in tables that discriminate among standard risks, preferred (lower) risks, and high risks, and the cost to the insured can vary considerably. Of course, some people have a sufficient number of factors, or serious-enough factors, to make them uninsurable. This underwriting process reduces the likelihood of *adverse selection.* Adverse selection refers to the fact that individuals who know that they have higher-than-average risk are more likely to apply for life insurance. Unless the insurance company performs its underwriting well, mortality experience can be worse than projected.

The Probability of Dying at Certain Ages

Exhibit 5 provides information about the mortality (i.e., the probability of dying) for males and females at different ages.[4] The cost of life insurance is based on the probability that the insured will die during the duration of the policy. The table helps demonstrate why younger (versus older) individuals, females (versus males), and non-smokers (versus smokers) tend to pay less for life insurance—the expected probability of dying in a given year is lower.

Exhibit 5 Mortality of Males and Females at Certain Ages

	Male			Female		
Age	Composite	Non-Smoker	Smoker	Composite	Non-Smoker	Smoker
20	0.10%	0.10%	0.13%	0.05%	0.05%	0.06%
25	0.11	0.10	0.16	0.05	0.05	0.08
30	0.11	0.10	0.18	0.07	0.06	0.10
35	0.12	0.11	0.20	0.10	0.09	0.15
40	0.17	0.15	0.28	0.13	0.12	0.21
45	0.27	0.23	0.46	0.19	0.17	0.31
50	0.38	0.33	0.65	0.31	0.28	0.54
55	0.62	0.55	1.06	0.51	0.47	0.91
60	0.99	0.89	1.63	0.80	0.74	1.40
65	1.69	1.55	2.66	1.19	1.11	2.03
70	2.58	2.41	3.79	1.78	1.68	2.98
75	4.19	4.00	5.73	2.79	2.66	4.52
80	7.01	6.79	9.01	4.39	4.24	6.70
85	11.66	11.41	14.01	7.45	7.28	10.54

EXAMPLE 9

Mortality Expectations

If a given male and female are the same age and have equivalent health profiles, evaluate which one should expect to pay more for life insurance.

Solution:

A key pricing component of life insurance is expected mortality. From Exhibit 5, one can see that the chance of death for females across the age spectrum is less than it is for males of the same age. Therefore, all else being equal, females should expect to pay less than males for the equivalent life insurance.

4 Data are based on the American Academy of Actuaries' Commissioners Standard Ordinary Task Force 2001 mortality table.

4.1.4.2 Calculation of the Net Premium and Gross Premium The *net premium* of a life insurance policy represents the discounted value of the future death benefit. To illustrate a simplified calculation of the net premium, we will consider the example of a one-year, non-renewable term life insurance policy with a death benefit of US$100,000 for Ramon, a 40-year-old non-smoking male. The insurance company insures thousands of people with characteristics like Ramon's. Thus, the life insurance company will experience a predictable distribution of death benefit payments in a given year, although it does not know who among its customers will die during that year.

Premiums are collected at the beginning of the year, and for simplicity, we will assume that death benefit payments occur at the end of the year. As shown in Exhibit 5, and in the absence of other underwriting information, Ramon has a probability of 0.15% of dying within the year. Although the life insurance company will pay a death benefit of either US$100,000 or US$0, we can calculate an expected outflow at the end of the year of US$150, which equals (0.0015 × US$100,000) + (0.9985 × US$0). Finally, a discount rate, or interest factor, representing an assumption of the insurance company's return on its portfolio, is applied to the expected outflow. Assuming a 5.5% rate, US$150 is discounted by one year to a present value of US$142.18 (US$150/1.055), which is the net premium.

As mentioned previously, life insurance companies typically offer level term policies, under which the insured can pay equal annual premiums for a specified number of years—for example, a five-year level term policy. The calculation still requires discounting expected future death benefit payments back to the present, but we must also consider the fact that the individuals who die within the five-year period will not be paying premiums for the remaining outstanding term.

To determine what the insurance company would actually charge Ramon for the one-year policy, the insurer must consider other factors to calculate the *gross premium*. The gross premium adds a *load* to the net premium, allowing for expenses and a projected profit for the insurance company.

Expenses are incurred by the insurer for both writing a life insurance policy and managing it on an ongoing basis. Expenses associated with writing a life insurance policy include the costs of the underwriting process, which potentially include a sales commission to the agent who sold the policy and the cost of a physical exam. Ongoing expenses include overhead and administrative expenses associated with monitoring the policy, ensuring that premiums are paid on a timely basis, and verifying a potential death claim. Furthermore, most companies provide a low percentage "renewal commission" for the first years of the policy, which encourages the agent to provide needed advice to the policy owner and to try to keep the policy owner from terminating the policy.

Life insurers can be divided into two groups—stock companies and mutual companies. Stock companies are similar to other corporations in that they are owned by shareholders, have a profit motive, and are expected to provide a return to those shareholders. Within the constraints of supply and demand for their product, stock life insurance companies add a projected profit as a part of the load in pricing their policies. In contrast, mutual companies are owned by the policy owners themselves and there is no profit motive. Mutual companies typically charge a gross premium that is somewhat higher than the net premium plus expenses, even though mutual companies do not have profits per se. Then, if mortality experience, expenses, and/or investment returns are better than projected, the amount by which the gross premium exceeds the net premium plus expenses may be paid back to the policy owners as a policy dividend, which is considered a return of premium to the policy owner rather than income.

Premiums for level term policies are higher than those for annually renewable (one-year) policies in the early years. But premiums are lower in the later years of the policies—most notably for longer periods, such as a 20-year level term—because annually renewable term policies often have rapidly increasing premiums. As can be

seen in Exhibit 5 earlier in this section, mortality rates begin accelerating rather quickly after age 40. Life insurers sometimes offer low initial rates on annually renewable policies with the expectation that many purchasers of these policies will simply pay the increasing premiums.

Some consumers buy an annually renewable term policy with the intention of taking advantage of the "loss-leader" pricing in the early years and then, when rates rise too much, switching to another company that has a lower premium at the newly attained age. Unfortunately, there is risk in this strategy in that a health issue or accident could make that individual uninsurable, leaving him or her with an annually renewable policy that has an escalating premium.

EXAMPLE 10

Life Insurance Pricing

Discuss the three most relevant elements of life insurance pricing.

Solution:

The three most relevant considerations in pricing life insurance are mortality expectations, the discount rate, and loading.

- Mortality expectations: The insurer is concerned about the probability that the insured will die within the term of the policy. Actuaries evaluate mortality expectations based on historical experience, considering such factors as age and gender, the longevity of parents, blood pressure, cholesterol, whether the insured is a smoker, and whether the insured has had any diseases or injuries that are likely to lead to death during the policy term.
- Discount rate: A discount rate, or interest factor, representing an assumption of the insurance company's return on its portfolio, is applied to the expected outflow.
- Loading: After calculating the net premium for a policy, which may be considered the pure price of the insurance, the insurance company adjusts the premium upward to allow for expenses and profit. This adjustment is the load, and the process is called loading.

4.1.4.3 Cash Values and Policy Reserves As noted earlier, although initial premiums are higher, whole life policies offer the advantage of level premiums and an accumulation of cash value within the policy that (1) can be withdrawn by the policy owner when the policy endows (or matures) or when he or she terminates the policy or (2) can be borrowed as a loan while keeping the policy in force. These cash values build up very slowly in the early years, during which the company is making up for its expenses. For example, just the first-year commission on a whole life policy could be equivalent to 100% of the first-year premium; thus, the company is "in the hole" for the first few years and trying to recover the initial expenses. The commissions decline in subsequent early years as the effort required by a sales agent to service the policy is reduced.

Exhibit 6 shows a representation of the build-up of cash value within a whole life policy that endows at a specified age, perhaps age 100. It is important to recognize the interrelationship of the following amounts:

- The premium stays constant.
- The face value stays constant.

- The cash value increases.
- The insurance value decreases.

Essentially, as cash values increase and the insurance value decreases, the ongoing premium is paying for less and less life insurance.

Exhibit 6 Build-up of Cash Value in a Whole Life Insurance Policy

To the extent that the life insurance is intended to replace human capital, it may become unnecessary after the individual's working years are finished. Enough financial capital may have been accrued to make even the immediate death expenses payable from other funds without the need for life insurance. The existence of increasing cash values within a policy adds another dimension to the decision whether to terminate a policy.

Note also that life insurers are typically required by regulators to maintain *policy reserves*, which are a liability on the insurance company's balance sheet. Policy reserves become especially important for whole life policies. With a whole life policy, the insurance company specifies an age at which the policy's face value will be paid as an endowment to the policy owner if the insured person has not died by that time. The insurance company must accumulate reserves during the life of the policy to be able to make that payment.[5]

4.1.4.4 Consumer Comparisons of Life Insurance Costs It may seem easy to compare the cost of two different policies of equal size by simply looking at the first year's premiums. Although this may be the case with term policies, comparing the cost of two whole life insurance policies is much more complex because, for example, one policy may have larger premiums but also faster growth of cash values.

Consumer and/or governmental organizations may provide comparisons of policies from various life insurance companies based on projected data, including assumptions about future dividends and cash values. In many jurisdictions, regulations require that life insurance companies provide consumers with cost data that consider the time value of money and assume a specified number of years. The two most popular

5 The policy reserve can be defined as follows: Policy reserve = Present value of future benefits – Present value of future net premiums. From the equation, we can infer that as the insured person gets older, the present value of the future death benefit (or the cash value that could be withdrawn) gets larger. At the same time, the present value of the future net premiums gets smaller because fewer premiums remain. Thus, the policy reserves must grow larger over time until, at the time of endowment, the reserves equal the present value of the future benefits. (See Rejda and McNamara 2014, p. 272.)

indexes for comparison are the *net payment cost index* and the *surrender cost index*, both of which calculate a cost per year per thousand dollars of life insurance coverage under different sets of assumptions. Both methods assume a specific time period, such as 20 years, and a specific compounding discount rate, such as 5%.

The net payment cost index assumes that the insured person will die at the end of a specified period, such as 20 years. Calculation of the net payment cost index includes the following steps:

A Calculate the future value of an annuity due of an amount equal to the premium, compounded at a 5% discount rate for 20 years. An annuity due—an annuity for which the premium payment is received at the beginning of the period (versus an ordinary annuity, for which the premium payment is received at the end of the period)—is used because premiums are paid at the beginning of the period.

B Calculate the future value of an ordinary annuity of an amount equal to the projected annual dividend (if any), compounded at 5% for 20 years. An ordinary annuity is used because dividend payments are made at the end of the period.

C Subtract B from A to get the 20-year insurance cost.

D Calculate the payments for a 20-year annuity due with a future value equal to C and a discount rate of 5%. This amount is the interest-adjusted cost per year. Again, an annuity due is used because premium payments occur at the beginning of the year.

E Divide by the number of thousand dollars of face value.

The surrender cost index assumes that the policy will be surrendered at the end of the period and that the policy owner will receive the projected cash value. Calculation of the surrender cost index includes the following steps:

A Calculate the future value of an annuity due of an amount equal to the premium, compounded at 5% for 20 years. We use an annuity due here for the same reason indicated for the net payment cost index.

B Calculate the future value of an ordinary annuity of an amount equal to the projected annual dividend (if any), compounded at 5% for 20 years. We use an ordinary annuity here for the same reason indicated for the net payment cost index.

C Subtract B and the Year 20 projected cash value from A to get the 20-year insurance cost.

D Calculate the payments for a 20-year annuity due with a future value equal to C and a discount rate of 5%. This amount is the interest-adjusted cost per year.

E Divide by the number of thousand dollars of face value.

For example, a US$100,000 face value whole life policy has an annual premium of US$2,000, paid at the beginning of the year. Policy dividends of US$500 per year are anticipated, payable at year-end. A cash value of US$22,500 is projected for the end of Year 20.

Net Payment Cost Index Calculation	
Future value of premiums (annuity due): US$2,000 annual payment, 20 years, 5%	US$69,439
Future value of dividends (ordinary annuity): US$500 annual payment, 20 years, 5%	–16,533
20-year insurance cost	US$52,906

(Continued)

Annual payments for 20-year insurance cost (annuity due): 20 years, 5%	1,524
Divide by US$ thousands of face value	÷ 100
Net Payment Cost Index, cost per US$ thousand per year	US$15.24

Surrender Cost Index Calculation

Future value of premiums (annuity due): US$2,000 annual payment, 20 years, 5%	US$69,439
Future value of dividends (ordinary annuity): US$500 annual payment, 20 years, 5%	–16,533
20-year cash value (given above)	–22,500
20-year insurance cost	US$30,406
Annual payments for 20-year insurance cost (annuity due): 20 years, 5%	876
Divide by US$ thousands of face value	÷ 100
Surrender Cost Index, cost per US$ thousand per year	US$8.76

The major benefit of these indexes is the ease of comparing policies of the same type. Generally speaking, the lower the index value is, the better the value. However, policies do not always perform as projected. If the insurance company's actual return, expense, and/or mortality experiences are worse than projected, the *ex post* indexes could be larger.

Calculating Life Insurance Needs

Two distinctly different methods are commonly used to calculate the amount of life insurance needed. The *human life value* method is consistent with the concept of human capital. It involves replacing the estimated net contribution to family finances that the insured would generate if that individual did not die during his or her projected earning life. In general, this calculation involves estimating future income that would be generated by the insured, offset by incremental expenses that would be attributable to the insured. The net amounts in each year are then discounted back to the present to calculate the amount of insurance needed. An amount may be added to cover so-called "final expenses," such as funeral and other death expenses.

The *needs analysis* method, as the name implies, is concerned with meeting the financial needs of the family. Needs analysis typically involves estimating living expenses for survivors for an appropriate amount of time, typically until adulthood for surviving children and to projected life expectancy for a surviving spouse. Also included are education costs, final expenses, and any other special expenses. These amounts are discounted back to the present to calculate the total funds needed. Any assets available are subtracted, and the amount remaining is the life insurance needed.

Both the human life value and needs analysis methods are demonstrated in detail in Section 5.

4.1.5 *How Much Life Insurance Does One Need?*

The optimal amount of life insurance for an individual will vary based on a number of factors. Some individuals with no dependents or bequest goals may not need any insurance, whereas an individual with young children and a non-working spouse may need a significant amount of life insurance. In this section, we outline some of the key considerations to use when determining how much life insurance to purchase.

The primary purpose of life insurance is to replace the present value of future earnings. A 65-year-old individual without children will experience an emotional loss from the premature death of a spouse, as well as some additional short-term expenses, but the economic loss will be modest (or even negative if expected spending needs fall in retirement). Other reasons to consider life insurance include the following:

- *Immediate financial expenses:* These include direct costs associated with death, such as funeral and legal expenses. Although the costs associated vary by region, funerals can be expensive and represent a potentially sizable financial burden on the family. Additional immediate financial expenses could include covering the short-term loss of wages.
- *Legacy goals:* In addition to income replacement, an individual may use life insurance to achieve certain legacy goals. These can include gifts to charities, bequests to family members, and estate planning.

To calculate the amount of insurance needed, one should estimate the amount of money needed to restore the present value of expected earnings that would have occurred if the earner remained alive. Because the purpose of life insurance is to smooth consumption by preventing a drop in spending from an unexpected premature death, the value of life insurance should be equal to the difference in household spending with and without the human capital of the earner. An accurate calculation will adjust household spending needs downward to compensate for the reduction in household size, in addition to estimating the present value of the expected human capital of the insured. The cost of the insurance is obviously an important consideration as well.

Another important consideration when purchasing life insurance is the insurance company's ability to meet its financial obligations. Company financial strength is evaluated by various rating agencies and is important because it provides an indication of the ability of the insurer to meet its obligations and to weather adverse market conditions.

EXAMPLE 11

Appropriateness of Life Insurance

Consider two potential life insurance candidates: (1) a 40-year-old doctor who is married with two young children, substantial student loans, and sizable earnings; and (2) a 35-year-old single person with a moderate amount of financial wealth. Based on the information presented, which person would be a more appropriate candidate for life insurance and why?

Solution:

The first individual is a much more appropriate candidate for life insurance. Given that the doctor has substantial debt and high earnings, the value of this individual's earnings potential (human capital) is significant. Likewise, with two young children, there is a high dependence on future earnings, representing another reason the earnings potential should be hedged with life insurance. In contrast, the 35-year-old does not have any beneficiaries that would need to be supported. But the younger individual may want to consider purchasing insurance while he or she is still insurable.

4.2 Disability Income Insurance

Disability income insurance is designed to mitigate earnings risk as a result of a disability, which refers to the risk that an individual becomes less than fully employed because of a physical injury, disease, or other impairment. Many disabilities for gainfully employed individuals are relatively short rather than lifelong, but the financial disaster associated with the possibility of a lifelong disability can be addressed in a comprehensive risk management plan.

What is meant by disability? The definition of disability used by insurance providers typically specifies one of the following:

- Inability to perform the important duties of one's regular occupation
- Inability to perform the important duties of any occupation for which one is suited by education and experience
- Inability to perform the duties of any occupation

Consider a surgeon who loses the use of his or her dominant hand in an accident. By the first definition, this individual would likely be deemed fully disabled. By the second definition, this individual might be able to work as a general practitioner physician. By the third definition above, as long as the individual was able to be employed (e.g., as a professor at a medical school), he or she might not be considered disabled. For most people, especially professionals with specialized skills, policies that use the first definition are best, even though they are more expensive. In general, a disability income insurance policy will specify that some percentage of the difference between the pre-injury income and the post-injury income would be paid to the insured.

As with all insurance policies, disability income insurance policy standards vary widely in different jurisdictions and even for different companies. For most policies, the premium is fixed and based on the age of the insured at the time of policy issue, and the policies are underwritten for the health and occupation of the insured. Disability income coverage is available both through individual policies and through many employers. Disability income policies usually include provisions for partial and residual disability. Partial disability means that although the insured cannot perform all the duties of his or her occupation, the individual can perform enough to remain employed, albeit at a lower income. Partial disability provisions pay a reduced benefit, providing a financial incentive for the insured to get back to work as soon as possible. Residual disability refers to the possibility that although the insured can perform all the duties of his or her occupation, the individual cannot earn as much money as before. Consider the surgeon who can still perform operations but because of a back injury cannot perform as many surgeries per day as before the injury. The reduction in income would be addressed by the residual disability benefit, which is smaller than the benefit for full disability.

Typically, insurers will cover compensation only up to specific amounts. Furthermore, they will insure only up to a specific percentage of compensation, perhaps 60%–80%, for two reasons. First, if the insured becomes disabled, other expenses decrease, such as certain payroll taxes, commuting costs, clothing, and food; thus, full replacement is not necessary. Second, there is a greater chance for fraudulent claims if the disability income payments are close to the normal compensation.

Other aspects of disability income insurance include the following:

- The *benefit period* specifies how long payments will be made. A specified number of years may be stated in the policy, but typically, the benefit period lasts until normal retirement age, which varies globally between approximately 55 and 70. The age limit discourages the filing of fraudulent claims intended to substitute disability benefits for retirement income. Usually, a minimum number of years of benefits, perhaps five, is specified in case the individual should

become disabled within that many years of the specified age. For example, a 62-year-old who becomes disabled would receive benefits to age 67. This provision encourages individuals to maintain their policies all the way to retirement.

- The *elimination period*, or *waiting period*, specifies the number of days the insured must be disabled before payments begin being made. Naturally, the shorter the elimination period, the higher the premiums. A typical elimination period for policies in the United States is 90 days.
- The *rehabilitation clause* provides payments for physical therapy and related services to help the disabled person rejoin the workforce as soon as possible.
- The *waiver of premium* clause specifies that premiums need not be paid if the insured becomes disabled, and it often includes a reimbursement of premiums during the elimination period.
- The *option to purchase additional insurance rider* allows the insured to increase coverage without further proof of insurability, albeit at the rate appropriate for the insured's current age.
- A *non-cancelable and guaranteed renewable* policy guarantees that the policy will be renewed annually as long as premiums are paid and that there will be no changes to premiums or promised disability benefits until, usually, age 65. Even if employment income declines during the working life, the monthly benefit will remain at the level specified in the policy.
- A *non-cancelable* policy cannot be canceled as long as premiums are paid, but the insurer can increase premiums for the entire underwriting class that includes the insured. This version is less expensive than a non-cancelable and guaranteed renewable policy, but one should be aware that insurance companies with significant loss experience are likely to raise rates.
- Inflation adjustments to benefits may be provided by a *cost of living rider*, which will adjust benefits with an accepted index or by a specified percentage per year.

Note that, as with virtually all insurance types, any provision in a disability insurance policy that appears advantageous to the insured party will likely increase the premium.

4.3 Property Insurance

Property insurance is used by individuals to manage property risk, which was discussed earlier in the reading. Although property insurance coverage applies to a multitude of situations, for most individuals, the primary areas to cover are the home/residence and the automobile.

4.3.1 *Homeowner's Insurance*

With regard to a residence, homeowner's insurance is designed to address risks associated with home ownership as well as risks associated with personal property and liability. Renter's insurance is similar to homeowner's insurance but without coverage on the structure. Property insurance protects the insured in case of loss related to his or her property. As we discussed earlier, there are, of course, many different possible events relating to property risk, such as a house fire, an automobile collision, a stolen television, or a lost necklace.

Homeowner's policies may be specified as "all-risks," which means that all risks are included except those specified, or as "named-risks," which means that only those risks specifically listed are covered. All-risks policies are generally more costly. Homeowner's insurance may also be available in either of two versions, based on the way a claim is settled. A policy based on *replacement cost* will reimburse the insured person for the amount required to repair a damaged item or replace a lost, destroyed,

or stolen item with a new item of similar quality at current prices. A policy based on *actual cash value* will reimburse the insured person for the replacement cost less depreciation. The replacement cost version is a more expensive policy.

As mentioned earlier in the reading, a *deductible* is the amount of a loss that must be absorbed by the policy owner before the insurance company will make any payment. Deductibles represent a form of active risk retention. If the homeowner's policy has a US$1,000 deductible and there is hail damage of $10,000, the homeowner must pay the first $1,000 and the insurance company would be liable for the remaining $9,000. Deductibles ensure that the homeowner retains some responsibility (and risk) associated with a loss.

As part of their business models, insurance companies price their policies to encourage the use of higher deductibles. For the consumer, this means that a cost–benefit analysis should be performed when determining the optimal deductible level because a larger deductible likely means a lower insurance premium. Imagine that a policy with a $1,000 deductible for a given property has an annual premium of $2,000 and a policy with a $500 deductible has an annual premium of $2,100. The consumer should recognize that selecting the second policy means essentially paying $100 more for a $1,000 insurance policy that has a $500 deductible. An alternative way of looking at it is to ask whether it is worth $100 to insure the second $500 of loss.

Some individuals underinsure their homes to save money, but they do so at their own risk. If a potential loss could exceed the amount of insurance, that individual is retaining risk of that excess amount, either consciously or unconsciously. For individuals who have significant wealth, whose home is a relatively small percentage of their net worth, and who have adequate liquidity, it may make sense to self-insure these types of risks (i.e., maintain only a limited amount of homeowner's insurance or own a policy with a very high deductible).

Mortgage lenders typically require that the homeowner carry enough insurance that if the mortgagor dies, a total loss would trigger payment of an amount at least equal to the outstanding mortgage. Because mortgage balances typically decline over time, insurance contracts covering the outstanding mortgage can be purchased with a decreasing face value and decreasing premiums.

Insurance companies have a different interest from that of mortgage lenders. They want the house to be insured for its full value—less the value of the land because the land will not be destroyed—or at least a high percentage of full value. Premiums are calculated based on this assumption. Although the insurance company is obligated to pay only the face value of the policy in the case of a total loss, it is at a disadvantage if partial losses occur.

Consider a $500,000 (replacement cost) home that, because inflation in home prices has been ignored, is insured for only $250,000. In the absence of other contractual restrictions, if the house sustains $250,000 of damage in a fire, the insurance company would have to pay the entire face value of the policy even though the house sustained only a 50% loss. From the company's standpoint, it should have been receiving the larger premiums for a $500,000 house to pay $250,000 for a 50% loss.

To offset this dilemma, losses are reimbursed at a lower rate if the home is underinsured. It is common for an insurance company to reduce payments if the home is insured for less than 80% of its replacement cost.

Homeowners' liability risks are typically addressed within the insurance policy on the home. That is, there is a provision in the policy for liability coverage for a specified amount in case, for example, a visitor is injured in an accident at the home. This coverage excludes professional liability, such as physicians' malpractice insurance, and business liability, which should be covered with separate policies. The homeowner's policy also excludes liability resulting from intentional acts—for example, throwing a chair through a neighbor's window.

Aside from purchasing homeowner's insurance, one can address homeowner risk through other risk management techniques. The following are some examples:

- Risk of theft of valuable financial documents can be avoided by storing them in a bank's safe deposit box.
- Risk of overall theft can be reduced through the use of high-quality locks, alarms, and surveillance systems.
- Risk of loss or corruption of electronic data can be avoided by storing backups offsite.
- Risk of damage to electronic equipment from a power surge can be reduced by installing surge protectors.
- Risk of loss from fire can be reduced through the use of fire-resistant building materials—and through the easy availability of fire extinguishers.

4.3.2 *Automobile Insurance*

Automobile property risk can also be addressed through various risk management methods. For example, one might avoid driving in inclement weather conditions. One might require passengers to wear seat belts, reducing their likelihood of injury. One might use common, frequently promoted safe driving techniques or even take alternate routes that are less risky. If buying a new car, one might consider a vehicle with a backup camera and lane-change warning system.

Automobile insurance rates are primarily based on the value of the automobile and the primary operator's age and driving record. Other factors are also included but vary considerably among jurisdictions. Coverages for damage to the automobile are typically divided into two parts. *Collision coverage* is for damage from an accident, and *comprehensive coverage* is for damage from other sources, such as glass breakage, hail, and theft. There may also be coverage available in case one's automobile is damaged by an uninsured or underinsured driver, as well as medical coverage for passengers in the insured's automobile. Insurance companies normally insure automobiles only up to the cost of replacing the automobile with one of the same make and model and in the same condition. If the cost to repair the automobile exceeds its actual cash value, the insurance company typically reimburses only the amount of the actual cash value.

As with homeowner's insurance, automobile owners typically retain some risk through the use of deductibles or by avoiding collision and comprehensive coverage. Again, selecting the amount of the deductible or rejecting property coverage involves a simple cost–benefit analysis. If the individual is able to bear the wealth risk and to afford repairs or a new car if damage occurs, then risk retention will increase expected wealth over time.

Liability associated with automobiles is typically covered under the same policy, with specified limits for bodily injury and property damage. In most countries, some level of third-party coverage is mandatory and additional insurance may be purchased to increase the level of protection. Liability limits often vary for different types of loss—for example, higher limits to cover the costs of physical injury and separate limits to cover the loss of property. If actual liability in an accident exceeds these amounts, the automobile owner is responsible for the remainder.

4.4 Health/Medical Insurance

Any discussion of **health insurance** is highly dependent on the country of residence. In certain countries, health care is governmentally funded and there is no private health insurance. In others, there is a two-tiered system, with governmental coverage for everyone and upgraded coverage for additional payments.

In the United States, one type of insurance approach is called an *indemnity plan*, which allows the insured to go to essentially any medical service provider, but the insured must pay a specified percentage of the "reasonable and customary" fees. Another type of plan is a *preferred provider organization* (PPO), which is a large network of physicians and other medical service providers that charge lower prices to individuals within the plan than to individuals who obtain care on their own. A third type of plan is a *health maintenance organization* (HMO), which allows office visits at no, or very little, cost to encourage individuals to seek help for small medical problems before they become more serious.

Comprehensive major medical insurance covers the vast majority of health care expenses, such as physicians' fees, surgical fees, hospitalization, laboratory fees, x-rays, magnetic resonance imaging (MRIs), and most other expenses that are "reasonable and customary" and part of generally accepted medical care. Aside from the premiums for the actual coverage, major medical insurance includes several other provisions that can substantially influence the total financial outlay. Below are some of the key terms of most health (medical) insurance plans:

- *Deductibles* refer to the amount of health care expenses that the insured person must pay in a year before any expense reimbursement is paid by the insurance company.
- *Coinsurance* specifies the percentage of any expense that the insurance company will pay, often 80%, with the insured person responsible for the remainder.
- *Copayments* are fixed payments that the insured must make for a particular service, such as a doctor's office visit.
- *Maximum out-of-pocket expense* refers to the total amount of expenses incurred within a year beyond which the insurance company pays 100%. It is often expressed in terms of an individual maximum and a family maximum. This concept is often referred to as a stop-loss limit.
- *Maximum yearly benefit* refers to the maximum amount that the insurance company will pay in a year.
- *Maximum lifetime benefit* refers to the maximum amount that the insurance company will pay over an individual's lifetime.
- *Preexisting conditions* refer to health conditions that the insured had when applying for insurance. They may or may not be covered by the insurance company, depending on the policy, laws, and regulations.
- *Preadmission certification* refers to a requirement that the insured receive approval from the insurer before a scheduled (non-emergency) hospital stay or treatment.

Of course, the cost of a plan will be affected by the degree of inclusion and specified value of the preceding provisions. Besides the cost of the plan, health insurance purchasers should be concerned about the breadth and quality of the network of physicians and hospitals available to insured individuals.

4.5 Liability Insurance

To manage liability risk, individuals often obtain **liability insurance**. It is possible that the amount of liability coverage in the homeowner's and automobile insurance policies is less than one thinks is appropriate. In that case, it is reasonable to purchase a *personal umbrella liability insurance* policy. This type of policy has specified limits but pays claims only if the liability limit of the homeowner's or automobile policy is exceeded. For example, consider an individual whose automobile policy specifies a property damage liability limit of US$100,000 and who has an umbrella policy with

a liability limit of US$1 million. If that individual is responsible for an automobile accident that causes US$300,000 of damage, the automobile policy would pay the first US$100,000 and the umbrella policy would pay the remaining US$200,000. Umbrella policies are relatively inexpensive.

It is common for people to think of liability insurance coverage in terms of protecting one's own financial assets. Some jurisdictions may specify exempt property—one's home or retirement savings, for example—that cannot be seized in the case that liability for an accident exceeds the amount of insurance coverage. Thus, one might ask oneself, "What is the worst thing that could happen to me in case of an extremely large liability judgment?" But if the goal is to indemnify the injured party—that is, to make the injured party "whole" financially—the amount of insurance purchased should be based on the potential financial catastrophe that could face an injured party.

4.6 Other Types of Insurance

Other types of risks may be present, depending on the individual's situation. For example, when purchasing a home, many individuals purchase *title insurance* (and in some jurisdictions, it is required). The purpose of title insurance is to make sure that ownership of the property is not in doubt. Personal watercraft and trailers may require a separate insurance policy or an endorsement, which is a form of insurance coverage added to an existing policy to cover risks that are not otherwise included in that policy. Again, appropriate levels of risk avoidance, reduction, prevention, and retention will depend on the situation and the size and probability of the potential loss.

One may consider service contracts when purchasing an automobile, home appliance, or other sizable product to avoid repair costs. These types of pseudo-insurance are profit centers for the companies selling them and are often relatively expensive for consumers, partly because of a lack of competition. For example, at the time of purchase of an automobile, one may be offered the opportunity to purchase an extended warranty at the same time from the automobile dealer. There is limited opportunity for price shopping, and the price of the service contract can usually be rolled into the automobile loan. Under these circumstances, the automobile dealer can charge a high rate to the disadvantage of the purchaser. Note that even this type of contract typically involves a deductible.

4.7 Annuities

Individuals have a finite but unknown lifespan. The efficient allocation of financial resources across an unknown lifespan is a planning challenge because consumption smoothing requires the allocation of available financial resources across an expected time frame. Humans may plan to spread their resources based on an average lifetime, but this strategy exposes them to the risk of outliving their assets in old age. One efficient strategy is to pool the risk of an unknown lifespan across individuals through the use of an annuity.

Annuities have existed in a variety of forms for thousands of years. The Romans sold a financial instrument called an "annua" that returned a fixed yearly payment, either for life or for a specified period, in return for a lump sum payment. Even today, annuities remain popular risk management tools, especially for older individuals and retirees who want to mitigate the risk associated with outliving their assets (i.e., longevity risk). Annuities are generally purchased from an insurance company; however, government pensions and payouts from employer pension plans are also technically annuities.

Annuities have become increasingly complex over time, and various types exist. With an **immediate annuity**, an amount of money is paid to the insurance company in return for a guarantee of specified future monthly payments over a specified period

of time, either a number of years or the life of the insured, who is called the *annuitant*. A **deferred annuity** allows an individual to purchase an income stream to begin at a later date. We further discuss various forms of immediate and deferred annuities in the following sections.

The annuity payment guaranteed by the insurance company is most directly based on the amount of money tendered, the age and gender of the annuitant, and the insurance company's required rate of return (including its cost of funds and its expense and profit factors). Although life insurance helps provide financial protection in case the insured "dies too soon," immediate life annuities provide financial protection in case the insured "lives too long."

In this section, we discuss some of the key aspects of annuities, such as the parties to an annuity contract, the different types of annuities that exist, payout methods, annuity taxation, and the appropriateness of annuities for individuals. We conclude with an overview of how annuities can benefit retirees and provide a framework that explains which retirees may benefit the most from an annuity.

4.7.1 *Parties to an Annuity Contract*

There are four primary parties to an annuity contract: the insurer, the annuitant, the contract owner, and the beneficiary. The insurer—generally an insurance company—is the entity that is licensed to sell the annuity. The annuitant is the person who receives the benefits. The contract owner is the individual who purchases the annuity and is typically the annuitant. In some instances, the contract owner and the annuitant may be different: For example, if the annuity is purchased by a company for a retiring employee, then the company is the contract owner and the employee is the annuitant. Lastly, the beneficiary is an individual or entity that will receive any proceeds upon the death of the annuitant. For contracts like a plain vanilla single-premium annuity, there may not be any death benefit; however, with variable annuities and annuities with some kind of minimum guaranteed payment period (e.g., 10 years), often referred to as a "period certain" option, there may be some residual value once the annuitant passes away.

4.7.2 *Classification of Annuities*

There are a variety of ways to classify annuities. The two most critical dimensions that help distinguish the primary types of annuities are (1) deferred versus immediate and (2) fixed versus variable. We will expand on these types shortly, but briefly, deferred annuities provide income that begins at a future date after the initial purchase of the annuity. In some cases, the original investment may retain some liquidity prior to initiation of annuity payments if the purchaser retains the right to sell the deferred annuity. In contrast, with immediate payout annuities—or single-premium immediate annuities (SPIAs), as they are often called—the individual permanently exchanges a lump sum for a contract that promises to pay the annuitant an income for life. For both deferred and immediate annuities, the annuity can be invested in what is termed a "fixed" account or a "variable" account.

Many other versions of annuities are available to meet different needs. For example, a *joint life annuity* is based on the expected lifespans of two annuitants, usually husband and wife, and payments are made as long as at least one of the two is alive. All else equal, the monthly payment is lower for this type of annuity because adding a second annuitant extends the payment timespan.

4.7.2.1 Deferred Variable Annuities In its most basic form, a deferred variable annuity is similar to a mutual fund, although it is structured as an insurance contract and typically sold by someone licensed to sell insurance products. With most deferred variable annuities, there is a menu of potential investment options from which an individual can choose. Typical investment options might include a pre-determined target risk asset

allocation consisting of a diversified mix of securities managed by multiple investment managers. Many of the investment managers replicate popular mutual fund strategies for the annuity separate account. Compared with traditional investment programs (e.g., mutual funds), these annuities can be more expensive for investors, and the number of investment fund options within the programs may be limited.

Deferred variable annuity contracts may include a death benefit. A typical death benefit guarantees that the beneficiary named in the contract will receive the entire amount used to purchase the annuity—a feature that has value to the beneficiary only if the individual dies when the value of the contract is less than the initial investment. Like all features of deferred annuities, the death benefit creates a risk for the issuing insurance company. To offset this risk, the insurance company charges a fee. As with mutual funds, individuals maintain control of their money through the right to exit (or sell) the contract, although there can be considerable surrender charges for withdrawing one's money. Also, similar to mutual funds, a deferred variable annuity does not guarantee lifetime income unless the individual (1) adds an additional feature (a contract rider) or (2) annuitizes the contract by converting the value of the deferred variable annuity into an immediate payout annuity. It is worth noting that relatively few deferred variable annuity investors end up "annuitizing."

Adding a guaranteed minimum withdrawal benefit for life rider to a deferred variable annuity can create a guaranteed income stream for life for the investor. The typical guaranteed minimum withdrawal benefit for life promises to pay the individual a fixed percentage (e.g., 4%) of the initial investment value as long as he or she lives. Each payment is subtracted from the current value of the deferred variable annuity contract. If the markets continue to perform well, the initial investment value may not be depleted, and any remaining value will go to the investor's beneficiaries. In a down market, the investment value may be depleted. If this is the case, the insurance company is contractually obligated to continue to pay the investor the guaranteed minimum benefit as long as the investor is alive.

4.7.2.2 Deferred Fixed Annuities Deferred fixed annuities provide an annuity payout that begins at some future date. For each dollar invested, the insurance company will tell the investor how much income he or she will receive when annuity payments commence at a specified age in the future. It costs considerably less for a 30-year-old to purchase a dollar of income for life starting at age 65 than it does for a 55-year-old to purchase a dollar of income for life starting at age 65. At any point prior to annuitization (i.e., conversion of the investment into an annuity), the investor can cash out and receive the economic value of the accumulated purchases less any applicable surrender charges, in which case the annuity contract is terminated. Once in retirement, the individual has two options: (1) cash out or (2) begin withdrawing the accumulated funds. In either case, the "economic value" of the accumulated purchases is annuitized, converting the deferred fixed annuity into an immediate fixed annuity (which we discuss in Section 4.7.2.4). In contrast to deferred variable annuities, which most investors choose not to annuitize, most deferred fixed annuities are eventually annuitized.

4.7.2.3 Immediate Variable Annuities With an immediate variable annuity, the individual permanently exchanges a lump sum for an annuity contract that promises to pay the annuitant an income for life. As the name suggests, the amount of the payments varies over time based on the performance of the portfolios that the assets are invested in. A common feature that can be added to an immediate variable annuity for an additional cost is an income floor that protects the annuitant in the event of a down market.

4.7.2.4 Immediate Fixed Annuities With immediate fixed annuities, the most common and most utilized type of annuity, an individual trades a sum of money today for a promised income benefit for as long as he or she is alive. The "income yield" for an

immediate fixed annuity is the total amount of ongoing annual income received as a percentage of the initial purchase price. For example, if an individual purchases an immediate fixed annuity for $100,000 and in exchange receives a guarantee to be paid $8,000 per year for as long as the individual is alive, the income yield for the annuity would be 8%.

The income yield for immediate fixed annuities, or any type of annuity, varies based on a number of factors. One key factor is the age of the insured individual (or individuals). Exhibit 7 contains the payout rates for two different immediate annuity types: a life-only annuity (which pays benefits only as long as the individual is alive, with no residual benefits) and a life annuity with a 10-year certain payment (whereby benefits are guaranteed to last for at least 10 years). Quotes are included for three different types of annuitants: male, female, and joint (a couple). (The couple consists of a male and a female assumed to be the same age, and the survivor benefit is 100% of the primary benefit; that is, the benefit stays the same as long as either of the couple survives.)

Exhibit 7 An Example of Annual Payouts as a Percentage of Initial Premium

Life Only				Life with 10-Year Period Certain			
Age	Male	Female	Joint	Age	Male	Female	Joint
60	6.28%	5.87%	5.51%	60	6.15%	5.86%	5.42%
65	7.02	6.47	5.96	65	6.75	6.32	5.88
70	8.04	7.31	6.65	70	7.46	7.01	6.59
75	9.53	8.73	7.68	75	8.33	7.93	7.45
80	11.90	10.87	9.35	80	9.30	8.96	8.51
85	15.17	14.27	11.70	85	10.08	9.95	9.45
90	20.10	19.34	14.51	90	10.66	10.49	9.86

Source: www.immediateannuities.com (retrieved December 2014).

There are a number of important takeaways from Exhibit 7. First, the payouts (i.e., income yields) are higher when expected remaining longevity is shorter. For example, a male of 85 will receive a higher income yield than a male of 65 because the older male has a shorter life expectancy. A 65-year-old female will have a smaller payout than a 65-year-old male because females have a longer average life expectancy than males. The income yield is determined by estimating the average longevity of a given annuitant pool. A shorter average payment period will mean higher income for the older annuitants in the pool.

Another takeaway from the table is that the inclusion of a period certain (or return-of-premium feature) will reduce the payout, but to varying degrees. For example, adding the 10-year period certain has a relatively small effect on the income yield for a 60-year-old male (which decreases from 6.28% to 6.15%), but it has a significantly greater impact for the 90-year-old male (whose payout rate decreases from 20.10% to 10.66%). Again, this difference is based on life expectancies. The probability of a 60-year-old male dying in the first 10 years is much smaller than the probability of a 90-year-old male dying over the next 10 years, so the payouts are adjusted accordingly. An individual who is concerned with lifetime income maximization is likely better off not adding any type of rider that includes a residual benefit; however, such a rider may be desirable if an individual has competing goals of generating lifetime income and providing some residual wealth for heirs.

In addition to mortality, another key variable that affects annuity pricing is the expected return the insurance company can earn on premiums. Because insurance companies tend to invest conservatively, the available yield on bonds provides a relatively good proxy, at least from a historical perspective, for how payout rates change over time. When current yields on bonds are lower than historical bond yields and life expectancies are increasing, payouts on annuities will be relatively low by historical standards. Low annuity yields may discourage many individuals from buying annuities if they believe that yields will eventually go back up. In reality, however, lower annuity payout rates simply reflect the increasing cost of hedging longevity risk using available investments.

4.7.2.5 Advanced Life Deferred Annuities The final type of annuity that we discuss is a hybrid of a deferred fixed annuity and an immediate fixed annuity. This so-called *advanced life deferred annuity* (ALDA) is often referred to as pure longevity insurance. Although it might sound a bit contradictory, ALDAs are deferred immediate payout annuities. Similar to an immediate fixed annuity, an ALDA involves the permanent exchange of a lump sum for an insurance contract that promises to pay an income. However, in contrast to an immediate payout annuity, for which the payments begin immediately, an ALDA's payments begin later in life—for example, when the individual turns 80 or 85.

Given that a specific monthly benefit may not begin until age 85, a deferred immediate life annuity would clearly cost less to purchase than a regular immediate life annuity. We note three reasons for this lower cost. First, because payments on the deferred annuity begin so far in the future, the insurance company has ample time to earn money on the amount tendered. Second, life expectancy for an 85-year-old is much shorter than for a 65-year-old, so the number of payments made will be fewer. Third, it is quite possible that the annuitant may actually die before any payments are made. For a relatively small premium, longevity insurance can provide additional security and can supplement income in later years.

EXAMPLE 12

Comparing Annuities

Compare fixed immediate annuities and variable immediate annuities.

Solution:

Both fixed and variable immediate annuities represent an irrevocable exchange of money for an insurance contract (the annuity contract). With a fixed immediate annuity, payments are "fixed" in either nominal terms or, in some cases, real terms, providing certainty about payment streams. With both fixed and variable immediate annuities, a common feature is a "period certain," whereby the payments continue to a designated beneficiary for a specified period, typically 10 years.

4.7.3 *Advantages and Disadvantages of Fixed and Variable Annuities*

In this section, we discuss the relative advantages and disadvantages of both fixed and variable annuities. As a reminder, fixed annuities provide a benefit that is fixed (or known) for life, whereas variable annuities have a benefit that can change over time and that benefit is generally based on the performance of some underlying portfolio or investment. When selecting between fixed and variable annuities, there are a number of important considerations.

4.7.3.1 Volatility of Benefit Amount The most obvious difference between fixed and variable annuities is the type of benefit. Fixed annuities provide a constant income stream that is guaranteed not to change, whereas the income from a variable annuity could change considerably depending on the terms of the annuity payout. Retirees seeking a high level of assurance with respect to benefit payouts are likely better served by a fixed annuity, or a variable annuity that limits the possible change in the benefit over time. Retirees who are risk tolerant may be more interested in a variable annuity. If a retiree is willing to adjust his or her spending over time, that individual may be able to increase the amount spent each year by selecting a variable annuity for which the payment is linked to a risky portfolio of assets.

4.7.3.2 Flexibility The flexibility of an annuity varies materially with the type of annuity and its individual features. For example, an individual who purchases an immediate fixed annuity has effectively traded some amount of wealth for a guarantee of income for life. In most situations, this exchange is irrevocable: The individual who purchased the immediate fixed annuity cannot "undo" the transaction and request the original purchase amount back. The fact that these annuities are irrevocable makes sense from the insurer's perspective because (in theory) if given the option, every individual would request the initial premium back.

Variable annuity payments are typically tied to the performance of an underlying subaccount. This subaccount can often be withdrawn by the annuitant, subject to limitations. Therefore, variable annuities can provide the annuitant with guaranteed income for life as well as the flexibility to access the funds should he or she (or they) need to do so. There may be penalties associated with withdrawing funds from a variable annuity, and in some cases, withdrawals may not be allowed (e.g., in the case of an immediate variable annuity).

4.7.3.3 Future Market Expectations A fixed annuity locks the annuitant into a portfolio of bond-like assets at whatever rate of return exists at the time of purchase. This scenario creates some interest rate risk because the value of these underlying securities will fall if interest rates rise.

If the annuitant assumes that interest rates will vary over time, he or she may be tempted to delay annuitization until interest rates rise. This delay, however, will reduce expected consumption during the delay period because the annuitant receives only market returns on investment assets and no mortality credits. Mortality credits, which will be discussed at greater length shortly, are effectively the difference between the future payout one would receive without pooling one's investments and the future payout one receives when the investment pool includes individuals who have already passed away. Delay of annuitization may also expose the annuitant to the risk that life expectancies will systematically increase during the delay period, which would increase the cost of annuitization (i.e., decrease future potential available payouts). Annuitizing earlier allows the annuitant to hedge the risk of a large increase in future longevity for a population.

Variable annuities allow an annuitant to accept some variation in payments in return for the possibility of higher future payments if the market performs well. Because most retirees will rationally accept some market risk with their investment portfolio, this option allows individuals to increase their retirement income efficiency by benefiting from both a mortality credit and a risk premium. The benefit of accepting market risk varies by type of annuity, and many variable annuity features limit the potential growth in income payments in future time periods. Variable annuities without growth-limiting features, such as minimum income guarantees, are most likely to provide a future income that outpaces inflation on average.

4.7.3.4 Fees The fees associated with variable annuities tend to be higher than those for fixed annuities. These higher fees come from a variety of factors but are primarily attributable to the costs of hedging market risk, administrative expenses, and reduced price competition. Evidence suggests that the price of insurance products is significantly affected by price competition, and immediate fixed annuities are much easier for a consumer to compare (the consumer will simply select the highest annuity payment for the amount he or she will spend). The opaque pricing of variable annuities can reduce price competition if consumers are unable to easily compare the relative efficiency of product characteristics. A thorough price analysis may require weighing the possible added costs of opaque variable annuity features—perhaps using analytical tools to help assess these costs—against the benefits of a potentially higher return.

4.7.3.5 Inflation Concerns Inflation can have a significant negative impact on the real income received from a fixed annuity. For example, if annual inflation averages 3%, after approximately 24 years, the income would be worth approximately half as much as it was worth when the annuity began. In their purest form, fixed annuities are nominal and will not change with inflation; however, it is possible to create a partial inflation hedge by having benefits "step up" some predetermined amount each year (e.g., 3%). Although this adjustment is not a perfect inflation hedge, it does provide a mechanism to ensure that payments increase over time. There are a number of variable annuities (and riders on fixed annuities) that allow the payments to increase or decrease based on changes in inflation. An individual interested in guaranteeing some lifetime level of income that changes with inflation may find these types of policies or riders valuable.

4.7.4 *Payout Methods*

The payout methods available from an annuity are similar regardless of whether the annuity is fixed or variable. In certain instances, the annuitant is unable to choose the payout method, especially with some types of government pensions, but there is generally some level of choice when purchasing a private annuity from an insurance company. The primary payout methods were discussed previously but are summarized again here:

- *Life annuity:* Payments are made for the entire life of the annuitant and cease at his or her death.
- *Period-certain annuity:* Payments are made for a specified number of periods without regard to the lifespan or expected lifespan of the annuitant.
- *Life annuity with period certain:* This payment type combines the features associated with a life annuity and a period-certain annuity, so payments are made for the entire life of the annuitant but are guaranteed for a minimum number of years even if the annuitant dies. The most common length of the period certain is 10 years. For example, if the annuitant dies after 6 years, a life annuity with 10 years period certain will make payments to the annuitant's beneficiary for the remaining 4 years and then cease.
- *Life annuity with refund:* This type is similar to a life annuity with period certain, but instead of guaranteeing payments for life or for a certain number of years, a life annuity with refund guarantees that the annuitant (or the beneficiary) will receive payments equal to the total amount paid into the contract, which is equal to the initial investment amount less fees.
- *Joint life annuity:* With a life annuity on two or more individuals, such as a husband and a wife, payments continue until both members are no longer living. For example, a married couple may purchase an immediate annuity that pays a monthly benefit as long as either one of them is alive. The contract states

the benefit that the survivor will receive, which can be as much as 100% of the primary benefit or a smaller amount, such as 50% or 75% of the full benefit. The annuity payments cease when the survivor passes away.

It is important to note that the payout methods are not mutually exclusive. In theory, one could combine each of the different methods into a single annuity. Annuity payments can also be made at different frequencies, such as monthly, quarterly, or annually, although monthly payments are generally the most common. It is also possible to include riders or other methods that specify how the benefit may change over time. For example, it is possible to purchase an annuity for which the payment increases by some fixed percentage (or amount) each year.

4.7.5 *Annuity Benefit Taxation*

In some locations, annuities can offer attractive tax benefits, such as tax-deferred growth. For example, in the United States, the growth in an annuity is taxed only when the individual receives income from the annuity. This presents an opportunity for tax-deferred growth, especially for someone who purchases the annuity at a relatively young age or has exhausted other tax-sheltering alternatives. The actual taxation of the benefits varies considerably by type of annuity but is generally based on some average of the difference between the amount paid for the annuity and the benefits received.

The actual method of taxation varies materially by country, and before purchasing an annuity or recommending an annuity for a client, one should become familiar with the applicable tax consequences or consult a local expert on annuity taxation. In general, the potential for tax deferral, combined with a high marginal tax rate on alternative investments, may make annuities attractive for retirees.

4.7.6 *Appropriateness of Annuities*

When creating an income stream from a pool of assets, each retiree has a choice. The individual can choose either to receive periodic withdrawals from an investment portfolio (i.e., not annuitize) or to purchase an annuity (i.e., annuitize). This decision is obviously based on a variety of factors and preferences. When discussing the potential benefits of annuitizing, it is important to understand the concept of mortality credits (which we briefly mentioned earlier). Each payment received by the annuitant is a combination of principal, interest, and mortality credits. Mortality credits are the benefits that survivors receive from those individuals in the mortality pool who have already passed away. It is possible to demonstrate this effect visually using a chart (see Exhibit 8).

In Exhibit 8, we show an example of mortality credits for US male individuals, using male mortality rates based on the Society of Actuaries' 2012 Individual Annuity Reserve Table and an interest rate of 3%. We also assume that the individual receives US$70 of annual income for life for an approximate initial cost of US$1,000. Given these assumptions, the annual benefit payment can be decomposed into three parts: interest (based on the remaining assets from the initial investment minus benefits paid), return of premium, and mortality credits.

Exhibit 8 Mortality Credits

An individual who self-insures longevity risk would receive only (approximately) the interest and return-of-premium portions of Exhibit 8. The additional mortality credits arise because some individuals will pass away early, thereby subsidizing the future benefits of those individuals who are still alive. In this way, an individual can receive more income and additional certainty from purchasing an annuity. However, this certainty comes at a cost because the expected benefits of an annuity are generally not positive. Annuities are a form of insurance, and most forms of insurance, by definition, do not (and should not) have a positive expected value because it would imply that the insurance company lost money on the average policy sold. Moreover, it would likely not be advantageous to purchase an annuity from an insurance company that lost money on the average policy sold because that company would likely eventually go out of business and no longer be able to fund future expected benefit payments.

Therefore, an individual who purchases an annuity is acquiring the benefit of certainty regarding lifetime income in exchange for accepting lower potential wealth at death, as well as lower lifetime income depending on the cost of the annuity. This perspective can be used to create a "retirement income efficient frontier" whereby the decision of how much to annuitize is based on an individual's preference for wealth maximization and aversion to running out of money. This concept is similar to the traditional Markowitz (1952) efficient frontier; but for the retirement income efficient frontier, wealth replaces expected returns on the vertical axis and shortfall risk (which is defined approximately as the risk associated with running out of money over one's lifetime) replaces standard deviation on the horizontal axis. The exact definitions of "wealth" and "shortfall risk" (as well as the terms themselves) have varied across literature but still tend to be relatively consistent. The concept of the retirement income efficient frontier, which is displayed visually in Exhibit 9, is derived from Chen and Milevsky (2003), among others.

Exhibit 9 Retirement Income Efficient Frontier

Certain factors can generally be expected to affect a retiree's demand for annuities, either positively or negatively. For example, the following factors would generally suggest increased demand for an annuity:

- Longer-than-average life expectancy
- Greater preference for lifetime income
- Less concern for leaving money to heirs
- More conservative investing preferences (i.e., greater risk aversion)
- Lower guaranteed income from other sources (such as pensions)

The broad international shift away from defined benefit plans and toward defined contribution plans has increased the demand for annuities. Therefore, it is important to have an understanding of annuities and which individuals they are most likely to benefit.

IMPLEMENTATION OF RISK MANAGEMENT FOR INDIVIDUALS

5

A variety of factors need to be considered when implementing an optimal risk management strategy for an individual or a household. In this section, we will indicate how human capital affects the asset allocation decision, provide a case study analyzing and critiquing an insurance program, and present appropriate strategies for asset allocation and risk reduction for a given investor.

5.1 Determining the Optimal Risk Management Strategy

As with portfolio selection, the decision to retain risk or to manage risk through insurance or annuities is determined by a household's risk tolerance. At the same level of wealth, a more risk-tolerant household will prefer to retain more risk—either through higher insurance deductibles or by simply buying little or no insurance—than a less risk-tolerant household. Additionally, the amount of overhead and administrative expenses built into the cost of the insurance (the load) will vary by product.

If an individual decides not to insure a risk exposure, he or she may still choose to moderate the impact of a potential loss. The term *loss control* refers to efforts to reduce or eliminate the costs associated with risks. There are three general approaches to loss control. *Risk avoidance* is the purest form of loss control. That is, one can remove the possibility that an event involving loss will occur. For example, one may avoid the risk of loss of a collector car or piece of jewelry by selling the asset. This strategy can be particularly appealing if the asset is no longer providing significant utility, or if the magnitude of the risk exposure rises because of price appreciation. Two other types of loss control are *loss prevention* and *loss reduction*. Loss prevention is the process of taking actions to reduce the probability that a loss event will occur. For example, installing a security system reduces the probability of a break-in that could lead to a loss by theft. Operating an automobile that has a backup camera reduces the probability of causing property damage or personal injury when the automobile is backing up. Installing a swimming pool alarm reduces the probability that a child will drown. Loss reduction is the process of seeking to reduce the size of a loss if a loss event occurs. For example, maintaining a high-quality fire extinguisher in the kitchen may allow a homeowner to contain a fire that would otherwise cause extreme damage. Unlike the loss prevention examples, the fire extinguisher does not reduce the likelihood of the loss event.

As initially discussed in Section 3.1.3, in addition to risk avoidance and risk reduction, individuals can also manage risk through the techniques of *risk transfer* and *risk retention*. Although risk transfer generally involves insurance or annuities, individuals can also use *non-insurance risk transfers* in many situations, and these usually take the form of contracts. For example, an apartment renter may select a long-term lease to lock in the amount of the monthly rent for a longer time during a period of inflation, thus transferring the risk of increased rent to the landlord, who then must absorb the opportunity cost. Incorporation of an individual's business provides a non-insurance risk transfer in many countries. By incorporating, the individual shields his or her personal financial assets from any legal judgment in which the business is found to be at fault.

A systematic risk management approach would be to consider the optimal strategy for each risk exposure. Some guidelines are helpful in deciding when it is appropriate to accept (retain) risk, when it is best to reduce the potential magnitude (or severity) of the risk, and when it makes sense to transfer risk. Small-magnitude risks below a risk retention limit should be retained (i.e., self-insured) and the magnitude/severity reduced to the point where the expected cost is equal to the expected benefit. For example, installing a high-quality fire-rated roof on a house may reduce both the probability of a fire (e.g., from sparks from a house fire next door) and the potential damage from a fire. However, the cost of installing a new, expensive roof may be too high to be justified. In this case, the large-magnitude potential loss from fire can be transferred through property insurance and a deductible can be used to set the optimal amount of risk retention.

A common risk management approach is summarized in Exhibit 10.

Exhibit 10 Risk Management Techniques

Loss characteristics	High frequency	Low frequency
High severity	Risk avoidance	Risk transfer
Low severity	Risk reduction	Risk retention

An insurance product can provide indemnification by ensuring that there will be no (or minimal) loss in net wealth. For example, an insurance claim will provide reimbursement of flood damage to a $20,000 vehicle if the household has a comprehensive insurance policy. If not, the household risks reducing its net wealth by the size of the loss exposure. Indemnification in life insurance can be more complex. A human life value analysis seeks to replace the loss in human capital. A needs analysis (as discussed in Section 4) estimates the present value of future consumption that would need to be replaced if the income of a primary earner were lost.

EXAMPLE 13

Risk Management Strategy

Describe *loss control* in risk management.

Solution:

Loss control refers to efforts to reduce or eliminate costs associated with risks. A simple method of loss control is to avoid risks (risk avoidance)—for example, by not engaging in high-risk hobbies, such as rock climbing. Another approach to loss control is loss prevention, in which one attempts to reduce the likelihood of a risky event. For example, one may install an alarm system to discourage burglars. Loss reduction refers to approaches that attempt to minimize the size of the loss if a risky event does occur. For example, an airbag in an automobile does not reduce the likelihood of an accident, but it may reduce the seriousness of injuries sustained by those involved in an accident.

5.2 Analyzing an Insurance Program

This section provides a case study of how one might analyze an individual's insurance needs and design an insurance program. In this case, Jacques and Marion Perrier are 40 years old and 38 years old, respectively. They have two children: Henri, age 8, and Émilie, age 6. Jacques is a manager of technical services for a large corporation and earns €100,000 per year. Marion works part-time as a nurse, earning €20,000 after tax per year but plans to return to full-time work in 10 years, when Émilie turns 16. Marion expects that, with adjusted market conditions and after 10 years of inflation, she will earn €60,000 after tax per year as a full-time nurse at that time. Jacques and Marion are in excellent health and maintain a lifestyle that is well within their income.

The family lives in the city in a comfortable condominium that they bought for €250,000 five years ago and that is currently valued at €300,000. They owe €190,000 on a mortgage that still has 25 years to maturity. Although both Jacques and Marion take public transportation to work, they have an automobile, which is 10 years old but in excellent condition with relatively few kilometers of use. Jacques and Marion intend to live in the condominium at least until Jacques's planned retirement at age 60. At that time, they will decide whether to remain in the condominium or move to the small town nearby where Jacques grew up.

Four years ago, when his parents died, Jacques inherited the moderately sized but attractive home where he grew up. It was worth €150,000 at the time and has increased in value to €165,000 (a 10% increase during this period). For two years, the family tried to use the house as a weekend retreat, but they discovered that their children's activities and the desire to go to different places caused them to use the house infrequently. For the past two years, they have rented the house to a middle-aged couple

who have no children. There is no debt on the house, and the rent is enough to pay for taxes and other expenses and to generate positive cash flow that Jacques and Marion are using for family vacations.

Both of Jacques's parents died at age 70. Marion's father died at age 80. Her mother, Françoise, is in good health at age 72, and women in her family have generally lived to very old ages. Françoise has a pension but does not have much in assets.

5.2.1 *Current Insurance Plan*

Life Insurance. Jacques bought a whole life insurance policy with a death benefit of €200,000 when Henri was born. Jacques is the insured, and his estate is the beneficiary. His employer also provides a €50,000 term life insurance policy that names Marion as the beneficiary. There is no life insurance on Marion.

Health Insurance. The family is covered by a national health insurance plan.

Disability Insurance. Jacques's employer provides short-term disability payments for up to six months. As a part-time employee, Marion has no disability benefits.

Long-Term Care Insurance. Elderly individuals in Jacques and Marion's country are eligible for long-term care at a cost equal to 75% of their pension benefits.

Property Insurance. The exterior of the condominium is insured through the condominium owners' association. The insured value is increased annually to consider current market and replacement values. Jacques and Marion have a property insurance policy on the contents of their condominium for €20,000. Jacques's parents insured the house for €100,000 15 years ago. They never increased the coverage, and Jacques has maintained the same policy. The automobile has coverage for liability and collision, as well as comprehensive coverage.

Data Summary

- Jacques: age 40; €100,000 annual earnings; €200,000 whole life insurance policy; €50,000 term life insurance policy
- Marion: age 38; €20,000 annual earnings after tax; no life insurance
- Children: Henri, age 8, and Émilie, age 6
- Condominium: €300,000 current value; €190,000 25-year remaining mortgage; exterior of building fully insured; contents insured for €20,000
- Rental home: €165,000 current value; no mortgage; insured for €100,000

5.2.2 *Program Review*

Life Insurance. As we discussed in Section 4.1.5, two approaches are commonly used in calculating life insurance needs. The first is the human life value method, which estimates the present value of earnings that must be replaced. As we will demonstrate, the human life value method indicates that Jacques should purchase approximately €1.11 million of additional life insurance. The second approach is the needs analysis method, which estimates the financial needs of dependents. As we will also demonstrate, the needs analysis method indicates that Jacques should purchase approximately €1.25 million of additional life insurance.

Of course, there is no absolute when calculating life insurance needs because there are so many variables and uncertainties. However, in this case, the two methods generate relatively close numbers. To augment Jacques's current life insurance program, he should purchase at least €1 million in additional term life insurance, but €1.25 million would be more desirable.

Although an annually renewable term policy will be less expensive, a 20-year level term policy should be considered. At the end of 20 years, Jacques will be nearing the end of his working career and the children will be fully grown. Jacques and Marion will have accumulated a high enough level of savings that income replacement will be unnecessary. At that time, the term policy can be allowed to lapse and the €200,000 whole life policy can be retained.

Whole life coverage like Jacques's current policy is relatively expensive, but the pricing and cash build-up at this point in the policy's life indicate that it is probably wise not to replace the policy with term coverage now. Even though life insurance rates have fallen as life expectancies have lengthened and competition has increased, the decline is probably not enough to offset the advantages of the whole life policy at this point. In addition to providing life insurance coverage, the policy's cash-value buildup can be considered a conservative part of the asset allocation of the retirement portfolio.

Marion should be named as the primary beneficiary on the new policy, with Henri and Émilie as secondary beneficiaries, although countries may differ on the exact approach for designating a beneficiary who is a minor. It may be advisable to name a custodian and/or create a trust for Henri and Émilie until they reach adulthood. The old policy should be changed to include these beneficiary designations as well. Making death benefits payable to the estate, as is the case currently on the whole life policy, can make receipt of payments much slower and may subject benefits to greater taxation.

Although Marion's income is modest, her death would cause a financial burden in terms of both lost income and added expenses to replace her family and household responsibilities. Furthermore, her income will increase when she returns to full-time work in 10 years, and financial responsibility for the children will still exist at that time. At Marion's current age and with her excellent health, and because she is female, life insurance rates are very low. However, it is possible that a health issue or accident could cause her rate to increase or even make her uninsurable. Given the complexity of Marion's situation, it is difficult to calculate a recommendation for the amount of life insurance needed.

Life insurance companies typically offer lower rates for larger amounts of coverage in a series of steps. For example, the price per €1,000 of coverage may decrease at €100,000, €250,000, €500,000, and €1,000,000 of coverage. But companies are hesitant to underwrite policies that are large relative to the insured's human life value, or the discounted value of future earnings. A €250,000 policy would take advantage of the price break but would be relatively large for Marion's current income. Still, it is justifiable based on her future employment plan. Purchasing a policy of this size will provide adequate protection for the 10 years until she goes back to work full time, and at that point the children will be more independent, reducing the need for life insurance. As with Jacques, a 20-year level term policy is reasonable.

Life Insurance Needs For Jacques and Marion

As mentioned previously, the *human life value* method is consistent with the concept of human capital and involves replacing the estimated net contributions to family finances that Jacques would generate if he did not die during his projected earning life. Calculating these contributions involves the following steps:

- Start with the actual pre-tax compensation that Jacques would receive from employment: €100,000.
- Adjust for income taxation, and here we assume a 30% rate: €100,000 – €30,000 = €70,000 post-tax compensation.

- Adjust for family expenses attributable to Jacques that will not exist after his death, such as his transportation, travel, clothing, food, entertainment, and insurance premiums. Here, we assume those expenses to be €20,000. So €70,000 – €20,000 = €50,000 income after expenses.
- Add the value of any non-taxable employee benefits that the family will no longer receive, such as employer contributions to retirement plans, which we assume to be €15,000: €50,000 + €15,000 = €65,000.
- Estimate the amount of pre-tax income needed to replace that income on an after-tax basis. Note that the rate of taxation of annual income generated from life insurance proceeds may be different from the rate of taxation of Jacques's employment income, and marginal rates may be lower for lower incomes. Here, we assume a 20% tax rate: €65,000/(1 – t) = €65,000/(1 – 0.20) = €81,250.
- We then apply an annual growth rate, assumed here to be 3%, to consider the effects of inflation and career advancement over the full 20 years until retirement.
- Finally, we discount all the future cash flows back to the present at an appropriate rate, assumed here to be 5%.

Assuming the lost income replacement would be needed by Jacques's family immediately, the human life value calculation can be solved as the present value of an annuity due with growing payments (a so-called "growing annuity due"). Using calculator keystrokes for an annuity due with level payments, the growth of payments can be incorporated by adjusting the discount rate to account for the growth rate of earnings. The adjusted rate *i* can be calculated as follows, as long as the discount rate is larger than the growth rate:[6] [(1 + Discount rate)/(1 + Growth rate)] – 1, or (1.05/1.03) – 1 = 1.94%. Thus,

- set the calculator for beginning-of-period payments;
- n = 20 (the number of years until retirement);
- payment = €81,250; and
- i = 1.94%.

Solving for the present value of an annuity due, the human life value method recommends €1,362,203 of life insurance for Jacques. Because Jacques already has €250,000 of life insurance, he should purchase an additional €1,112,203, according to this method. This amount would likely be rounded to €1.1 million.

As discussed in Section 4 of this reading, the *needs analysis* method is concerned with meeting the financial needs of the family rather than replacing human capital. Needs analysis typically includes the following steps, which are presented in greater detail in Exhibit 11:

- Estimate the amount of cash that will be needed upon the death of the insured person. This amount will include final expenses (funeral and burial) as well as any taxes that may be payable. It is also common to pay off all debt (including mortgages) and to fully fund future education costs. An emergency fund should be created.
- Estimate the capital needed to fund family living expenses. This calculation requires discounting estimated living expenses (i.e., calculating the present value of future cash flow needs) during multiple time frames, typically as follows:
  - Estimate the surviving spouse's living expense needs, assumed here to continue for 52 years, until Marion is 90 years old. Note that when the mortgage and other debts are paid off, living expenses are lower.
  - Estimate the children's living expense needs, assumed here to continue until they are 22 years old. This amount does not include the education fund.

6 Most individuals' situations would call for a discount rate that is higher than the inflation rate. If that is not the case, or if future cash flows are not projected to grow at a constant rate, the present value can be calculated in the typical manner as the present value of a series of unequal payments.

- Include an additional amount for extra expenses during a transition period after Jacques's death, perhaps covering two years. In general, this period recognizes that there may be some contractual obligations, such as a car lease, that may not terminate upon a person's death.
- Consider Marion's future income (earnings). Note, however, that Marion may prefer not to go back to work full time as soon as planned because of the extra responsibilities of being a single parent. She may even choose to resign from her part-time job.

- Calculate total needs as the sum of cash needs and capital needs.
- Calculate total capital available, which may include cash/savings, retirement benefits, life insurance, rental property, and other assets.
- Calculate the life insurance need as the difference between the total financial needs and the total capital available.

Exhibit 11 is a representation of a needs analysis for Jacques.

Exhibit 11 Financial Needs: Life Insurance Worksheet

Cash Needs	**Euro (€)**
Final expenses	10,000
Taxes payable	5,000
Mortgage retirement	190,000
Other debt	10,000
Education fund	200,000
Emergency fund	30,000
Total cash needs	445,000
Capital Needs [present value of annuity due: growth rate = 3%, discount rate = 5%, adjusted rate (as above) = 1.94%]	
Marion's living expenses (60,000/year for 52 years)	1,991,941
Children's living expenses:	
Henri (10,000/year for 14 years)	123,934
Émilie (10,000/year for 16 years)	139,071
Transition period needs (10,000/year for 2 years)	19,810
Less Marion's income:	
Until Émilie is 16 (20,000/year for 10 years)	–183,713
Age 48–60 (60,000/year for 12 years)	–398,565[a]
Total capital needs	1,692,478
Total Financial Needs	**2,137,478**
Capital Available	
Cash and savings	30,000
Vested retirement accounts—present value	200,000
Life insurance	250,000
Rental property	165,000
Total capital available	645,000

(continued)

Exhibit 11 (Continued)

Cash Needs	Euro (€)
Life insurance need (Total financial needs less total capital available)	**1,492,478**

[a] Calculated in two steps: (1) Compute the amount needed in 10 years, when Marion will begin earning €60,000 per year. Assuming 12 years of earnings from age 48 to age 60, a 3% annual growth in earnings, and a 5% discount rate (1.94% adjusted discount rate), a present value of an annuity due calculation shows that €649,220 will be needed in 10 years. (2) Discount the €649,220 back to the present—10 years at the unadjusted discount rate of 5%—for a total of €398,565. The discount rate is not adjusted during this period because there are no payments to which a growth rate would be applied. We simply discount a future value to the present.

This amount of life insurance under the needs analysis method would likely be rounded to €1.5 million. Because Jacques already has €250,000 of life insurance, he should purchase an additional €1.25 million, according to this method—considerably higher than the €1.11 million calculated earlier using the human life value method. The amount of life insurance selected may depend on which method seems to be more relevant to the family situation. One may view the two values as a reasonable range and use the larger number, the smaller number, or perhaps an average of the two. In many cases, selection of an amount may be further affected by "breakpoints" in the insurance company's premium schedule. The premium rate may decline when insurance coverage reaches, for example, €250,000, €500,000, and €1,000,000.

As a final note, consider that if Jacques dies prematurely, there will be an increased need for life insurance for Marion while Henri and Émilie are still children.

5.2.3 *Recommendations*

Health Insurance. Although the Perrier family is covered by national health insurance, they may want to seek private health insurance. In many countries, this type of coverage provides quicker treatment, a wider choice of physicians, and a higher standard of care.

Disability Insurance. Both Jacques and Marion should consider long-term disability income insurance that guarantees the option to purchase additional coverage without underwriting. This type of policy would allow them to increase coverage as their incomes increase. They should look for "own occupation" coverage that specifies that they would be considered disabled if they could no longer perform the duties of their current positions. They should also select a benefit period that extends at least until their respective retirement ages, possibly age 65. For Jacques, a relatively long, 180-day elimination period would coordinate well with his company's short-term disability plan and would save money. Marion should consider a shorter elimination period, perhaps 90 days, because she has no short-term coverage. Both should choose an option that allows increased coverage based on inflation.

Taxation should be considered in purchasing a disability income policy. In some jurisdictions, premium payments may be deductible for income tax purposes but benefits are taxed. In others, it may make a difference whether the policy is purchased individually or through the employer. In any case, the amount of the benefit selected should be sufficient to replace income, net of any tax advantages and reduction of expenses. Most insurance companies do not like to sell policies with benefits that represent more than 70%–80% of an individual's income (less for high-income individuals) because high percentages create a moral hazard, in that the insured may decide that declaring a disability would give him or her a larger net income without the need to work.

Long-Term Care Insurance. Although the Perriers' country provides some degree of long-term care assistance, it is possible that the facilities available are not of the standard that would satisfy them. Furthermore, the pricing structure appears to strongly favor individuals with limited income. The Perriers should consider long-term care insurance for themselves, especially if there is a coordination provision with the national plan. At their current ages, rates would be reasonable and would be locked in at the time the policy is purchased. Although stays in long-term care facilities are typically shorter than five years, it would be prudent to purchase a policy that does not have a time limit. Most policies have benefits that are based on a specified amount of money per day. The amount selected should be appropriate for the local cost structure, and the Perriers should pay the extra premium required to receive an automatic inflation adjustment, both before and after any claim.

Long-term care insurance may also be appropriate for Marion's mother, especially because women in her family tend to have long lives. This coverage will be more expensive at her age, but it would alleviate the potential need for care in the home, which would probably be provided by Marion. To avoid the financial and psychological stress of providing home care, a long-term care policy would be useful.

Property Insurance. Jacques and Marion should check to make sure that the condominium association's insurance coverage is sufficient for the structure. They should also determine whether that policy provides any coverage for contents and, if so, to what extent. It is likely that the condominium association's coverage for contents, if any, is modest, and Jacques and Marion undoubtedly have personal property worth far more than the €20,000 of coverage in their personal policy.

The Perriers should make a thorough valuation of their personal property, even though this is a cumbersome task, and make sure they have or obtain a sufficient amount of coverage. A prudent approach that helps avoid insurance claim problems is to make a written and/or photographic inventory of all contents and improvements within the condominium. Any personal property that has specified limits within their policy should be appraised and scheduled. For example, an expensive necklace should be taken to a jeweler for a formal appraisal, after which the necklace should be added to the insurance policy, which will likely require a higher premium. A copy of the appraisal and inventory should be provided to the insurance company, and another copy should be kept off site in case of a disaster in their condominium.

Property insurance on the house should be reviewed. It appears that the amount of coverage is far less than appropriate. Furthermore, it is not clear whether the transfer of ownership of the property is properly noted on the policy. In the case of a claim, Jacques and Marion may have to deal with legal issues in order to collect. Even if the property ownership issue is clarified, it is likely that the house is insured as the Perrier's residence or secondary residence. However, it is now a rental house, and it requires a different insurance policy. They should also determine whether the rental house's contents are included in the policy. Because they probably are not, it would be worthwhile to explain to the renters that they should obtain their own insurance on the contents (their property). This step is especially important because the Perriers could be considered liable for any loss of the renters' property if, for example, there is a fire caused by faulty wiring.

With regard to auto insurance, the Perriers should make sure that they have substantial liability insurance coverage, especially because it appears that they will have substantial assets to protect. However, they may want to consider whether collision and comprehensive coverage are cost effective for a 10-year-old automobile. Because they seem to drive relatively little, it may make sense to self-insure.

With sufficient liability coverage on the condominium and the auto, the Perriers may qualify for umbrella liability insurance. They should consider this relatively inexpensive coverage to provide additional liability protection relating to the auto and

condominium. As a nurse, Marion may want to consider professional liability insurance if it is not provided by her employer. If either Jacques or Marion serves on any type of board of directors of a corporation, public service, or other entity, they should make sure that that entity provides appropriate liability coverage for its directors.

Longevity Insurance. Marion's mother may be an excellent candidate for longevity insurance. As noted earlier, longevity insurance is typically structured as a life annuity with payments beginning at some future date, such as age 85. Because it is not underwritten, it is generally a poor choice for someone whose life expectancy is shorter than average for his or her age and a good choice for someone whose life expectancy is longer than average, as is the case with Marion's mother. The annuity payments would not start for more than a decade, but they would offer additional income in her later years and help combat inflation, and the cost would be relatively low. Longevity insurance may be viewed as a complement to or even a partial substitute for long-term care insurance. A cost–benefit analysis of the available options should be performed to ensure that the policy selected best matches the goals and financial resources of the household.

5.3 The Effect of Human Capital on Asset Allocation Policy

There are two primary ways to consider how the different subcomponents of an individual's total economic wealth should affect portfolio construction. The first is asset allocation, which includes the overall allocation to risky assets. The second is the underlying asset classes, such as stocks and bonds, selected by the individual. For example, an individual who works in a risky profession that has a high correlation with the stock market might first choose a less aggressive portfolio (e.g., with a lower allocation to stocks than the average person of the same age). Next, the investor would select which individual stocks and bonds (or asset classes) to hold to minimize the overall risk of the portfolio within a total wealth framework.

For many people and for many occupations, human capital is generally considered to be a relatively bond-like asset. For example, dividend growth in the S&P 500 Index exhibited a quarterly volatility of 16.4% from first quarter 1948 to fourth quarter 2013, whereas wage growth volatility was closer to 2.5% over the same period.[7] Among individuals, occupation can have a large impact on the degree of wage growth volatility. For example, Oyer (2008) found that stock market conditions can have a strong impact on the lifetime earnings of MBA students. Asset performance that is strongly correlated with the lifetime earnings of a worker will provide less hedging benefit because the assets magnify, rather than reduce, variability in consumption.

EXAMPLE 14

Human Capital and Asset Allocation (1)

The riskiness of human capital, as well as that of other assets, should affect the allocation of an individual's financial capital. Consider three investors: George, John, and Sam. Each investor owns only two assets—human capital and financial capital—and wants his total wealth (i.e., human capital plus financial capital) to have a 45% stock allocation. If human capital is assumed to be 30% stock-like, what is the optimal allocation for the financial capital of George, John, and Sam?

7 Based on data obtained from the US Bureau of Economic Analysis.

Person	Human Capital (HC)	Financial Capital (FC)	Total Wealth (TW)
George	$500,000	$150,000	$650,000
John	$800,000	$300,000	$1,100,000
Sam	$150,000	$150,000	$300,000

Solution:

The allocation is as follows:

Person	(A) TW × 45% Target Equity	(B) HC × 30% HC Equtiy	(C) (A) – (B) FC Equity	(D) (C)/FC FC Equity Allocation %
George	$292,500	$150,000	$142,500	95.00%
John	$495,000	$240,000	$255,000	85.00%
Sam	$135,000	$45,000	$90,000	60.00%

Even within an occupation, each individual has different human capital risks. For example, two people may have the exact same job, but because of random market forces, one could lose his or her job and be unable to find suitable reemployment for an extended period of time. Many financial services workers lost their jobs during the global financial crisis of 2008–2009, and many who became unemployed have been forced to change careers given the lack of available openings. This outcome could have a significant impact on their long-term human capital. Alternatively, a person may have a health shock that seriously reduces their ability to rent his or her human capital for the same wage rate as before. Health shocks that meet the threshold of disability may be partially hedged through the insurance market, and the impact of job loss can be partially hedged through unemployment insurance. Most human capital volatility (other than premature death), however, is difficult to hedge through the insurance market.

If both spouses are employed, this may reduce the overall riskiness of the household's human capital. Each spouse provides his or her own income, each with its own risks, but unless the human capital of the two spouses is highly correlated (e.g., if they are both employed in the same family business), their combined human capital will benefit from diversification. An individual who receives income from numerous sources—such as salaries from different jobs, as well as dividends, interest, and so on—must consider the characteristics of his or her total compensation.

A lower-earning partner may also have a more risky human capital value if the higher-earning partner is tied to a specific geographic location. In the event of a job loss, this household may suffer a more significant decline in human capital value than a household in which both partners are able to move to a location where they can maximize their wage rate. The human capital of a less mobile household will have a lower present value and greater volatility. If human capital is very employer-specific (if the individual would have trouble earning the same wage from a different employer), then it is also less valuable and more risky. A household with a non-working spouse may be in a less vulnerable position than a single-person household if the non-working spouse can exercise the option to rejoin the workforce if the primary earner suffers an unexpected loss in earnings.

Most of the wealth an investor holds outside the investment portfolio (e.g., human capital and defined benefit pensions) tends to be relatively conservative in nature (i.e., more bond-like than stock-like). After an optimal investment policy is determined

that establishes a target mix of risky and risk-free assets based on risk tolerance, the total wealth asset allocation should be adjusted as the value of the assets changes over time. For example, younger investors should likely allocate more of their investment portfolio to stocks because the value of human capital (which is bond-like) is highest early in the life cycle. Conversely, older investors should shift more of their wealth toward bonds because their bond-like human capital is gradually depleted as they approach retirement. This investment strategy is consistent with such life-cycle investments as target-date funds (in which the target date is the expected retirement date of the individual), which gradually increase the allocation to bonds as investors get closer to retirement.

The economic (holistic) balance sheet discussed earlier in the reading considers the current value of marketable and non-marketable assets. However, this type of balance sheet does not consider the stochastic nature of each individual asset or how the value of one asset rises and falls with respect to other assets within the portfolio over time. It also does not consider the relative liquidity of each asset category, which can be particularly important when there are limited financial instruments that can be used, for example, to borrow against the value of a pension. The allocation for the financial portfolio should be coordinated with the risk associated with the non-marketable assets in an investor's portfolio, such as human capital. Using this perspective, the financial portfolio can be considered a completion or hedge portfolio, because it is invested in such a way as to optimize the overall risk characteristics of an individual's total wealth.

Human capital is a unique asset class in a number of ways. First, it can require a continued investment in knowledge and skills to maintain or increase its value. Some professions are more risky than others and will provide either greater income variance or income that is more strongly correlated with systematic risks (i.e., will rise and fall with economic cycles). Some forms of human capital are more vulnerable to disability risks or premature death. A precision welder may earn the same income as an accountant, but the welder may be more vulnerable to an injury that would sharply reduce the value of that human capital. Human capital is also more illiquid, and there are limited financial instruments available that can be used to effectively borrow against expected human capital when earnings fall below a desired level of consumption. Some occupations will have an earnings path that is likely to keep pace with inflation, whereas other occupations will not. Employees in some occupations may have invested in human capital that allows them to be very productive in a specific role for their employer. This heavy investment in employer-specific human capital may not easily be rented to another employer for the same wage rate. This places the employee at greater risk of future income volatility. Many who enjoyed steady income growth in the past—for example, mortgage brokers in the United States during the 2000s—were not fully aware of their own human capital risk. Similarly, individuals who work in the real estate industry should likely seek to underweight real estate assets in their portfolios to reduce exposure to real estate from a total wealth perspective. This diversification may be a challenge for those who carry optimistic beliefs about the future growth of their own industry, but history shows that few industries are immune to market shocks.

EXAMPLE 15

Human Capital and Asset Allocation (2)

Describe how investment strategies can be modified to account for human capital risk.

Solution:

Investment assets may be strongly or weakly correlated with the human capital value of a worker. The overall volatility of one's economic balance sheet can be reduced by selecting assets that correlate weakly (or even negatively) with human capital. Sector investments may be particularly valuable if they are not a complement to the industry that employs the primary earner. Workers with more volatile assets may also prefer more liquid investments.

EXAMPLE 16

Human Capital and Asset Allocation (3)

Compare investment planning for a young family with investment planning for a newly retired couple.

Solution:

A younger household will hold most of its wealth in human capital. For most households, human capital is a bond-like asset that returns a relatively stable income over time. This fact increases the optimal allocation to risky assets within the investment portfolio for younger households. For a newly retired couple, the value of human capital declines relative to the value of the investment portfolio. To balance the total risk of the older household's portfolio, investment portfolio risk should be reduced because investment assets are a larger share of the economic balance sheet (ignoring the impact of charitable bequests and other obligations).

5.4 Asset Allocation and Risk Reduction

An individual or household manages wealth risk mainly to smooth spending over time. A strategy that combines appropriate investments with insurance products, or other risk management tools, can be used to provide the highest level of spending for the level of risk the individual or household is willing to take. Each household will have its own risks and preferences that determine which strategy makes sense.

Investment risk, property risk, and human capital risk can be either idiosyncratic or systematic. Idiosyncratic risks include the risks of a specific occupation, the risk of living a very long life or experiencing a long-term illness, and the risk of premature death or loss of property. Within a total wealth framework, idiosyncratic human capital risks are reduced through investment portfolio strategies and/or through insurance (or annuity) products. Pooling risk allows a household to efficiently reduce idiosyncratic risk. Systematic risks affect all households. For example, a diversified investment portfolio of risky assets will be exposed to the systematic risk that the overall market will fall in value. Earnings can also be affected by systematic risk through a recession or slow economic growth. A cure for cancer might increase overall longevity, placing all households at greater risk of outliving their assets.

The first step in creating strategies for asset allocation and risk reduction is to identify idiosyncratic risk exposures that can be efficiently reduced through diversification or hedging. A young doctor with two children and a lower-earning spouse bears a number of idiosyncratic risks. First, the couple's investment portfolio should be well diversified and not highly correlated with the doctor's income. Second, the household's largest asset, its human capital, could be diminished or lost through disability or premature death. Life insurance and disability insurance provide a hedge

that pools idiosyncratic human capital risk. Medical malpractice insurance provides protection against idiosyncratic liability risk. In general, hedging these risks trades a small drop in expected wealth for an increase in the likelihood of smooth spending.

Young households may have additional liquidity constraints that will affect recommended products. A doctor who expects his or her earnings to rise sharply and who has high current expenses may choose to defer retirement saving for a few years. This individual should not, however, avoid paying premiums on insurance used to hedge the value of human capital. Term life insurance can provide ample coverage at a modest price, and the household may consider a longer elimination period on disability insurance to fit the cost into the current budget. The investment portfolio allocation may be of little consequence because the value of the total wealth portfolio consists almost entirely of human capital. Instead, investments may be selected to increase liquidity that can be used to protect current consumption from any short-term income shock.

A 60-year-old couple nearing retirement with grown, independent children and a large investment portfolio will face a different set of risks. Although their combined income may be higher than that of the young doctor, the value of their human capital is far less if they plan to retire in five years. Therefore, for the older couple, risks to the investment portfolio are far more relevant than human capital risks. Life insurance may have value only as a means of covering estate planning and liquidity needs. Disability insurance can likely be dropped. Health and liability remain significant idiosyncratic risk exposures that can be efficiently reduced through health, long-term care, and liability insurance. Home equity can be protected through property insurance; the risk of idiosyncratic regional real estate price variation should also be considered. The couple's risk of outliving their assets can be protected through the purchase of annuities. Market risk can be particularly important because, compared with a younger household, the older couple's investments are a far larger share of total household wealth. An older household may have fewer liquidity constraints and thus more flexibility to retain risks—for example, through higher insurance deductibles and longer elimination periods on long-term care insurance. This older household may also choose to retain the majority of property risk. A rational increase in risk retention can be combined with a reduction in portfolio risk to achieve an efficient balance of total wealth risk. The household will receive a higher expected return (equal to the insurance load) from accepting greater insurable risk while simultaneously reducing the expected return on the investment portfolio by increasing the share of safe assets.

Human capital risks are correlated with market returns and can be at least partially hedged through holistic portfolio construction. Consider a 50-year-old couple, Jennifer and Wade. Jennifer earns US$75,000 a year working as a tenured college professor, and Wade earns US$100,000 selling drilling parts to the oil industry. Jennifer participates in the state public employee pension system, which is currently in good enough financial condition to cover promised benefits for the next 40 years. Wade has US$300,000 saved in a 401(k), half in employer stock. Both are eligible to receive Social Security benefits.

Wade works in a cyclical industry and will see high variability in income but a modest covariance of earnings with the performance of the overall stock market. Although Wade's income today is higher than Jennifer's income, the difference in the present value of their human capital will not be that great. Wade's income is more volatile because it rests largely on the strength of the domestic oil industry. Jennifer may apply a discount rate equivalent to that of current state government bonds because her salary is unlikely to change and her salary risk is comparable to the state's ability to pay general obligation debts. The discount rate on Wade's income may be placed above the historical equity premium because his human capital risk is not easily diversified and is more volatile than the market in general.

To preserve consumption if Wade is laid off for a period of time, the couple should consider holding a significant amount of assets in marketable securities that can be easily liquidated to fund short-term spending needs. These types of assets include money market accounts and short-term government bonds, which can be easily traded in the secondary market. Investment assets held in taxable accounts can be accessed for emergency spending in the event of long-term unemployment. The combination of Jennifer's stable salary and Wade's volatile income allows the couple to take on greater risk than if they lived on Wade's income alone. If Wade and Jennifer have an average level of investment risk tolerance, then they should invest in a mix of stocks and bonds, each within the most tax-efficient account, to create a balanced portfolio appropriate to the couple's risk preferences and the risk of the remainder of the total wealth portfolio.

Wade's more risky human capital is highly correlated with the overall economy, although as previously mentioned, his wages are likely not strongly correlated with the equity market in general. A more efficient investment portfolio will provide a partial hedge against Wade's idiosyncratic human capital risk. The obvious first step would be to sell Wade's investments in employer stock. This may be complicated by restrictions on selling the stock or even Wade's subjective opinion of the potential value of his employer's stock. If Wade is restricted from selling his company stock, an adviser might suggest put options to hedge this risk. To balance the risk to Wade's human capital, the retirement portfolio should overweight sector funds that are either uncorrelated or negatively correlated with the oil industry. Sectors, such as transportation, that perform well when oil prices fall will provide some buffer against fluctuations in the value of Wade's human capital.

The value of Jennifer's pension will likely be a significant share of the couple's total wealth. Discounted at a modest bond rate of comparable duration to the expected pension payments, the value of her pension likely exceeds the US$300,000 that John has saved in his 401(k). If her pension were less secure, which can be estimated based on the percentage of future obligations that can be funded from current assets, then the pension would be discounted at a higher rate. Jennifer's pension can be viewed as a forced savings plan with a promised stable future payout that is comparable to a bond. If the discounted value is estimated to be US$500,000, then this portion of the total portfolio will be characterized as a bond-like asset. Couples with significant pension assets can accept greater risk in the rest of their investment portfolio because poor risky asset performance has less of an impact on future spending when the bulk of consumption will be funded from stable pension income. Wade can take greater risk in his 401(k) because the couple will be able to rely on Jennifer's pension. Note that although it is often difficult to consider, the possibility of divorce should also affect recommendations if pension assets are not allocated to the other spouse. For example, couples may want to hold greater liquidity, and spouses with defined contribution savings or more volatile human capital may choose to take less investment risk.

EXAMPLE 17

Asset Allocation and Risk Reduction

Consider two 35-year-old couples, each of which earns a combined US$150,000 per year. One couple consists of an individual who is employed as a petroleum engineer and a non-working spouse. The other couple consists of two high school teachers. Compare asset allocation and risk reduction strategies for each couple.

Solution:

The human capital value of the couple consisting of the petroleum engineer and the non-working spouse is likely lower than the combined human capital value of the high school teachers, although the combined lifetime cumulative wages of the teachers is likely lower than those of the engineer and the spouse. Earnings for the engineer are highly correlated with oil prices, and either rising or falling prices will affect the household's available income in the future. The impact of a disability on employability may be more severe for the engineer than for a teacher. The engineer should thus likely consider a less risky portfolio and should overweight securities that have a low correlation with oil prices. Conversely, the teachers should select a riskier portfolio as a result of their higher human capital and low correlation with individual market sectors.

SUMMARY

The risk management process for individuals is complex given the variety of potential risks that may be experienced over the life cycle and the differences that exist across households. In this reading, key concepts related to risk management and individuals include the following:

- The two primary asset types for most individuals can be described broadly as human capital and financial capital. Human capital is the net present value of the individual's future expected labor income, whereas financial capital consists of assets currently owned by the individual and can include such items as a bank account, individual securities, pooled funds, a retirement account, and a home.
- Net wealth is an extension of net worth that includes claims to future assets that can be used for consumption, such as human capital, as well as the present value of pension benefits.
- There are typically four key steps in the risk management process for individuals: Specify the objective, identify risks, evaluate risks and select appropriate methods to manage the risks, and monitor outcomes and risk exposures and make appropriate adjustments in methods.
- The financial stages of life for adults can be categorized in the following seven periods: education phase, early career, career development, peak accumulation, pre-retirement, early retirement, and late retirement.
- The primary goal of an economic (holistic) balance sheet is to arrive at an accurate depiction of an individual's overall financial health by accounting for the present value of all available marketable and non-marketable assets, as well as all liabilities. An economic (holistic) balance sheet includes traditional assets and liabilities, as well as human capital and pension value, as assets and includes consumption and bequests as liabilities.
- The total economic wealth of an individual changes throughout his or her lifetime, as do the underlying assets that make up that wealth. The total economic wealth of younger individuals is typically dominated by the value of their human capital. As individuals age, earnings will accumulate, increasing financial capital.

- Earnings risk refers to the risks associated with the earnings potential of an individual—that is, events that could negatively affect someone's human and financial capital.
- Premature death risk relates to the death of an individual, such as a family member, whose future earnings (human capital) were expected to help pay for the financial needs and aspirations of the family.
- Longevity risk is the risk of reaching an age at which one's income and financial assets are insufficient to provide adequate support.
- Property risk relates to the possibility that one's property may be damaged, destroyed, stolen, or lost. There are different types of property insurance, depending on the asset, such as automobile insurance and homeowner's insurance.
- Liability risk refers to the possibility that an individual or other entity may be held legally liable for the financial costs of property damage or physical injury.
- Health risk refers to the risks and implications associated with illness or injury. Health risks manifest themselves in different ways over the life cycle and can have significant implications for human capital.
- The primary purpose of life insurance is to help replace the economic value of an individual to a family or a business in the event of that individual's death. The family's need for life insurance is related to the potential loss associated with the future earnings power of that individual.
- The two main types of life insurance are temporary and permanent. Temporary life insurance, or term life insurance, provides insurance for a certain period of time specified at purchase, whereas permanent insurance, or whole life insurance, is used to provide lifetime coverage, assuming the premiums are paid over the entire period.
- Fixed annuities provide a benefit that is fixed (or known) for life, whereas variable annuities have a benefit that can change over time and that is generally based on the performance of some underlying portfolio or investment. When selecting between fixed and variable annuities, there are a number of important considerations, such as the volatility of the benefit, flexibility, future market expectations, fees, and inflation concerns.
- Among the factors that would likely increase demand for an annuity are the following: longer-than-average life expectancy, greater preference for lifetime income, less concern for leaving money to heirs, more conservative investing preferences, and lower guaranteed income from other sources (such as pensions).
- Techniques for managing a risk include risk avoidance, risk reduction, risk transfer, and risk retention. The most appropriate choice among these techniques often is related to consideration of the frequency and severity of losses associated with the risk.
- The decision to retain risk or buy insurance is determined by a household's risk tolerance. At the same level of wealth, a more risk-tolerant household will prefer to retain more risk, either through higher insurance deductibles or by simply not buying insurance, than will a less risk-tolerant household. Insurance products that have a higher load will encourage a household to retain more risk.

- An individual's total economic wealth affects portfolio construction through asset allocation, which includes the overall allocation to risky assets, as well as the underlying asset classes, such as stocks and bonds, selected by the individual.
- Investment risk, property risk, and human capital risk can be either idiosyncratic or systematic. Examples of idiosyncratic risks include the risks of a specific occupation, the risk of living a very long life or experiencing a long-term illness, and the risk of premature death or loss of property. Systematic risks affect all households.

REFERENCES

Chen, Peng, and Moshe A. Milevsky. 2003. "Merging Asset Allocation and Longevity Insurance: An Optimal Perspective on Payout Annuities." *Journal of Financial Planning*, vol. 16, no. 6 (June): 52–62.

Ibbotson, Roger G., Moshe A. Milevsky, Peng Chen, and Kevin X. Zhu. 2007. *Lifetime Financial Advice: Human Capital, Asset Allocation, and Insurance*. Charlottesville, VA: Research Foundation of CFA Institute.

Markowitz, Harry. 1952. "Portfolio Selection." *Journal of Finance*, vol. 7, no. 1 (March): 77–91.

Oyer, Paul. 2008. "The Making of an Investment Banker: Stock Market Shocks, Career Choice, and Lifetime Income." *Journal of Finance*, vol. 63, no. 6 (December): 2601–2628.

Rejda, George E., and Michael J. McNamara. 2014. *Principles of Risk Management and Insurance*, 12th ed. Upper Saddle River, NJ: Prentice Hall.

PRACTICE PROBLEMS

The following information relates to Questions 1–8

Richard Lansky is an insurance and wealth adviser for individuals. Lansky's first meeting of the day is with Gregory Zavris, age 27, a new client who works as a journalist. Gregory's only asset is $5,000 in savings; he has $67,000 in liabilities. During the conversation, Lansky describes the concepts of financial capital and human capital, as well as the components of economic and traditional balance sheets. Gregory asks Lansky:

> On which balance sheet are my future earnings reflected?

Gregory does not have medical insurance. He asks Lansky for advice regarding a policy that potentially would allow him to avoid paying for office visits related to minor medical problems.

In the afternoon, Lansky meets with Gregory's parents, Molly and Kirk, ages 53 and 60. Molly is a tenured university professor and provides consulting services to local businesses. Kirk is a senior manager for an investment bank. Lansky determines that Molly's income is more stable than Kirk's.

Kirk and Molly discuss estate planning, and Lansky recommends a whole life insurance policy on Kirk's life, with Molly responsible for paying the premiums. In the event of Kirk's death, Gregory would be entitled to the proceeds from the policy. Lansky explains that one feature of the policy provides for a portion of the benefits to be paid even if a premium payment is late or missed.

Molly tells Lansky that she has recently been reading about annuities and would like to clarify her understanding. Molly makes the following statements.

Statement 1	Both deferred and immediate annuities provide the same flexibility concerning access to invested funds.
Statement 2	The income yield for a given amount invested in a life-only immediate annuity is higher for an older person than for a younger person.

At the end of the consultation, Molly asks Lansky for advice regarding her retired aunt, Rose Gabriel, age 69. Molly believes that Gabriel's life annuity and pension benefits will provide enough income to meet her customary lifestyle needs. Gabriel lives in her mortgage-free home; her medical insurance plan covers basic health care expenses. Women in Gabriel's family generally have long life spans but often experience chronic health problems requiring extended nursing at home. Therefore, Molly is concerned that medical expenses might exceed Gabriel's net worth during her final years.

1 Gregory's human capital is:

- **A** lower than his financial capital.
- **B** equal to his financial capital.
- **C** higher than his financial capital.

2 The *most* appropriate response to Gregory's balance sheet question is:

- **A** the economic balance sheet only.
- **B** the traditional balance sheet only.

© 2017 CFA Institute. All rights reserved.

C both the economic and the traditional balance sheets.

3 Given Gregory's policy preference, which type of medical insurance should Lansky recommend?

A Indemnity plan

B Preferred provider plan

C Health maintenance organization plan

4 In estimating Molly's human capital value, Lansky should apply an income volatility adjustment that is:

A less than Kirk's.

B the same as Kirk's.

C greater than Kirk's.

5 Regarding the whole life insurance policy recommended by Lansky, Kirk would be the:

A owner.

B insured.

C beneficiary.

6 The whole life insurance policy feature described by Lansky is a:

A non-forfeiture clause.

B waiver-of-premium rider.

C guaranteed insurability rider.

7 Which of Molly's statements about annuities is/are correct?

A Statement 1 only

B Statement 2 only

C Both Statement 1 and Statement 2

8 The type of insurance that will *best* address Molly's concern about Gabriel is:

A disability insurance.

B longevity insurance.

C long-term care insurance.

The following information relates to Questions 9–15

Henri Blanc is a financial adviser serving high-net-worth individuals in the United States. Alphonse Perrin, age 55, meets with Blanc for advice about coordinating his employee benefits with his investment and retirement planning strategies.

Perrin has adopted a life-cycle portfolio strategy and plans to retire in 10 years. Recently, he received a promotion and $50,000 salary increase to manage a regional distribution center for a national retail firm. Perrin's spending needs are currently less than his annual income, and he has no debt. His investment assets consist of $2,000,000 in marketable securities (90% equity/10% fixed income) and a vineyard with winery valued at $1,500,000.

Blanc leads Perrin through a discussion of the differences between his financial capital and his human capital, as well as between his traditional balance sheet and his economic balance sheet. Perrin is vested in a defined benefit pension plan based

on years of service and prior salary levels. Future benefits will vest annually based on his new salary. Perrin makes the following statements regarding his understanding of pension benefits.

Statement 1 Unvested pension benefits should be classified as human capital.

Statement 2 Vested pension benefits should not be classified as financial capital until payments begin.

Perrin asks Blanc to compare his traditional and economic balance sheets. Blanc calculates that the sum of the present values of Perrin's consumption goals and bequests exceeds that of his unvested pension benefits and future earnings.

Perrin tells Blanc that he expects a slower rate of growth in the US economy. Perrin expresses the following concerns to Blanc.

Concern 1 Holding all else equal, I wonder what the effect will be on my human capital if the nominal risk-free rate declines?

Concern 2 My employer projects a slower rate of sales growth in my region; therefore, I am anxious about losing my job.

Perrin is a widower with three adult children who live independently. Perrin's oldest son wishes to inherit the vineyard; the two other children do not want to be involved. Perrin would like to accommodate his children's wishes; however, he wants each child to inherit equal value from his estate. Blanc explains potential uses of life insurance to Perrin and suggests that one of these uses best meets Perrin's immediate needs.

Perrin expresses a preference for a life insurance policy that provides a range of investment options. Perrin selects a policy and asks Blanc to calculate the net payment cost index (per $1,000 of face value, per year), using a life expectancy of 20 years and a discount rate of 5%. Table 1 provides information about Perrin's policy.

Table 1 Perrin's Life Insurance Policy

Face value	$500,000
Annual premium (paid at beginning of the year)	$12,000
Policy dividends anticipated per year (paid at end of the year)	$2,000
Cash value projected at the end of 20 years	$47,000

9 Which of Perrin's statements regarding his pension is/are correct?

A Statement 1 only

B Statement 2 only

C Both Statement 1 and Statement 2

10 Blanc's calculations show that Perrin's net wealth is:

A less than his net worth.

B equal to his net worth.

C greater than his net worth.

11 In response to Perrin's Concern #1, human capital will *most likely*:

A decrease.

B remain the same.

C increase.

12 Perrin's Concern #2 identifies a risk related to:

A human capital only.

B financial capital only.

C both human and financial capital.

13 Which of the following uses of life insurance *best* meets Perrin's immediate needs?

A Provides estate liquidity

B Acts as a tax-sheltered savings instrument

C Replaces lost earning power for dependents

14 The type of life insurance *most appropriate* for Perrin is:

A term.

B universal.

C whole life.

15 The net payment cost index that Blanc should calculate is *closest* to:

A $17.48.

B $20.00.

C $20.19.

The following information relates to Questions 16–23

Adrian and Olivia Barksdale live in Australia with their 16-year-old twins. Adrian, 47, works in a highly cyclical industry as an engineering manager at a bauxite mine. Olivia, 46, is an accountant. The Barksdales are saving for their retirement and college funding for both children. Adrian's annual salary is A$190,000; Olivia's annual salary is A$85,000. The family's living expenses are currently A$95,000 per year.

Both Adrian and Olivia plan to work 18 more years, and they depend on their combined income and savings to fund their goals. The Barksdales' new financial adviser, Duncan Smith, recommends an appropriate disability insurance policy to cover Adrian, given his large salary. Because he has a highly specialized job, Adrian is willing to pay for the most comprehensive policy available.

Smith is also concerned about the Barksdales' existing life insurance coverage. Currently, the Barksdales have a term life policy insuring Adrian with a death benefit of A$100,000. Smith assesses the family's insurance needs in the event Adrian were to die this year. To do so, Smith uses the needs analysis method based on the financial data presented in Exhibit 1 and the following assumptions:

- The discount rate is 6.0%, and the tax rate is 30%.
- Salary and living expenses grow at 3.5% annually.
- Salary and living expenses occur at the beginning of each year.
- The following assumptions apply in the event of Adrian's death:
  - Olivia will continue to work until retirement;
  - Family living expenses will decline by $30,000 per year;
  - Olivia's projected living expense will be $50,000 per year for 44 years; and
  - The children's projected living expenses will be $15,000 per year for 6 years.

Exhibit 1 Barksdale Family Financial Needs Worksheet

Cash Needs	AUD (A$)
Final expenses and taxes payable	20,000
Mortgage retirement	400,000
Education fund	300,000
Emergency fund	30,000
Total cash needs	750,000
Capital Available	
Cash and investments	900,000
Adrian: Life insurance	100,000
Total capital available	1,000,000

Next, Smith discusses the advantages and disadvantages of annuities. The Barksdales are interested in purchasing an annuity that offers the following characteristics:

- a payout that begins at retirement,
- the ability to invest in a menu of investment options, and
- a payout that continues as long as either Olivia or Adrian is living.

Olivia's mother, Sarah Brown, is also a client of Smith. She is age 75 and retired, and she needs a known income stream to assist her with current and future expenses. Brown's parents both lived longer than average, and she is concerned about outliving her assets. Smith recommends an annuity.

The Barksdales also worry about longevity risk given their family history and healthy lifestyle. Both spouses want an annuity for their later years (beginning in 40 years) that will ensure the greatest supplemental, level income stream relative to the cost. The Barksdales are willing to forgo the right to cash out the policy.

Smith turns to a discussion about the Barksdales' investment portfolio and how total economic wealth (human capital plus financial capital) might affect asset allocation decisions. The Barksdales' human capital is valued at $2.9 million and estimated to be 35% equity-like. Smith determines that an overall target allocation of 40% equity is appropriate for the Barksdales' total assets on the economic balance sheet.

Smith makes two recommendations regarding the Barksdales' investment portfolio.

Recommendation 1 The portfolio should have lower risk than a portfolio for similar investors in the same lifestyle stage.

Recommendation 2 The portfolio should underweight securities having a high correlation with bauxite demand.

16 Based on Adrian's job and salary, the *most appropriate* disability policy would define disability as the inability to perform duties of:

A any occupation.

B Adrian's regular occupation.

C any occupation for which Adrian is suited by education and experience.

17 Based on the given assumptions and the data in Exhibit 1, the additional amount of life insurance coverage needed is *closest* to:

A A$0.

B A$331,267.

C A$2,078,101.

18 Based on the Barksdales' annuity preferences, which type of annuity should they purchase?

A Deferred fixed

B Deferred variable

C Immediate variable

19 Based on the Barksdales' annuity preferences, which annuity payout method should they choose?

A Joint life annuity

B Life annuity with refund

C Life annuity with period certain

20 Based on Brown's goals and concerns, which type of annuity should Smith recommend for her?

A Deferred fixed

B Immediate fixed

C Immediate variable

21 Which type of annuity *best* satisfies the Barksdales' desire for supplemental income in their later years?

A Deferred fixed

B Deferred variable

C Advanced life deferred

22 Based on Exhibit 1, and meeting the Barksdales' target equity allocation for total economic wealth, the financial capital equity allocation should be *closest* to:

A 35.0%.

B 54.5%.

C 56.1%.

23 Which of Smith's recommendations regarding the Barksdales' investment portfolio is/are correct?

A Recommendation 1 only

B Recommendation 2 only

C Both Recommendation 1 and Recommendation 2

SOLUTIONS

1 C is correct. Gregory is in the early career stage of life, and human capital represents a large proportion of his total wealth. Gregory is relatively young; therefore, the present value of his expected earnings implies positive human capital. Furthermore, Gregory's savings are rather low, so his financial capital is small. Consequently, his human capital is greater than his financial capital.

2 A is correct. The present value of expected future earnings is reflected on an economic balance sheet but not on a traditional balance sheet.

3 C is correct. A health maintenance organization plan is a type of medical insurance that allows office visits at no, or very little, cost. Gregory would like to avoid paying for office visits related to minor medical problems; hence this alternative is the most appropriate.

4 A is correct. The income volatility adjustment reflects the fact that income from different professions can vary significantly. Molly works in an industry that has low correlation with the capital markets; she also earns income from an additional source. Kirk works in an industry that has high correlation with capital markets, and so he might experience higher income variability than Molly. Consequently, in estimating Molly's human capital, the income volatility adjustment for Molly should be lower than Kirk's.

5 B is correct. The policy would be on Kirk's life; his death would trigger the insurance payment. Therefore, Kirk would be the insured.

6 A is correct. The whole life insurance policy feature described is a nonforfeiture clause, whereby there is the option to receive some portion of the benefits if premium payments are missed (i.e., before the policy lapses).

7 B is correct. Statement 2 is correct because, all else equal, the income yield is higher when expected longevity is shorter; therefore, the income yield will be higher for an older person.

8 C is correct. Molly is concerned about a potential late-life medical condition that may require extended home care for Gabriel. Long-term care insurance is designed to cover a portion of the cost of home care, assisted living facilities, and/or nursing home expense. Gabriel has enough resources to cover her living expenditures, but her medical insurance might be insufficient to cover the costs of extended home care, medicine, or hospital stays. Consequently, long-term care insurance is the most appropriate insurance choice given Gabriel's situation.

9 A is correct. Unvested pension benefits are typically contingent on future work and are thus considered to be part of human capital. Statement #2 is incorrect: vested pension benefits can be considered components of financial capital.

10 A is correct. Net wealth is calculated as follows:

> Net wealth = Net worth from the traditional balance sheet + (Present value of future earnings + Present value of unvested pension benefits) – (Present value of consumption goals + Present value of bequests)

Perrin's net wealth is less than his net worth because the sum of the present values of consumption and bequests is greater than the sum of the present values of future earnings and unvested pensions.

11 C is correct. Human capital, HC_0, is calculated as follows:

$$HC_0 = \sum_{t=1}^{N} \frac{p(s_t)w_{t-1}(1 + g_t)}{(1 + r_f + y)^t}$$

Holding all else equal as Perrin directs, a reduction in the nominal risk-free rate, r_f, would decrease the total discount rate, thus increasing the present value of human capital.

12 C is correct. The projected slowdown in his employer's sales growth may result in Perrin's unemployment, indicating that he may be subject to earnings risk. Human capital would be reduced by the loss of future earnings and halt accrual of pension benefits at Perrin's present employer. Financial capital could also be affected because assets may need to be sold to make up for any loss of income.

13 A is correct. Life insurance best meets Perrin's immediate need for estate liquidity. A life insurance policy can provide liquidity without the delay involved in the legal process of settling the estate. This liquidity can be particularly valuable if the estate contains illiquid assets or assets that are difficult to separate and distribute equitably among heirs. Currently, it would be difficult to separate and equitably distribute Perrin's financial assets to his three children such that the oldest son inherits the vineyard and winery while keeping the other two children uninvolved because the business is worth more than one-third of Perrin's investment assets. The problem of separating and equitably distributing the estate exists presently regardless of the value of Perrin's personal property.

14 B is correct. Perrin's estate distribution plan indicates a need for estate liquidity funded by permanent insurance that can remain in force until his death. Perrin prefers a policy that offers a range of investment options. Universal life is thus most appropriate because it is a form of permanent insurance that can remain in force until Perrin's death and typically has more options for investing the cash value than do whole life policies.

15 C is correct. The net payment cost index assumes that the insured will die at the end of a specified period—in this case, the given life expectancy of 20 years. Calculating the net payment cost index includes the following steps.

Future value of premiums (annuity due, 5%, 20 years)	$416,631.02
Financial calculator operations:	
N = 20, I = 5, PV = 0, PMT = −12,000, mode = begin: FV → 416,631.02	
Future value of dividends (ordinary annuity, 5%, 20 years)	($66,131.91)
N = 20, I = 5, PV = 0, PMT = 2,000, mode = end: FV → −66,131.91	
20-Year insurance cost	$350,499.11
Annual payments for insurance cost (annuity due, 5%, 20 years)	($10,095.24)
N = 20, I = 5, PV = 0, FV = 350,499.11, mode = begin: PMT → −10,095.24	
Net payment cost index ($10,095.24/500)	($20.19)

16 B is correct. The most comprehensive policy would define disability as the inability to perform Adrian's regular occupation. For professionals with specialized skills, policies that use regular occupation are generally preferred even though they are more expensive. Mr. Barksdale works in a specialized, high-paying occupation, and the family depends on his income.

17 B is correct. The additional amount of life insurance coverage needed is calculated as the difference between the family's total financial needs and total capital available.

Total financial needs are calculated as follows.

Cash Needs	AUD (A$)
Final expenses and taxes	20,000
Mortgage retirement	400,000
Education fund	300,000
Emergency fund	30,000
Total cash needs	750,000

Capital Needs	Present Value
Olivia's living expenses, 44 years	1,377,175
Children's living expenses, 6 years	84,848
(Olivia's income, 18 years)	–880,756
Total capital needs	581,267
Total financial needs	1,331,267

Capital needs are determined as the present value of an annuity due: growth rate = 3.5%, discount rate = 6.0%. Growth of payments is incorporated by adjusting the discount rate to account for the growth rate of earnings. As long as the discount rate is larger than the growth rate, the adjusted rate i can be calculated as follows: [(1 + Discount rate)/(1 + Growth rate)] – 1, or i = (1.06/1.035) – 1 = 2.42%.

The present value of Olivia's living expenses is calculated as follows:

PMT = –$50,000; i = 2.42%, n = 44. Set for payments at beginning of year. PV = $1,377,175.

The present value of the children's living expenses is calculated as follows:

PMT = –15,000; i = 2.42%, n = 6. Set for payments at beginning of year. PV = $84,848.

The present value of Olivia's income is calculated as follows:

PMT = –$85,000 × (1– Tax rate); PMT = $85,000 × 0.70 = 59,500; i = 2.42%, n = 18. Set for payments at beginning of year. PV = –$880,756.

Total capital needs are calculated as follows:

$1,377,175 + $84,848 – $880,756 = $581,267. Adding this amount to total cash needs of $750,000 results in total financial needs of $1,331,267.

The total capital available is calculated as follows.

Capital Available	AUD (A$)
Cash and investments	900,000
Current life insurance	100,000
Total capital available	1,000,000

The additional life insurance need is calculated as follows.

Total financial needs	1,331,267
Total capital available	1,000,000
Life insurance shortfall (excess)	331,267

18 B is correct. The Barksdales want an annuity with a deferred payout (beginning at retirement) and an ability to invest in a diversified mix of securities. Most deferred variable annuities offer a diversified menu of potential investment options, whereas a fixed annuity locks the annuitant into a portfolio of bond-like assets at whatever rate of return exists at the time of purchase.

19 A is correct. A joint life annuity best addresses the Barksdales' goal of receiving a payout as long as either of them is alive. Under a joint life annuity, two or more individuals, such as a husband and a wife, receive payments until all beneficiaries die.

20 B is correct. With immediate fixed annuities, Brown will trade a sum of money today for a promised income benefit for as long as she is alive. Brown is already age 75 and is concerned about longevity risk; she wants a known income stream currently and in the future. Therefore, an immediate fixed annuity is the most appropriate choice.

21 C is correct. In contrast to an immediate payout annuity, an advanced life deferred annuity's (ALDA's) payments begin later in life—for example, when the individual turns 80 or 85. An ALDA would provide the greatest supplemental level income relative to the cost because the payments are made far in the future, life expectancy is shorter when the payments begin, and some policyholders will die without receiving payments.

22 C is correct. The equity allocation of the Barksdale's financial capital is calculated as follows:

Total economic wealth = Human capital + Financial capital = $2,900,000 + $900,000 = $3,800,000.

Target equity allocation of total economic wealth = $3,800,000 × 40% = $1,520,000

Human capital equity allocation = $2,900,000 × 35% = $1,015,000

Financial capital equity allocation = $1,520,000 – $1,015,000 = $505,000

% Financial capital equity allocation = Financial equity allocation/Total financial capital
= $505,000/$900,000
= 0.5611, or 56.1%

23 C is correct. People with higher risk and potential volatility in income (human capital) should take on lower risk in their investment portfolios. Adrian's income is more than two-thirds of the household total and is somewhat volatile because of cyclical demand for his employer's product. Additionally, because income is tied to a particular industry or sector, the Barksdales should underweight securities having a high correlation with bauxite demand.

PORTFOLIO MANAGEMENT
STUDY SESSION

6

Portfolio Management for Institutional Investors

Broadly defined, institutional investors include retirement plans such as defined-benefit or defined-contribution plans, grant making organizations, endowments, insurance companies, banks, sovereign wealth funds, and investment intermediaries. These institutions typically have a well-defined purpose or business model in which their investment portfolio plays a pivotal role. Each group faces a unique set of investment objectives and constraints.

This study session provides a conceptual, yet practical, framework for understanding institutional portfolio management. Concepts and practices important in determining the investment policy statement (IPS) are presented for different types of institutional investors.

READING ASSIGNMENT

Reading 13	Managing Institutional Investor Portfolios by R. Charles Tschampion, CFA, Laurence B. Siegel, Dean J. Takahashi, and John L. Maginn, CFA

Note: The concepts and practices important to institutional investment management appear in many readings throughout the Level III study sessions.

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

13

Managing Institutional Investor Portfolios

by R. Charles Tschampion, CFA, Laurence B. Siegel, Dean J. Takahashi, and John L. Maginn, CFA

R. Charles Tschampion, CFA (USA). Laurence B. Siegel is at the CFA Institute Research Foundation (USA). Dean J. Takahashi is at Yale University (USA). John L. Maginn, CFA (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** contrast a defined-benefit plan to a defined-contribution plan and discuss the advantages and disadvantages of each from the perspectives of the employee and the employer;
☐	**b.** discuss investment objectives and constraints for defined-benefit plans;
☐	**c.** evaluate pension fund risk tolerance when risk is considered from the perspective of the 1) plan surplus, 2) sponsor financial status and profitability, 3) sponsor and pension fund common risk exposures, 4) plan features, and 5) workforce characteristics;
☐	**d.** prepare an investment policy statement for a defined-benefit plan;
☐	**e.** evaluate the risk management considerations in investing pension plan assets;
☐	**f.** prepare an investment policy statement for a participant directed defined-contribution plan;
☐	**g.** discuss hybrid pension plans (e.g., cash balance plans) and employee stock ownership plans;
☐	**h.** distinguish among various types of foundations, with respect to their description, purpose, and source of funds;
☐	**i.** compare the investment objectives and constraints of foundations, endowments, insurance companies, and banks;
☐	**j.** discuss the factors that determine investment policy for pension funds, foundation endowments, life and non-life insurance companies, and banks;
☐	**k.** prepare an investment policy statement for a foundation, an endowment, an insurance company, and a bank;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**l.** contrast investment companies, commodity pools, and hedge funds to other types of institutional investors;
☐	**m.** compare the asset/liability management needs of pension funds, foundations, endowments, insurance companies, and banks;
☐	**n.** compare the investment objectives and constraints of institutional investors given relevant data, such as descriptions of their financial circumstances and attitudes toward risk.

1 INTRODUCTION

The two broad classes of investors active in capital markets internationally are individual and institutional investors. **Institutional investors** are corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets. Frequently representing large pools of money, institutional investors have attained great importance—in many cases dominance—in financial markets worldwide. Institutional investors have also made important contributions to the advancement of investment knowledge and techniques, spurred by the challenges of effectively managing large amounts of money.

Today, advances in portfolio theory, performance pressures, and an ever-increasing array of new investment instruments surround the institutional portfolio manager and both test and enhance the manager's skills. As the manager meets these challenges and pressures, he or she should reflect that behind all investment portfolios lie "flesh and blood" individuals whose financial wellbeing is affected by the manager's actions. News reports remind us that ethical lapses occur with serious consequences for both clients and errant portfolio managers. The client's interests must come first. Ethical conduct is the fundamental requirement for managing an institutional or any other type of portfolio.

This reading presents the portfolio management process from the perspective of five different groups of institutional investors: pension funds, foundations, endowments, insurance companies, and banks. These five classes cover a wide spectrum of investment policy considerations and are well suited to illustrating the challenges and complexity of the institutional portfolio manager's tasks.

We have organized this reading as follows. In Section 2 we present the background and investment setting of pension funds, which fall into two main types: defined benefit and defined contribution. For each of these types of pensions, we discuss the elements of formulating an investment policy statement (IPS)—the governing document for all investment decision-making. We follow the same pattern of presentation for foundations and endowments in Section 3, insurance companies in Section 4, and banks in Section 5. The final section summarizes the reading.

PENSION FUNDS

2

Pension funds contain assets that are set aside to support a promise of retirement income. Generally, that promise is made by some enterprise or organization—such as a business, labor union, municipal or state government, or not-for-profit organization—that sets up the pension plan. This organization is referred to as the **plan sponsor**.

Pension plans divide principally into one of two broad types, based on the nature of the promise that was made. They are either defined-benefit (DB) plans or defined-contribution (DC) plans. A **defined-benefit plan** is a pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants. In contrast, a **defined-contribution plan** specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants. There are also some hybrid types of plans (or *schemes*, as they often are called outside of North America), such as cash balance plans, that have characteristics of both DB and DC plans. A **cash balance plan** is a defined-benefit plan whose benefits are displayed in individual recordkeeping accounts. These accounts show the participant the current value of his or her accrued benefit and facilitate portability to a new plan.

It is useful to understand the distinctions between DB and DC plans in greater detail. A DB plan sponsor promises the organization's employees or members a retirement income benefit based on certain defined criteria. For example, a worker may be promised that for every year employed by the company, he or she will receive a certain fixed money benefit each month. Alternatively, a plan sponsor might promise to pay a certain percentage of some factor related to the employee's pay (e.g., final year, average of final five years, average of top 5 of last 10 years, etc.). The sponsor might also promise to adjust benefit payments for those already retired in order to reflect price inflation. Additionally, the plan may have a whole list of other plan provisions dealing with early retirement supplements, surviving spouse benefits, and so forth.

All DB plans share one common characteristic: They are promises made by a plan sponsor that generate a future financial obligation or "pension liability." The nature and behavior of this liability is uncertain and often complex; consequently, setting investment policy for DB plans presents unique challenges.

The sponsor's promise for DB plans is made for the retirement stage—what the employee will be able to withdraw. In contrast, the promise for DC plans is made for the current stage—what the plan sponsor will contribute on behalf of the employee. This contribution promise at its most basic might be a fixed percentage of pay that is put into the plan by the employer. Alternatively, it could be a contribution based on a formula tied to the profitability of the sponsor. It could also be a promise to match a certain portion of a participant's own contributions into the plan.

DC plans encompass arrangements that are 1) pension plans, in which the contribution is promised and not the benefit, and 2) **profit-sharing plans**, in which contributions are based, at least in part, on the plan sponsor's profits. We can also classify as DC plans the miscellaneous individual, private business, and governmental tax-advantaged savings plans in which the benefit is not promised and in which participants typically make contributions to the plans (for example, Individual Retirement Accounts, or IRAs). The common elements of all these plans are 1) a contribution is made into an account for each individual participant, 2) those funds are invested over time, 3) the plans are tax-deferred, and 4) upon withdrawal from the plan or reaching retirement, the participants receive the value of the account in either a lump sum or a series of payments.

The key differences between DC and DB plans are as follows:

- For DC plans, because the benefit is not promised, the plan sponsor recognizes no financial liability, in contrast to DB plans.

- DC plan participants bear the risk of investing (i.e., the potential for poor investment results). In contrast, in DB plans the plan sponsor bears this risk (at least in part) because of the sponsor's obligation to pay specified future pension benefits. DB plan participants bear early termination risk: the risk that the DB plan is terminated by the plan sponsor.
- Because DC plan contributions are made for individual participants' benefit, the paid-in contributions and the investment returns they generate legally belong to the DC plan participant.
- Because the records are kept on an individual-account basis, DC plan participants' retirement assets are more readily **portable**—that is, subject to certain rules, vesting schedules, and possible tax penalties and payments, a participant can move his or her share of plan assets to a new plan.[1]

From an investment standpoint, DC plans fall into two types:

- Sponsor directed, whereby much like a DB plan, the sponsor organization chooses the investments. For example, some profit-sharing plans (retirement plans in which contributions are made solely by the employer) are sponsor directed.
- Participant directed, whereby the sponsor provides a menu of diversified investment options and the participants determine their own personalized investment policy. Most DC plans are participant directed.

For a participant-directed DC plan, there is very little the institutional sponsor can do in the context of establishing a single investment policy allocation for the plans. Even for sponsor-directed DC plans, the investment policy is substantially less complex than for DB plans. We thus address DB plans first.

2.1 Defined-Benefit Plans: Background and Investment Setting

Defined-benefit plans have existed for a long time, with the first such corporate arrangement established in the United States by American Express in 1928. Today the incidence of DB plans varies internationally, although in recent years the overall use of DC plans has been increasing. In the United States, private defined-benefit plan assets stood at approximately $2.2 trillion as of the end of 2010. Judging by both the number of plan participants and the aggregate amount of plan assets, however, in the United States DC plans predominate. The increasing dominance of DC plans in the United States has been fueled chiefly by the growth of 401(k) plans in the corporate sector. In the United Kingdom, the DB model traditionally accounted for the majority of private sector schemes; more recently, only about 20 percent of private sector workers are covered by DB plans.[2] Elsewhere in Europe, DB plans continue to follow the basic pension model as well, although DC plans are increasingly accepted. Japanese private pensions are overwhelmingly defined-benefit, although Japanese companies now offer cash balance and DC plans as well.

Pension assets fund the payment of pension benefits (liabilities). Thus a pension plan's investment performance should be judged relative to the adequacy of its assets with respect to funding pension liabilities, even if it is also judged on an absolute basis. Understanding pension liabilities is important for knowledgeably setting investment policy.

---

1 Transfer of assets from a DB plan may be feasible; if so, it requires an actuary's calculations. For example, in Canada a terminated employee can request that the dollar value of his vested benefits in a DB plan (as determined by an actuary) be transferred to an individual registered retirement plan. In this context, **vested** means owned by the plan participant.

2 See www.pensions-institute.org/workingpapers/wp0821.pdf.

The sponsor's plan actuary is a mathematician who has the task of estimating the pension liabilities. In addition to the specifics of defining benefits, the estimation of liabilities also involves projecting future workforce changes, determining wage and salary growth levels, estimating probabilities of early retirement elections, applying mortality tables, and other factors. The plan actuary's work provides the following key information to the plan sponsor.

First, an actuary will determine the liability's size and how its present value relates to the portfolio's existing asset size. The relationship between the value of a plan's assets and the present value of its liabilities is known as the plan's **funded status**. In a **fully funded plan**, the ratio of plan assets to plan liabilities is 100 percent or greater (a funded status of 100 percent or greater). The **pension surplus** equals pension plan assets at market value minus the present value of pension plan liabilities. In an **underfunded plan**, the ratio of plan assets to plan liabilities is less than 100 percent.

Three basic liability concepts exist for pension plans:

- **Accumulated benefit obligation (ABO).** The ABO is effectively the present value of pension benefits, assuming the plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date (**accumulated service**). The ABO excludes the impact of expected future wage and salary increases.
- **Projected benefit obligation (PBO).** The PBO stops the accumulated service in the same manner as the ABO but projects future compensation increases if the benefits are defined as being tied to a quantity such as final average pay. The PBO thus includes the impact of expected compensation increases and is a reasonable measure of the pension liability for a going concern that does not anticipate terminating its DB plan. Funding status is usually computed with respect to the PBO.
- **Total future liability.** This is the most comprehensive, but most uncertain, measure of pension plan liability. Total future liability can be defined as the present value of accumulated *and* projected future service benefits, including the effects of projected future compensation increases. This financial concept can be executed internally as a basis for setting investment policy.

An actuary's work will also determine the split of the plan liability between retired and active **lives** (employees). This distinction will indicate two important factors:

- Because retirees are currently receiving benefits, the greater the number of retired lives, the greater the cash flows out of the fund each month, and thus the higher the pension fund's liquidity requirement. The portion of a pension fund's liabilities associated with retired workers is the **retired-lives** part; that associated with active workers is the **active-lives** part.
- Because the same mortality table is being applied to both active and retired plan beneficiaries, a plan with a greater percentage of retirees generally has a shorter average life or duration of future pension liabilities.

We now turn to developing the investment policy statement elements for a DB plan.

2.1.1 *Risk Objectives*

In setting a risk objective, plan sponsors must consider plan status, sponsor financial status and profitability, sponsor and pension fund common risk exposures, plan features, and workforce characteristics, as shown in Exhibit 1. (Risk tolerance, to review, is the willingness and ability to bear risk.)

Exhibit 1 Factors Affecting Risk Tolerance and Risk Objectives of DB Plans

Category	Variable	Explanation
Plan status	Plan funded status (surplus or deficit)	Higher pension surplus or higher funded status implies greater risk tolerance.
Sponsor financial status and profitability	Debt to total assets Current and expected profitability	Lower debt ratios and higher current and expected profitability imply greater risk tolerance.
Sponsor and pension fund common risk exposures	Correlation of sponsor operating results with pension asset returns	The lower the correlation, the greater risk tolerance, all else equal.
Plan features	Provision for early retirement Provision for lump-sum distributions	Such options tend to reduce the duration of plan liabilities, implying lower risk tolerance, all else equal.
Workforce characteristics	Age of workforce Active lives relative to retired lives	The younger the workforce and the greater the proportion of active lives, the greater the duration of plan liabilities and the greater the risk tolerance.

The points in Exhibit 1 deserve comment. In principle, an overfunded pension plan can experience some level of negative returns without jeopardizing the coverage of plan liabilities by plan assets because the plan surplus acts as a cushion. Thus the sponsor's ability to assume investment risk in the plan increases with funded status, even though it may have no need to do so. An underfunded plan may increase the plan sponsor's willingness to take risk in an attempt to make the plan fully funded; however, all else equal, an underfunded plan has less ability to take risk because a funding shortfall already exists. Consequently, an underfunded plan must de-emphasize its willingness to take risk.

If a plan is not fully funded, the plan sponsor has an obligation to make contributions to the plan. The sponsor's financial strength and profitability can affect the sponsor's ability and willingness to make such contributions when needed. When the sponsor is financially weak, it has a reduced ability to fund shortfalls that might occur from unfavorable investment experience.[3] Further, when the sponsor's operating results are highly correlated with pension asset returns, the size of pension contributions may increase when the sponsor's operating results are weak.

Certain plan provisions may give participants options to speed up the disbursement of benefits, decreasing risk tolerance, all else equal. Older workforces mean shorter duration liabilities and higher liquidity requirements, implying lower risk tolerance in general. Also, for a plan with an older workforce, if the plan becomes underfunded, the company will have less time to generate and make contributions to the plan.

Example 1 illustrates some of these concepts.

3 Historically, in some countries such as Germany and the United Kingdom, DB pensions are not set up as separate entities and pension liabilities are set up as book reserves on a company's own balance sheet. In such cases, pension benefits are direct liabilities of the company. However, the European Union prescription that International Accounting Standards be adopted by companies listed within the EU is one of several forces at work reducing national differences.

EXAMPLE 1

Apex Sports Equipment Corporation (1)

George Fletcher, CFA, is chief financial officer of Apex Sports Equipment Corporation (ASEC), a leading producer of winter and water sports gear. ASEC is a small company, and all of its revenues come from the United States. Product demand has been strong in the past few years, although it is highly cyclical. The company has rising earnings and a strong (low debt) balance sheet. ASEC is a relatively young company, and as such its defined-benefit pension plan has no retired employees. This essentially active-lives plan has $100 million in assets and an $8 million surplus in relation to the projected benefit obligation. Several facts concerning the plan follow:

- The duration of the plan's liabilities (which are all US-based) is 20 years.
- The discount rate applied to these liabilities is 6 percent.
- The average age of ASEC's workforce is 39 years.

Based on the information given, discuss ASEC's risk tolerance.

Solution:

ASEC appears to have above average risk tolerance, for the following reasons:

1. The plan has a small surplus (8 percent of plan assets); that is, the plan is overfunded by $8 million.
2. The company's balance sheet is strong (low use of debt).
3. The company is profitable despite operating in a cyclical industry.
4. The average age of its workforce is low.

The primary purpose of DB pension fund assets is to fund the payment of pension liabilities. DB plans share this characteristic with insurance companies and banks, as we shall later see. For all these investors, risk relative to liabilities is important and the asset/liability management (ALM) perspective on risk and on investing more generally is a primary concern. **Asset/liability management** is a subset of a company's overall risk management practice that typically focuses on financial risks created by the interaction of assets and liabilities; for given financial liabilities, asset/liability management involves managing the investment of assets to control relative asset/liability values. For a DB plan, one key ALM concept is the pension surplus, defined as pension assets at market value minus the present value of pension liabilities. DB plans may state a risk objective relative to the level of pension surplus volatility (i.e., standard deviation). Another kind of ALM risk objective relates to shortfall risk with respect to plan liabilities. (**Shortfall risk** is the risk that portfolio value will fall below some minimum acceptable level over some time horizon; it can be stated as a probability.) Shortfall risk may relate to achieving:

- a funded status of 100 percent (or some other level) with respect to the ABO, PBO, or total future liability;
- a funded status above some level that will avoid reporting a pension liability on the balance sheet under accounting rules; and
- a funded status above some regulatory threshold level. Examples (in the United States) include:

- levels under the Employee Retirement Income Security Act (ERISA) that would trigger additional contribution requirements; and
- levels under which the Pension Benefit Guaranty Corporation (PBGC) would require additional premium payments.[4]

Other goals that may influence risk objectives include two that address future pension contributions:

- Minimize the year-to-year volatility of future contribution payments.
- Minimize the probability of making future contributions, if the sponsor is currently not making any contributions because the plan is overfunded.

The risk considerations given above interact with each other extensively. For example, for a plan to maintain its funded status, the plan sponsor may need to increase contributions. Prioritizing risk factors is an integral part of establishing the sponsor's risk objectives. In addition to risk objectives relative to liabilities and contributions (which are characteristic of DB investment planning), sponsors may state absolute risk objectives, as with any other type of investing.

EXAMPLE 2

Apex Sports Equipment Corporation (2)

George Fletcher now turns to setting risk objectives for the ASEC pension plan. Because of excellent recent investment results, ASEC has not needed to make a contribution to the pension fund in the two most recent years. Fletcher considers it very important to maintain a plan surplus in relation to PBO. Because an $8 million surplus will be an increasingly small buffer as plan liabilities increase, Fletcher decides that maintaining plan funded status, stated as a ratio of plan assets to PBO at 100 percent or greater, is his top priority.

Based on the above information, state an appropriate type of risk objective for ASEC.

Solution:

An appropriate risk objective for ASEC relates to shortfall risk with respect to the plan's funded status falling below 100 percent. For example, ASEC may want to minimize the probability that funded status falls below 100 percent, or it may want the probability that funded status falls below 100 percent to be less than or equal to 10 percent. Another relevant type of risk objective would be to minimize the probability that ASEC will need to make future contributions.

In summary, plan funded status, sponsor financial status, plan features, and workforce characteristics influence risk tolerance and the setting of risk objectives. The plan sponsor may formulate a specific risk objective in terms of shortfall risk, risk related to contributions, as well as absolute risk.

2.1.2 *Return Objectives*

A DB pension plan's broad return objective is to achieve returns that adequately fund its pension liabilities on an inflation-adjusted basis. In setting return objectives, the pension sponsor may also specify numerical return objectives. A pension plan must

4 The PBGC is a US government agency that insures the vested DB pension benefits of beneficiaries of terminated DB plans. The premium rates charged by PBGC increase with the insured DB plan's level of unfunded vested benefits.

meet its obligations. For a DB pension plan, the *return requirement* (in the sense of the return the plan needs to achieve on average) depends on a number of factors, including the current funded status of the plan and pension contributions in relation to the accrual of pension benefits. If pension assets equal the present value of pension liabilities and if the rate of return earned on the assets equals the discount rate used to calculate the present value of the liabilities, then pension assets should be exactly sufficient to pay for the liabilities as they mature. Therefore, for a fully funded pension plan, the portfolio manager should determine the return requirement beginning with the discount rate used to calculate the present value of plan liabilities.[5] That discount rate may be a long-term government bond yield, for example. The pension fund's stated return desire may be higher than its return requirement, in some cases reflecting concerns about future pension contributions or pension income:

- **Return objectives relating to future pension contributions.** The natural ambitious or "stretch target" of any DB plan sponsor is to make future pension contributions equal zero. A more realistic objective for most is to minimize the amount of future pension contributions, expressed either on an undiscounted or discounted basis.
- **Return objectives related to pension income.** Both US Generally Accepted Accounting Principles (GAAP) and International Accounting Standards (IAS) incorporate accounting rules that address the recognition of pension expense in the corporate plan sponsor's income statement. The rules are symmetrical—that is, a well-funded plan can be in a position of generating negative pension expense, i.e. pension income. In periods of strong financial market performance, a substantial number of corporations will have pension income that is a measurable portion of total net income reported on the corporate plan sponsor's income statement. A sponsor in this position may have an objective of maintaining or increasing pension income.[6]

Just as risk tolerance increases with the duration of plan liabilities, in general, so may the stated return desire—within realistic limits. For example, if the plan has a young and growing workforce, the sponsor may set a more aggressive return objective than it would for a plan that is currently closed to new participants and facing heavy liquidity requirements.

It is worth noting that pension plan sponsors may manage investments for the active-lives portion of pension liabilities according to risk and return objectives that are distinct from those they specify for the retired-lives portion. Retired-lives benefits may be fixed in nominal terms—for example, based on a worker's final wages. For assets associated with such liabilities, return and risk objectives may be more conservative than for assets associated with liabilities for active lives, because active-lives liabilities will grow with inflation.

5 See Scanlon and Lyons (2006) for a detailed discussion of current issues related to return requirements.
6 In considering whether to adopt this as an objective, however, a plan sponsor must recognize that pension income is based on the *expected* future return on pension assets. Many analysts exclude pension income from measures of core or underlying earnings.

EXAMPLE 3

Apex Sports Equipment Corporation (3)

George Fletcher now addresses setting return objectives for ASEC. Because the plan is fully funded, Fletcher is proposing a return objective of 7.5 percent for the plan. Referring to the information in Examples 1 and 2, as well as to the above facts, answer the following questions.

1. State ASEC's return requirement.
2. State one purpose Fletcher might have in proposing a desired return of 7.5 percent.
3. Create and justify the return objective element of an investment policy statement for the ASEC pension plan.

Solution to 1:

The discount rate applied to finding the present value of plan liabilities is 6 percent. This discount rate is ASEC's return requirement.

Solution to 2:

Besides meeting pension obligations, Fletcher may have one of the following objectives in mind:

- To minimize ASEC's future pension contributions.
- To generate pension income (negative pension expense).

Solution to 3:

A statement such as the following is appropriate:

Return objectives

The primary return objective for the ASEC pension plan is to achieve a total return sufficient to fund its liabilities on an inflation-adjusted basis. The ASEC pension plan has a long-term growth orientation, with a total return objective of 7.5 percent per year.

Justification

In formulating a return objective for this essentially active-lives fund, considerations include:

- The return requirement is 6 percent. The objectives are consistent with achieving at least this level of return and with meeting pension liabilities.
- Because the plan has a long duration, little need for immediate liquidity, and a fully funded status, and because the sponsor's financial strength and profitability are strong, ASEC has above-average risk tolerance and can adopt an aggressive return objective. Thus a long-term growth orientation with a focus on capital appreciation, as well as a specific objective of 7.5 percent, appears to be appropriate.

In the next sections, we address the five broad categories of constraints.

2.1.3 *Liquidity Requirement*

A DB pension fund receives pension contributions from its sponsor and disburses benefits to retirees. The net cash outflow (benefit payments minus pension contributions) constitutes the pension's plan liquidity requirement. For example, a pension

fund paying $100 million per month in benefits on an asset base of $15 billion, and receiving no sponsor pension contribution, would have an annual liquidity requirement of 8 percent of plan assets. During the year, the asset base would need to grow to $16.2 billion in order to meet the payout requirement without eroding the capital base. The following issues affect DB plans' liquidity requirement:

- The greater the number of retired lives, the greater the liquidity requirement, all else equal. As one example, a company operating in a declining industry may have a growing retired-lives portion placing increasing liquidity requirements on the plan.
- The smaller the corporate contributions in relation to benefit disbursements, the greater the liquidity requirement. The need to make contributions depends on the funded status of the plan. For plan sponsors that need to make regular contributions, young, growing workforces generally mean smaller liquidity requirements than older, declining workforces.
- Plan features such as the option to take early retirement and/or the option of retirees to take lump-sum payments create potentially higher liquidity needs.

EXAMPLE 4

Apex Sports Equipment Corporation (4)

Recall the following information from Example 1. ASEC is a relatively young company, and as such its defined-benefit pension plan has no retired employees. This essentially active-lives plan has $100 million in assets and an $8 million surplus in relation to the PBO. Several facts concerning the plan follow:

- The duration of the plan's liabilities (which are all US-based) is 20 years;
- The discount rate applied to these liabilities is 6 percent; and
- The average age of the workforce is 39 years.

Because of excellent recent investment results, ASEC has not needed to make a contribution to the pension fund in the most recent two years.

Based on the above information, characterize ASEC's current liquidity requirement.

Solution:

ASEC currently has no retired employees and is not making pension contributions into the fund, but it has no disbursements to cover. Thus, ASEC has had no liquidity requirements recently. Given that the average age of ASEC's workforce is 39 years, liquidity needs appear to be small for the near term as well.

When a pension fund has substantial liquidity requirements, it may hold a buffer of cash or money market instruments to meet such needs. A pension fund with a cash balance can gain equity market exposure by holding stock index futures contracts, or bond market exposure by holding bond futures, if it desires.

2.1.4 *Time Horizon*

The investment time horizon for a DB plan depends on the following factors:

- whether the plan is a going concern or plan termination is expected; and
- the age of the workforce and the proportion of active lives. When the workforce is young and active lives predominate, and when the DB plan is open to new entrants, the plan's time horizon is longer.

The overall time horizon for many going-concern DB plans is long. However, the horizon can also be multistage: for the active-lives portion the time horizon is the average time to the normal retirement age, while for the retired-lives portion, it is a function of the average life expectancy of retired plan beneficiaries.

EXAMPLE 5

Apex Sports Equipment Corporation (5)

Based on the information from Example 4, characterize the time horizon for ASEC's pension plan.

Solution:

On average, the plan participants are 39 years old and the duration of plan liabilities is 20 years. The "time to maturity" of the corporate workforce is a key strategic element for any DB pension plan. Having a younger workforce often means that the plan has a longer investment horizon and more time available for wealth compounding to occur. These factors justify ASEC adopting a relatively long time horizon for as long as ASEC remains a viable going concern.

2.1.5 *Tax Concerns*

Investment income and realized capital gains within private defined-benefit pension plans are usually exempt from taxation. Thus investment planning decisions at the level of the plan itself can generally be made without regard to taxes. Although corporate contribution planning involves tax issues, as do plan terminations and the form of distributions to beneficiaries, defined-benefit pension fund investment planning usually does not. However, Example 6 illustrates a case in which tax considerations do arise.

EXAMPLE 6

Taxation and Return Objectives

In 1997, the UK government abolished a rule that had allowed pension funds to receive dividends gross of tax (that is, tax free). Discuss the probable impact of the change on the prior return objectives of pension funds, given that pension schemes often invest in dividend-paying ordinary shares.

Solution:

Total return on ordinary shares is the sum of capital appreciation and dividend yield. After the rule change, the after-tax total return became less than pretax total return for dividend-paying shares, so a given prior (pretax) return target became less effective at the margin in funding liabilities.

2.1.6 *Legal and Regulatory Factors*

All retirement plans are governed by laws and regulations that affect investment policy. Virtually every country that allows or provides for separate portfolio funding of pension schemes imposes some sort of regulatory framework on the fund or plan structure. In the United States, corporate plans and multi-employer plans are governed by the Employee Retirement Income Security Act of 1974 (ERISA), although state and local government plans as well as union plans are not. State and local government plans are subject to state law and regulations that can differ from each other and also from ERISA. In the United States, union plans are subject to regulation under the

Taft–Hartley Labor Act. An important attribute of ERISA is that it preempts state and local law, so that those plans that are subject to it must deal with only a single body of regulation. Both ERISA and state law and regulations generally specify standards of care that pension plan sponsors must meet in making investment decisions.

A pension plan trustee is an example of a **fiduciary**, a person standing in a special relation of trust and responsibility with respect to other parties (from the Latin word *fiducia*, meaning trust). A trustee is legally responsible for ensuring that assets are managed solely in the interests of beneficiaries (for a pension, the pension plan participants). Depending on legal jurisdiction, fiduciaries are subject to various legal standards of care as they execute their responsibilities. Beneficiaries may attempt to recover their losses from fiduciaries that fail to meet appropriate standards of care.

In Canada, pension funds are regulated at the provincial level, but the Ontario Pension Commission has arguably set the standard with an ERISA-like body of regulation. In the United Kingdom, recent years have seen the work of blue ribbon panels such as the Free Commission and the Myner Commission become standards for guiding investment policy. European countries such as the Netherlands; Asia-Pacific nations including Australia, Japan, and Singapore; and Latin American countries such as Brazil, Chile, and Mexico are examples of countries having regulatory frameworks for employee pension and savings plans.

Historically in some major developed markets, the pension plan structure does not involve having to deal with investment policy issues. For example, France has a state-run scheme requiring plan sponsor organizations to contribute. But apart from the countries where funded plans are not used, it is important for the institutional practitioner to understand and apply the law and regulations of the entity having jurisdiction when developing investment policy.

2.1.7 *Unique Circumstances*

Although we cannot make general statements about unique circumstances, one constraint that smaller pension plans sometimes face relates to the human and financial resources available to the plan sponsor. In particular, investment in alternative investments (for example, private equity, hedge funds, and natural resources) often requires complex due diligence. (**Due diligence** refers to investigation and analysis in support of an investment action or recommendation; failure to exercise due diligence may sometimes result in liability according to various laws.)

Another unique circumstance for a plan might be a self-imposed constraint against investing in certain industries viewed as having negative ethical or welfare connotations, or in shares of companies operating in countries with regimes against which some ethical objection has been raised. Such ethical investment considerations have played a role in the investment policy of many public employee pension plans and some private company and union pension plans. Australian and several European regulators require that pension funds disclose whether they include ethical criteria in their decision-making processes. In the United Kingdom, such legislation (imposed in 1999) contributed significantly to the growth of socially responsible investing in pension plans.

To conclude, Example 7 shows how Apex Sports Equipment might formulate an investment policy statement that incorporates the analysis in Examples 1 through 5.

EXAMPLE 7

Apex Sports Equipment Corporation Defined-Benefit Plan Investment Policy Statement

Apex Sports Equipment Corporation (the "Company") operates in the recreation industry. The Company sponsors the Apex Sports Equipment Corporation Pension Plan (the "Plan"), the purpose of which is to accumulate assets in order to fund the obligations of the Plan. The Plan fiduciary is the Apex Sports Equipment Corporation Plan Investment Committee (the "Committee"). The Plan is an employer contributory defined-benefit pension plan covering substantially all full-time Company employees.

Purpose

The purpose of the Investment Policy Statement (the "Policy") is to provide clear guidelines for the management of plan assets. This Policy establishes policies and guidelines for the investment practices of the Plan. The Committee has reviewed and, on 21 April 2011, adopted this Policy. The Policy outlines objectives, goals, restrictions, and responsibilities in order that:

- the Committee, staff, investment managers, and custodians clearly understand the objectives and policies of the Plan;
- the investment managers are given guidance and limitations concerning the investment of the Plan's assets; and
- the Committee has a meaningful basis for evaluating the investment performance of individual investment managers, as well as evaluating overall success in meeting its investment objectives.

The Plan shall at all times be managed in accordance with all state and federal laws, rules, and regulations including, but not limited to, the Employee Retirement Income Security Act of 1974 (ERISA).

Identification of Duties and Investment Responsibilities

The Committee relies on staff and outside service providers (including investment managers and bank custodians) in executing its functions. Each entity's role as fiduciary must be clearly identified to ensure clear lines of communication, operational efficiency, and accountability in all aspects of operation.

Investment Committee

The Committee is responsible for managing the investment process. The Committee, with the assistance of staff, monitors the performance of investments; ensures funds are invested in accordance with Company policies; studies, recommends, and implements policy and operational procedures that will enhance the investment program of the Plan; and ensures that proper internal controls are developed to safeguard the assets of the Plan.

Investment Managers

Investment managers will construct and manage investment portfolios consistent with the investment philosophy and disciplines for which they were retained. They will buy and sell securities and modify the asset mix within their stated guidelines. The Committee believes that investment decisions are best made when not restricted by excessive limitations. Therefore, full discretion is delegated to investment managers to carry out investment policy within their stated guidelines. However, investment managers shall respect and observe the specific limitations, guidelines, attitudes, and philosophies stated herein and within any implementation guidelines, or as expressed in any written

amendments. Investment managers are expected to communicate, in writing, any developments that may affect the Plan's portfolio to the Committee within five business days of occurrence. Examples of such events include, but are not limited to, the following:

- a significant change in investment philosophy;
- a change in the ownership structure of the firm;
- a loss of one or more key management personnel; and
- any occurrence that might potentially affect the management, professionalism, integrity, or financial position of the firm.

Bank Custodian

The bank trustee/custodian(s) will hold all cash and securities (except for those held in commingled funds and mutual funds) and will regularly summarize these holdings for the Committee's review. In addition, a bank or trust depository arrangement will be used to accept and hold cash prior to allocating it to the investment manager and to invest such cash in liquid, interest-bearing instruments.

Investment Goals and Objectives

The Plan's overall investment objective is to fund benefits to Plan beneficiaries through a carefully planned and well-executed investment program.

Return Objectives

The overall return objective is to achieve a return sufficient to achieve funding adequacy on an inflation-adjusted basis. Funding adequacy is achieved when the market value of assets is at least equal to the Plan's projected benefit obligation as defined in Statement of Financial Accounting Standards No. 87, as calculated by the Plan's actuary. The Plan has a total return objective of 7.5 percent per year. In addition, the Plan has the following broad objectives:

- The assets of the Plan shall be invested to maximize returns for the level of risk taken.
- The Plan shall strive to achieve a return that exceeds the return of benchmarks composed of various established indexes for each category of investment, in which the weights of the indexes represent the expected allocation of the Plan's investments over a three- to five-year time horizon.

Risk Objectives

- The assets of the Plan shall be diversified to minimize the risk of large losses within any one asset class, investment type, industry or sector distributions, maturity date, or geographic location, which could seriously impair the Plan's ability to achieve its funding and long-term investment objectives.
- The Plan's assets shall be invested such that the risk that the market value of assets falls below 105 percent of the Plan's projected benefit obligation in a given year is 10 percent or less.

Constraints

- The assets of the Plan shall maintain adequate liquidity to meet required benefit payments to the Plan's beneficiaries. The Plan currently and for the foreseeable future has minimal liquidity requirements.

- The Plan's assets shall be invested consistent with the Plan's long-term investment horizon.
- As a tax-exempt investor, the Plan shall invest its assets with a focus on total return without distinction made between returns generated from income and returns generated from capital gains.

Review Schedule

The Committee will review investment performance on a quarterly basis. This investment policy statement will be reviewed annually or more frequently as required by significant changes in laws or regulations, in the funded status of the Plan, or in capital market conditions.

Asset Allocation

The Committee believes that the level of risk assumed by the Plan is largely determined by the Plan's strategic asset allocation. The Committee has summarized the factors that should be considered in determining its long-term asset allocation as follows:

- the Plan's time horizon;
- the funded status of the Plan; and
- the Company's financial strength.

In establishing the long-run asset allocation for the Plan, the Committee will consider conservative long-run capital market expectations for expected return, volatility, and asset class correlations. The Plan's strategic asset allocation will be set out by the Committee in a separate strategic asset allocation document.

Rebalancing

The Committee is responsible for the Plan's asset allocation decisions and will meet to review target allocations as required based on market conditions, but at least every three years. Until such time as the Committee changes target allocations, the portfolio must periodically be rebalanced as a result of market value fluctuations. The Committee has delegated to staff the duty of implementing such rebalancing. After the Plan has reached its target equity allocation, the equity allocation shall be rebalanced to its equity target on a quarterly basis using index-based vehicles. Specific investment manager allocations will be rebalanced back to target on an annual basis. Staff will report rebalancing activity to the Committee.

2.1.8 *Corporate Risk Management and the Investment of DB Pension Assets*

A DB pension plan can potentially so significantly affect the sponsoring corporation's financial performance that the study of DB pension asset investment in relation to pension and corporate objectives has developed into a wide-ranging literature. Practically, we can make several observations. From a risk management perspective, the two important concerns are:[7]

- managing pension investments in relation to operating investments; and
- coordinating pension investments with pension liabilities.

7 See Haugen (1990). Coordinating pension liabilities with corporate liabilities has also been suggested as a risk management focus.

To explain the first concern, in Exhibit 1 we identified the correlation between sponsor operating results and pension asset returns as one variable to monitor in assessing risk tolerance. We explained that the lower the correlation, the greater the risk tolerance, all else equal. Assuming that business and pension portfolio risks are positively correlated, a high degree of operating risk would tend to limit the amount of risk that a pension portfolio could assume, and vice versa. Although we are concerned with the IPS, our view will be more rounded if we look at the different perspective of building the pension portfolio. One question to address in that regard is whether the pension portfolio diversifies risk relative to the sponsor's operating activities. All else equal, a portfolio that diversifies sponsor operational risk increases the chance that, if the sponsor needs to increase contributions to support the payment of plan pension benefits, the sponsor will be in a position to do so. Consider a portfolio with actively managed equity holdings that overweight the telecommunications sector. Such a portfolio would be less risky for a plan sponsor operating in the consumer staples sector, which has a relatively low correlation to telecom, than for one operating in a telecom-related technology sector (e.g., a supplier of DSL equipment to telephone companies).

With respect to the second concern, coordination, the plan manager's objective is to increase the probability that pension plan assets will be sufficient to fund pension plan benefits with the minimal requirement for additional contributions by the corporate plan sponsor. For a fully funded pension plan, the goal is to maintain the plan's funded status (pension surplus) relative to plan liabilities. Although both stated concerns are consistent from a comprehensive risk management perspective, asset/liability management approaches to portfolio construction emphasize managing investments relative to liabilities. From an ALM perspective, the characterization of risk in the IPS needs to be stated in *relative* terms. The emphasis shifts from the expected volatility of pension *assets* to the expected volatility of pension *surplus* and to probabilities concerning expected levels of funded status over appropriate time frames. In practice, we can use tools such as simulation to explore whether specific portfolios can be expected to satisfy such relative risk objectives. The volatility of surplus is lower if changes in the value of plan assets are positively correlated with changes in the value of plan liabilities. Because pension plan liabilities are interest rate sensitive, pension plan sponsors emphasizing an ALM approach tend to make more intensive use of interest-rate-sensitive securities (in particular, bonds) than would otherwise be the case.

2.2 Defined-Contribution Plans: Background and Investment Setting

Two broad types of defined-contribution plans are those where the investment of the assets is directed by the plan sponsor and those where the investment is participant-directed. Because setting investment policy for sponsor-directed plans is a simpler subset of the process for DB plans, here we will focus on participant-directed plans.

The principal investment issues for DC plans are as follows:

- **Diversification.** The sponsor must offer a menu of investment options that allows participants to construct suitable portfolios. For example, in the United States, Section 404(c) of ERISA establishes a safe harbor for DC plan sponsors against claims of insufficient or imprudent investment choice if the plan has 1) at least three investment choices diversified versus each other and 2) provision

for the participant to move freely among the options. Sponsors of participant-directed DC plans frequently make available to participants sophisticated retirement planning tools such as Monte Carlo simulation to aid in decision-making.

- **Company Stock.** Holdings of sponsor-company stock should be limited to allow participants' wealth to be adequately diversified.

Even for participant-directed DC plans, the plan sponsor must have a written investment policy statement. The IPS documents the manner in which the plan sponsor is meeting the fiduciary responsibility to have an adequate process for selecting the investment options offered to plan participants as well as for periodically evaluating those options; furthermore, the establishment of an IPS may be legally mandated. DC plans, however, call for quite different IPSs than do DB plans. A DC investment policy statement establishes procedures to ensure that a myriad of individual investor objectives and constraints can be properly addressed. This can best be seen in a sample statement, an example of which follows.

2.2.1 *The Objectives and Constraints Framework*

In the DC setting, the plan sponsor does not establish objectives and constraints; rather, the plan participants set their own risk and return objectives and constraints. The plan sponsor provides educational resources, but the participant is responsible for choosing a risk and return objective reflecting his or her own personal financial circumstances, goals, and attitudes toward risk.

EXAMPLE 8

Participant Wanting to Make Up for Lost Time

A middle-aged man joined the participant-directed DC plan of BMSR five years ago. He had no previous retirement plan or asset base aside from home equity, and he states that he needs to take more risk than most people so that he can catch up. In fact, the participant's asset base, current income, and desired spending rate for retirement at age 65 all indicate that the participant needs a very high annual rate of return to deliver his desired retirement income.

1. Does the participant have a higher than average risk tolerance?
2. If the participant's risk objectives are not appropriate, would BMSR counsel him to change them?

Solution to 1:

No. This participant's ability to take risk is less than his willingness because of his small asset base and the limited time left until he needs to draw on his retirement assets; his risk tolerance is not above average.

Solution to 2:

BMSR would not counsel the participant because the plan is participant-directed. The employee needs to educate himself about the objectives and constraints framework as applied to individual investors.

EXAMPLE 9

Participant Early in Career

A 25-year-old plan participant joined BMSR recently. She is single and in good health. She has always been conservative and does not feel confident in her ability to choose funds for her retirement plan. She thinks that perhaps she should just put half in the money market fund and half in the large-capitalization value common stock fund. How do this participant's plan choices match her situation?

Solution:

Given her investment time horizon, she may benefit by increasing her willingness to take risk to match her ability to take risk. She could adopt a more aggressive risk stance while increasing diversification by moving money from the money market fund to a bond fund and/or another equity fund (for example, a growth-oriented fund). If her company offers an investor education program, this participant should attend so that she can explore the elements of assessing risk tolerance.

As mentioned, participants in DC plans bear the risk of investment results. As a consequence, an investment policy statement for a DC plan fulfills a much different role than an investment policy statement for a DB plan. For example, an IPS for a participant-directed DC plan is the governing document that describes the investment strategies and alternatives available to the group of plan participants characterized by diverse objectives and constraints. Such an IPS necessarily becomes an overall set of governing principles rather than an IPS for a specific plan participant. Example 10 provides sample excerpts from an investment policy statement for a participant-directed DC plan.

EXAMPLE 10

Investment Policy Statement for BMSR Company Defined-Contribution Plan

Purpose

The purpose of this Investment Policy Statement is to assist the members of the Retirement Policy Committee (RPC) in effectively establishing, monitoring, evaluating, and revising the investment program established for the defined-contribution plan (the Plan) sponsored by the BMSR-Company (BMSR). The authority for establishing this responsibility is by action of the BMSR Board of Directors at its 26 March 2002 meeting. The primary focuses of this Investment Policy Statement are as follows:

- Clearly distinguish among the responsibilities of the RPC, the Plan participants, the fund managers, and Plan trustee/recordkeeper selected by the RPC.
- Provide descriptions of the investment alternatives available to Plan participants.
- Provide criteria for monitoring and evaluating the performance of investment managers and investment vehicles (funds) relative to appropriate investment benchmarks.

- Provide criteria for manager/fund selection, termination and replacement.
- Establish effective communication procedures for the fund managers, the trustee/recordkeeper, the RPC, and the Plan participants.

RPC Roles and Responsibilities

The RPC's responsibilities, in carrying out this Investment Policy Statement, include:

- monitoring the fund objectives and selecting specific funds to be offered to the Plan participants to provide sufficient diversification possibilities;
- monitoring the investment performance, including fees, of funds made available to Plan participants and terminating and replacing funds when judicious and appropriate;
- assuring ongoing communications with, and appropriate educational resources for, the Plan participants;
- selecting, monitoring and, if necessary, recommending the replacement of the Trustee/Recordkeeper of the Plan; and
- assuring that the interest rate for Plan loans is in accordance with the provisions of the Plan.

Plan Participant Roles and Responsibilities

The responsibilities of plan participants include the allocation of Plan contributions and accumulations among the various fund choices made available and the obligation to educate themselves sufficiently in order to make appropriate allocations over their career or life span. A participant's appropriate asset allocation is a function of multiple factors, including age, income, length of time before retirement, tolerance for risk, accumulation objectives, retirement income replacement objectives, and other assets. To permit participants to establish savings and investment strategies to suit their individual needs, the Plan offers a number of investment alternatives with varying return and risk characteristics.

The participant is best positioned to make the individual decision on how to allocate assets among the investment alternatives. As such, the investment direction of employees' elective deferrals and contributions made by BMSR will be each individual participant's responsibility. It is also each individual participant's responsibility to reallocate assets among funds as personal circumstances change.

To help address the factors mentioned above, BMSR will provide information to participants regarding the investment alternatives and basic principles of investing. However, the dissemination of information and the provision of investment alternatives by BMSR do not constitute advice to participants.

The return/risk concept is basic to investments. Over time, investment alternatives offering higher expected returns will exhibit higher risk (e.g., volatility of returns or of principal values). The Plan offers a variety of investment choices in order to provide participants the opportunity to select return/risk strategies that meet their savings and investment objectives and to adequately diversify.

ERISA 404(c) Compliance

BMSR intends to comply with ERISA Section 404(c) regulations by, among other things, offering a broad, diversified range of investment choices; allowing transfers of funds between investment choices at least once every 90 days; and providing sufficient investment information to participants on a regular basis.

Selection of Investment Alternatives

The RPC's role is to provide participants with an array of investment choices with various investment objectives that should enable participants to invest according to their varying investment needs. The investment choices offered should represent asset classes with different risk and return characteristics and with sufficient diversification properties. The following asset classes have the investment characteristics currently desired:

- money market instruments;
- intermediate-term fixed-income instruments;
- intermediate-term Treasury Inflation-Indexed Securities;
- equity
  - large-cap growth
  - large-cap blend/core
  - large-cap value
  - mid-cap blend/core
  - small-cap blend/core
  - international;
- life-cycle mutual funds (funds customized for various retirement dates).

The criteria for selection and for replacement of funds include the following:

- The array of investment options should be chosen with the goal of permitting participants to diversify their investments and to align the risk of their investments to their risk tolerance.
- The funds must have reasonable fees, including advisor fees, 12(b)-1 fees, and other fees.
- Every fund must have a clearly articulated and explained investment strategy, accompanied by evidence that the strategy is followed over time.
- The funds' time-weighted returns and volatility of returns over at least the three (and preferably five) prior years must compare favorably with the performance of a passively-managed index with the same style (e.g., large-cap growth). This is the primary performance criterion.
- Funds selected must:
  - be managed by a bank, insurance company, investment management company, or investment advisor (as defined by the Registered Investment Advisers Act of 1940) that has had significant assets under management for at least 10 years and has exhibited financial stability throughout that period;
  - provide historical quarterly performance calculated on a time-weighted basis and reported net and gross of fees;
  - provide performance evaluation reports that illustrate the risk–return profile of the manager relative to passive indexes and other managers of like investment style; and
  - clearly articulate the investment strategy to be followed and document that the strategy has been successfully executed over time.
- Transfers among investment funds are permitted on at least a quarterly basis, thus fulfilling an ERISA 404(c) requirement.

Monitoring Investment Performance

The RPC will monitor each fund's return and risk performance on a quarterly basis relative to appropriate investment benchmarks. In the event a fund over a five-year time frame:

- underperforms a passively managed (index) fund with similar objectives (i.e., same style) or, alternatively,
- ranks worse than the 50th percentile in terms of investment performance relative to funds with similar investment objectives,

the RPC will review the fund to determine whether its performance has resulted from the fund manager, the style of management, or market volatility, and decide whether the fund should be eliminated from the menu of possible investment choices. The RPC will also consider the fund's performance over periods of more than five years, if available, before making a decision.

As noted above, the RPC will evaluate each fund's performance using a five-year time horizon. The RPC realizes that most investments go through cycles; therefore, at any given time a fund may encounter a time period in which the investment objectives are not met or when a fund fails to meet its expected performance target. The fund's performance should be reported in terms of an annualized time-weighted rate of return. As noted above, the returns should be compared to appropriate market indexes and to peer group universes for the most recent five-year (or longer) period.

In light of the evaluation of each fund's performance, the RPC has the authority to recommend the replacement or elimination of an investment objective or fund if, in the opinion of the RPC, the investment objective or fund does not, or is not expected to, meet the specified performance criteria; is no longer suited to the needs of the Plan participants; or if, in the sole opinion of the RPC, a more appropriate investment choice exists.

EXAMPLE 11

BMSR Committee Decision

A member of the RPC committee for BMSR is concerned about the small-cap growth fund. During the last two years, this fund has ranked in the top half of small-cap growth funds and has outperformed a passively managed small-cap growth benchmark. However, the fund has dropped in value far more than the overall market. The concerned member suggests that the RPC replace the fund. Do the IPS criteria support this suggestion?

Solution:

According to IPS guidelines, investment performance must be evaluated over time horizons longer than two years. The IPS also specifies a comparison to a passively managed benchmark with the same style rather than to the overall market. For these reasons, the IPS cannot support the suggestion that the fund be eliminated.

2.3 Hybrid and Other Plans

During the 1990s, many employers concluded that neither the traditional DB nor DC plan structure exactly met their pension plan objectives. Hybrid plans began to emerge that combined the features of DB and DC plans.[8] Examples of hybrid plans include cash balance plans, pension equity plans, target benefit plans, and floor plans. These plans sought to combine some of the most highly valued features of a DC plan (such as portability, administrative ease, and understandability by participants) with the highly valued features of a DB plan (such as benefit guarantees, years of service rewards, and the ability to link retirement pay to a percentage of salary). In this section, we discuss cash balance plans as one example of a hybrid plan as well as another important type of plan, the employee stock ownership plan (ESOP).

A cash balance plan is a DB plan, in that the employer bears the investment risk. To employees, however, it looks like a DC plan because they are provided a personalized statement showing their account balance, an annual contribution credit, and an earnings credit. The contribution credit is a percentage of pay based on age, while the earnings credit is a percentage increase in the account balance that is typically tied to long-term interest rates. In reality, the account balance is hypothetical because unlike in a DC plan, the employee does not have a separate account. Some plans allow investment choices among fixed-income and equity-based options, which introduces investment risk for the employee.

Cash balance plans usually are not start-up plans but rather are traditional DB plans that have been converted in order to gain some of the features of a DC plan. Some of these plans have come under criticism as being unfair to older workers with many years of service, who may have accrued higher retirement benefits under the DB plan than the cash balance plan offers. In response to this criticism, some companies have offered a "grandfather" clause to older workers, allowing them to choose between joining a new cash balance plan or continuing with an existing traditional DB plan.

Finally, most developed countries allow for retirement or other savings plans that encourage employees to become stockholders of their employer. These plans may be complex qualified plans that purchase stock in a DC pension plan with pretax money, or they may be simple savings plans that allow employees to buy stock personally with their after-tax pay. The acronym ESOP refers to an employee *stock* ownership plan (in the United States) or employee *share* ownership plan (United Kingdom). These are DC plans that invest all or the majority of plan assets in employer stock. ESOPs are DC plans because the contribution is set as a percentage of employee pay. The final value of the plan for the employee will depend on the vesting schedule, the level of contributions, and the change in the per-share value of the stock.

Although ESOPs all share the common goal of increasing employee ownership in a company, they vary widely from country to country in terms of regulation. Some ESOPs may sell stock to employees at a discount from market prices, while others may not. Some require employee contribution; others prohibit such. Some ESOP trusts may borrow to purchase large amounts of employer stock, while others must rely solely on contributions.

In addition to encouraging ownership of one's employer, ESOPs have been used by companies to liquidate a large block of company stock held by an individual or small group of people, avoid a public offering of stock, or discourage an unfriendly takeover by placing a large holding of stock in the hands of employees via the ESOP trust. Apart from his or her investment in the ESOP, a plan participant may have a major investment of human capital in the company by virtue of working for that company. Should the company fail, the participant might see the value of the ESOP investment

8 In 1985 only 1 percent of Fortune 100 companies offered a hybrid plan; by 2002 that fraction had grown to 33 percent. See Scanlan and Lyons (2006, p. 38).

sharply decline at the same time that he or she becomes unemployed. An important concern for ESOP participants is that their overall investments (both financial and **human capital**) reflect adequate diversification.[9]

3 FOUNDATIONS AND ENDOWMENTS

Foundations and endowments provide vital support for much of today's philanthropic and charitable activities. **Foundations** are typically grant-making institutions funded by gifts and investment assets. **Endowments**, on the other hand, are long-term funds generally owned by operating non-profit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Although both are created by donations, foundations and endowments usually develop differently over time. Private foundations typically are created and funded by a single donor to fund philanthropic goals. The investment portfolio provides the dominant source of revenue, and the purchasing power of its corpus is either maintained or eventually given away. In the United States, tax law essentially mandates minimum levels of annual spending for some types of foundations. By donating cash and securities, many of the world's great industrialists and financiers have created foundations that bear their name (e.g., the Ford, Rockefeller, and Gates foundations). Endowments, by contrast, are often built up over time by many individual gifts to the endowed institution. Spending distributions are determined by the beneficiary institution, supplementing other revenue sources such as tuition, grants, fees, or gifts for current use. Prominent endowments, such as those of Harvard, Yale, and Princeton universities, have grown along with their institutions over centuries.

In Sections 3.1 and 3.2, we discuss the investment objectives and constraints of foundations and endowments, respectively.

3.1 Foundations: Background and Investment Setting

Foundations provide essential support of charitable activity. In broad terms, four types of foundations exist: independent, company sponsored, operating, and community.[10] Exhibit 2 briefly describes the principal types of foundations in the United States, as distinguished by their purpose, sources of funds, and annual spending requirements.[11] Independent foundations, also referred to as private or family foundations, are grant-making organizations funded by an individual donor and generally required to pay out a minimum of 5 percent of assets annually. Company-sponsored foundations tend to have a short-term investment focus to facilitate philanthropic funding from the corporation to grantees. Operating foundations, much like endowments, provide income to support specific programs. Community foundations draw upon broad support for donations to fund a variety of grants. Most of the following discussion relates to independent (private and family) foundations, which represent the majority of investment assets in the foundation sector.

9 Many 401(k) plans, especially large ones, have company stock as an investment option. For participants in such plans, similar issues arise.

10 Community foundations are a prominent type of public charity (meeting tax code tests for public support) in the United States and are used to represent public charities as a group.

11 The international links at the Association of Charitable Foundations (www.acf.org.uk/linksinter.htm) are good starting points for researching the diversity of foundations worldwide.

Exhibit 2 Types of Foundations in the United States

Foundation Type	Description	Source of Funds	Decision-Making Authority	Annual Spending Requirement
Independent foundation (private or family)	Independent grant-making organization established to aid social, educational, charitable, or religious activities.	Generally an individual, family, or group of individuals.	Donor, members of donor's family, or independent trustees.	At least 5% of 12-month average asset value, plus expenses associated with generating investment return.
Company-sponsored foundation	A legally independent grant-making organization with close ties to the corporation providing funds.	Endowment and/or annual contributions from a profit-making corporation.	Board of trustees, usually controlled by the sponsoring corporation's executives.	Same as independent foundation.
Operating foundation	Organization that uses its resources to conduct research or provide a direct service (e.g., operate a museum).	Largely the same as independent foundation.	Independent board of directors.	Must use 85% of interest and dividend income for active conduct of the institution's own programs. Some are also subject to annual spending requirement equal to 3.33% of assets.
Community foundation	A publicly supported organization that makes grants for social, educational, charitable, or religious purposes. A type of public charity.	Multiple donors; the public.	Board of directors.	No spending requirement.

The most noteworthy aspect of foundations is that they can vary widely in their investment goals and time horizons. For example, a foundation may be the primary or even sole source of funding for a charitable program. In such a case, a stable, reliable flow of funds is extremely important because the program has few alternative sources of funding to make up the shortfall. On the other hand, many foundations give funding for numerous independent projects or programs for only a few years at most. Because such foundations are generally not those projects' primary means of support, the funded programs can handle drops in spending by the foundation relatively easily because funding reductions are less likely to critically disrupt their operations. Often, a foundation's mission may address a problem with a limited time horizon or an urgent need (e.g., a need resulting from a natural disaster or an environmental emergency).

Another distinctive characteristic of the foundation sector, as contrasted to endowments, is that most private and family foundations must generate their entire grant-making and operating budget from their investment portfolio for the following reasons: These institutions generally do not engage in fund-raising campaigns; they may not receive any new contributions from the donor; and they do not receive any public support. These unique conditions help to guide the investment approach taken by foundations. In addition, as mentioned earlier, private and family foundations are subject to a payout requirement that mandates a minimum level of spending, while university endowments and many other nonprofit institutions face no such requirement.

3.1.1 *Risk Objectives*

Because foundations' goals differ somewhat from those of traditional defined-benefit pension funds and other asset pools, foundations can have a higher risk tolerance. Pension funds have a contractually defined liability stream (the pension payments expected to be made to retirees); in contrast, foundations have no such defined liability. The desire to keep spending whole in real terms, or to grow the institution, is simply that: a desire. Foundation investment policy can thus be more fluid or creative, and arguably more aggressive, than pension fund policy.

It is also acceptable, if risky, for foundations to try to earn a higher rate of return than is needed to maintain the purchasing power of assets—in essence, seeking to make as much money as possible. Such behavior makes it possible for the institution to increase its grant-making over time because the funding needs of organizations supported by foundations are essentially unbounded.

3.1.2 *Return Objectives*

Foundations differ in their purposes, and so vary in their return objectives. Some foundations are meant to be short lived; others are intended to operate in perpetuity. For those foundations with an indefinitely long horizon, the long-term return objective is to preserve the real (inflation-adjusted) value of the investment assets while allowing spending at an appropriate (either statutory or decided-upon) rate. Such a policy, if successful, keeps spending constant in real terms, on average over time, achieving what is sometimes called intergenerational equity or neutrality: an equitable balance between the interests of current and future beneficiaries of the foundation's support.[12]

If we look at the 5 percent annual spending minimum for foundations as a benchmark and add 0.3 percent as a low-end estimate of investment management expenses (i.e., the cost of generating investment returns), we thus have calculated that the fund must generate a return of 5.3 percent, plus the inflation rate, to stay even in real terms. We can use 5.3 percent plus the expected inflation rate as a starting point for setting the return objective of a foundation. If the expected inflation rate is 2 percent, the minimum return requirement will be 7.3 percent. This additive formulation of the return objective is intuitive but approximate. The most precise formulation is multiplicative, which accounts for the effect of compounding in a multiperiod setting and results in a higher requirement. For our example, the multiplicative calculation is $(1.05)(1.003)(1.02) - 1.0 = 0.0742$, or 7.42 percent.

3.1.3 *Liquidity Requirements*

A foundation's liquidity requirements are anticipated or unanticipated needs for cash in excess of contributions made to the foundation. Anticipated needs are captured in the periodic distributions prescribed by a foundation's spending rate. In the United States, the spending policy of private foundations is dictated, at least as concerns the 5 percent annual minimum, by the Tax Reform Act of 1969 and subsequent amendments. Expenses associated with management of the foundation's investments do not count toward the payout requirement, so one must add this cost (conservatively, 0.3 percent annually) to the minimum that the foundation is required to spend. "Overhead" associated with grant making—for example, the salaries of program officers and other executives—does count toward the payout requirement.

---

12 Think of a school that spends so much on scholarships in the current time frame that the endowment becomes depleted. A generation hence, the school will be in a poor financial position to give scholarships or otherwise compete for good students and professors. Under such a policy, intergenerational neutrality is clearly defeated. The underlying philosophy is that a long-lived foundation, or endowment, should not favor one particular generation of would-be recipients over another. A similar tension exists in certain types of trusts that must balance the interests of life income beneficiaries and remaindermen (who receive the trust corpus after the death of the income beneficiaries).

To avoid erosion in the portfolio's real value over time, many foundations try to spend only the minimum or else set a maximum that only slightly exceeds the minimum. In addition, to avoid large fluctuations in their operating budget, foundations may use a smoothing rule. A **smoothing rule** averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

The US Internal Revenue Service (IRS) allows carry-forwards and carry-backs, within limits, so that a foundation may avoid being penalized for underspending by spending more than 5 percent of assets in a subsequent year. Conversely, as a result of overspending in prior years, a foundation may be allowed to underspend in a subsequent year. Carry-forwards and carry-backs not only make smoothing rules workable but also allow a foundation to make a large grant in a single year without compromising the long-run soundness of its investment program.

The 5 percent payout requirement for private and family foundations, combined with the desire to maintain the portfolio's value in real terms, can be daunting. Foundation executives may disagree about whether the 5 percent spending requirement motivates an aggressive investment policy or a conservative one. Clearly, motivation refers to willingness to bear risk, but ability to bear risk must also be considered in determining a foundation's risk tolerance.

It is prudent for any organization to keep some assets in cash as a reserve for contingencies, but private and family foundations need a cash reserve for a special reason: They are subject to the unusual requirement that spending in a given fiscal year be 5 percent or more of the 12-month average of asset values *in that year*. One cannot, of course, know what this amount will be in advance, so one cannot budget for it. Instead, a well-managed foundation places some (say 10 percent or 20 percent) of its annual grant-making and spending budget in a reserve. This reserve may simply be in the form of not spending budgeted money until the year is mostly over and the 12-month average of asset values is known with greater certainty. In an "up" year for markets, this method may cause a rush of grants to be paid by the foundation at the end of the year, to avoid spending less than the minimum required amount. A year-end rush should be more acceptable to the foundation than the alternative that would occur without a reserve—overspending in flat or "down" market years.

3.1.4 *Time Horizon*

The majority of foundation wealth resides in private and other foundations established or managed with the intent of lasting into perpetuity. Our discussion has thus focused on strategies for preserving capital in real terms after spending. Some institutions, however, are created to be "spent down" over a predefined period of time; therefore, they pursue a different strategy, exhibiting an increasing level of conservatism as time passes. All else equal, investors often assume that a longer time horizon implies a greater ability to bear risk because a longer horizon affords them more time to recoup losses.

3.1.5 *Tax Concerns*

In the United States, income that is not substantially related to a foundation's charitable purposes may be classified as **unrelated business income** and be subject to regular corporate tax rates. For instance, a museum gift shop that sells artwork has business income related to its purposes; if it sells motorcycles, it has unrelated business income. Income from real estate is taxable as unrelated business income if the property is debt financed, but only in proportion to the fraction of the property's cost financed with debt.

In the United States, a private foundation must estimate and pay quarterly in advance a tax (currently set at 2 percent) on its net investment income. "Net investment income" includes dividends, interest, and realized capital gains, less the foundation's expenses related directly to the production of such income. The excise tax may be reduced to 1 percent if the charitable distributions for the year equal or exceed both

5 percent and the average of the previous five years' payout plus 1 percent of the net investment income. In creating this requirement, Congress hoped that foundations would translate their tax savings into increased charitable activities.

3.1.6 *Legal and Regulatory Factors*

Foundations may be subject to a variety of legal and regulatory constraints, which vary by country and sometimes by type of foundation. As one example, in the United States, the Internal Revenue Code (Section 4944) addresses private foundations, imposing a graduated series of excise taxes if a private foundation invests in a manner that jeopardizes the carrying out of its tax-exempt purposes. In the United States, many states have adopted the Uniform Management of Institutional Funds Act (UMIFA) as the primary legislation governing any entity organized and operated exclusively for educational, religious, or charitable purposes. We will present some of the details of UMIFA that concern investing activities when we address endowments.

3.1.7 *Unique Circumstances*

A special challenge faces foundations that are endowed with the stock of one particular company and that are then restricted by the donor from diversifying. The asset value of such an institution is obviously subject to the large market fluctuations attendant to any one-stock position.

With the permission of the donor, some institutions have entered into swap agreements or other derivative transactions to achieve the payoffs of a more diversified portfolio. Such a strategy achieves the donor's goal of retaining voting rights in the stock, while providing the foundation with a more stable asset value. Other institutions simply tolerate the fluctuations associated with a single-stock position.

Against the background of investment objectives and constraints for foundations, Example 12 illustrates how all these elements come together in an investment policy statement.

EXAMPLE 12

The Fund for Electoral Integrity

A group of major foundations has endowed a new organization, the Fund for Electoral Integrity, to supervise elections and political campaigns in countries undergoing a transition to democracy. The fund is headquartered in a developing country. It has received initial grants of $20 million, with $40 million expected to be received in further grants over the next three years. The fund's charter expressly decrees that the fund should spend itself out of existence within 10 years of its founding rather than trying to become a permanent institution. Determine and justify appropriate investment policy objectives and constraints for the Fund for Electoral Integrity.

Solution:

Risk Objective

Although the fund has a 10-year life, it is receiving donations over a period of years and it is also constantly spending money on programs. Thus, it can be assumed to have a five-year investment horizon on average and should *initially* adopt a conservative or below-average risk profile (a standard deviation of annual returns in the range of 5 percent to 7 percent).[13] Over the life of the fund, the

13 The standard deviation of annual returns on intermediate-term bonds typically falls in this range.

risk objective should gradually migrate to an even more conservative profile (standard deviation of 3 percent to 5 percent). The relatively short time horizon calls for a below-average risk tolerance. Both the risks inherent in markets and the fund's risk tolerance may change, so it is important to periodically review the investment policy and the portfolio from a risk management perspective. In making their investment recommendations, the board and investment committee should take the following into account:

- market risk (fluctuation in asset values);
- liquidity risk;
- political, regulatory, and legal risks;
- operations and control risks;
- any other risks that the board and investment committee deem relevant.

Return Objective

The fund's broad return objective is to earn the highest inflation-adjusted return consistent with the risk objective. At inception, the fund's return objective is to equal or better the total return of an average five-year maturity US Treasury note portfolio over a rolling four-year period.

Constraints

Liquidity

The fund must pay out roughly $6 million annually for 10 years.

Time Horizon

The fund has a 10-year time horizon.

Tax Concerns

The fund is a tax-exempt organization in the country in which it is organized.

Regulatory Factors

No special legal or regulatory factors impinge on the organization's ability to invest as it chooses.

Unique Circumstances

The fund has no constraints in the sense of prohibited investments.

3.2 Endowments: Background and Investment Setting

Endowments play a critical role in the vitality and success of today's charitable activity. As the long-term investment portfolios of nonprofit operating institutions, endowments provide a significant amount of budgetary support for universities, colleges, private schools, hospitals, museums, and religious organizations.

The term "endowment" has taken on two related but distinct meanings. As commonly understood, an endowment is simply the long-term investment portfolio of a charitable organization. Legally and formally, however, the term "endowment" refers to a permanent fund established by a donor with the condition that the fund principal be maintained over time. In contrast to private foundations, endowments are not subject to a specific legally required spending level.

Donors establish true endowments by making gifts with the stipulation that periodic spending distributions from the fund be used to pay for programs and that the principal value of the gift be preserved in perpetuity. Thus, true endowments are funds permanently restricted in terms of spending. Many schools and nonprofit organizations will supplement true endowments with voluntary savings in the form

of quasi-endowments, sometimes referred to as funds functioning as endowment (FFE). Although designated as long-term financial capital, quasi-endowments have no spending restrictions; the institution may spend such funds completely. Because endowments are owned by nonprofit organizations, they generally are exempt from taxation on investment income derived from interest, dividends, capital gains, rents, and royalties.

Typically, the large investment pools commonly referred to as endowments consist of a variety of individual funds, including true endowments and FFEs. Each endowment fund is established with a specific indenture detailing the conditions and intended uses of the gifts. Although many endowment funds are unrestricted, meaning that endowment spending can be used for the general purposes of the beneficiary institution, others are restricted so that monies can be spent only for specified purposes. For instance, one restricted fund might support a professorship, while another fund might support student financial aid. Spending from these funds must be kept distinct and support only the specified use—money from a professorship endowment, for example, cannot be used to provide student aid.

Endowments are a vital source of funding for many charitable programs, and spending distributions should be substantial to support such programs' needs. Large fluctuations in year-to-year spending can disrupt the endowed institution's operating budget, finances and staffing. Therefore, spending distributions should be stable and reliable. Because donors establish endowment funds with the intention of funding an activity in perpetuity, recipient institutions generally operate with the fiduciary intent of preserving the fund's purchasing power. The nonprofit should not count on new gifts to supplement endowment funds whose value has been eroded by spending beyond investment returns. In summary, endowments should provide substantial, stable, and sustainable spending distributions.

Historically, prior to the 1970s, income provided the basis for determining an endowment's spending distributions. Institutions invested their endowments primarily in stocks, bonds and cash, and they spent the dividend and interest income. Unfortunately, in following such policies, endowment spending was not tied to the investment portfolio's total return after inflation. Institutions skewed portfolios toward high-yielding fixed-income instruments at the expense of equities in order to increase current endowment spending. Although high-quality bonds typically make their promised nominal payments, unanticipated inflation reduces those payments' real values below anticipated levels. Furthermore, shifts toward higher-yielding assets allowed increased portfolio spending but decreased an endowment's ability to generate adequate inflation-adjusted long-term returns.

Educated and encouraged by a seminal Ford Foundation report published in 1969, many endowed institutions adopted a new approach to determining spending based on the concept of total return.[14] As codified by UMIFA in 1972, income and capital gains (realized and unrealized) are now included in determining total return in the United States. Freed from the strictures of yield, institutions could determine endowment-spending levels as a percentage of an endowment's market value.

Today, most endowed institutions determine spending through policies based on total return as reflected in market values. A spending rule, by defining the amount of the distribution from the endowment available for spending, helps instill discipline into the budgeting and financial management process. A balanced budget is not a meaningful achievement if it results from pulling from the endowment whatever is needed to cover a deficit.

14 See Cary and Bright (1969) for more information.

Spending is typically calculated as a percentage, usually between 4 percent and 6 percent of endowment market value (endowments are not subject to minimum spending rates as are private foundations in the United States).[15] In calculating spending, endowments frequently use an average of trailing market values rather than the current market value to provide greater stability in the amount of money distributed annually. In computing such an average, the endowment manager may adjust historical market values to reflect inflation. A common, simple rule might call for spending 5 percent of the average of the past three years' ending market values of the endowment. One problem with this rule is that it places as much significance on market values three years ago as it does on more recent outcomes. Even if endowment values were relatively stable for the last two years, an extraordinary return three years ago could force a dramatic change in spending this year. A more refined rule might use a geometrically declining average of trailing endowment values adjusted for inflation, placing more emphasis on recent market values and less on past values. Examples of spending rules include the following:

- **Simple spending rule.** Spending equals the spending rate multiplied by the market value of the endowment at the beginning of the fiscal year.

$$\text{Spending}_t = \text{Spending rate} \times \text{Ending market value}_{t-1}$$

- **Rolling three-year average spending rule.** Spending equals the spending rate multiplied by the average market value of the last three fiscal year-ends.

$$\text{Spending}_t = \text{Spending rate} \times (1/3)[\text{Ending market value}_{t-1} + \text{Ending market value}_{t-2} + \text{Ending market value}_{t-3}]$$

- **Geometric smoothing rule.** Spending equals the weighted average of the prior year's spending adjusted for inflation and the product of the spending rate times the market value of the endowment at the beginning of the prior fiscal year. The smoothing rate is typically between 60 and 80 percent.

$$\text{Spending}_t = \text{Smoothing rate} \times [\text{Spending}_{t-1} \times (1 + \text{Inflation}_{t-1})] + (1 - \text{Smoothing rate}) \times (\text{Spending rate} \times \text{Beginning market value}_{t-1})$$

Because most endowed institutions complete their budget planning process well before the endowment market value at the beginning of a fiscal year becomes known, it may be advisable to calculate spending from an endowment value based on a date in advance of the final budget process. The geometric smoothing rule description reflects this approach and uses the prior year's beginning, rather than ending, endowment market value.

3.2.1 *Risk Objectives*

An endowment's investment risk should be considered in conjunction with its spending policy and in the context of its long-term objective of providing a significant, stable, and sustainable stream of spending distributions. Spending policies with smoothing or averaging rules can dampen the transmission of portfolio volatility to spending distributions, allowing the institution to accept short-term portfolio volatility while striving for high long-term investment returns necessary to fund programs and maintain purchasing power. Endowments that do not use a smoothing rule may have less tolerance for short-term portfolio risk. Investment portfolios with very low volatility,

15 According to Swensen (2000), 90 percent of endowments spend between 4 percent and 6 percent of endowment market value annually.

or investment risk, usually provide low expected returns, which increases the risk of failing to achieve the endowment's goals of significant, stable, and sustainable spending. Low investment risk does not equate to low risk for meeting endowment objectives.

An institution's risk tolerance depends on the endowment's role in the operating budget and the institution's ability to adapt to drops in spending. If endowment income represents only a small portion of the budget, poor investment returns may have little impact on the bottom line. On the other hand, modest drops in endowment value may have serious consequences if endowment income contributes a large part of overall revenues. If the same market forces affect both its donor base and its endowment, an institution that relies heavily on donations for current income may see donations drop at the same time as endowment income. Large fixed expenditures such as debt service can aggravate damage inflicted by drops in endowment income.

On a short-term basis, an endowment's risk tolerance can be greater if the endowment has experienced strong recent returns and the smoothed spending rate is below the long-term average or target rate. In such a case, the endowment value could drop and spending might still increase the following year. On the other hand, endowment funds with poor recent returns and a smoothed spending rate above the long-term average run the risk of a severe loss in purchasing power. High spending rates can aggravate the erosion of the endowment's corpus at the same time that institution comes under pressure to cut operating expenses.

Because of the assumed positive relation between risk and return, a high required return objective and a willingness to meet relatively high spending needs often imply a high willingness to accept risk. On the other hand, short-term performance pressures will indicate a low willingness to accept risk. Despite their long-term investment mandate, endowment managers often come under pressure to perform well over relatively short-term time horizons for several reasons. Poor investment results may lead to reductions in the level of endowment spending. In addition, investment staff and trustees with oversight responsibility are evaluated formally or informally on relatively short time frames—often yearly. Many large endowments are highly visible; supporters and peers closely scrutinize their annual performance. Endowed institutions thus need to objectively assess and, if necessary, enhance their actual tolerance for short-term volatility before pursuing investment strategies that really are consistent with only a very long-term investment horizon.

3.2.2 *Return Objectives*

Endowments have high return objectives, reflecting the goal of providing a significant, stable and sustainable flow of income to operations. Endowments typically provide vital support of ongoing operations and programs, and distributions from endowment to operations should be as large as practical. An endowment manager must thus balance this objective of providing substantial resources to programs with the need to provide a stable flow. Erratic and volatile endowment distributions are unsuitable for programs with permanent staff or recurring expenses. Furthermore, an endowment must balance significant and stable spending objectives with the imperative to provide sustainable support—in other words, endowment funds should maintain their long-term purchasing power after inflation.

Endowments often need to generate relatively high long-term rates of return in order to provide a substantial flow of spending to institutions affected by rates of inflation above those of the general economy. The growth of higher education expenses in the United States is a case in point. Inflation for US higher education expenses has been generally above that for the broad economy such as the gross domestic product (GDP) deflator or for consumers as measured by the US Consumer Price Index (CPI). Since 1960, annual inflation for colleges and universities, as measured by the Higher Education Price Index (HEPI), averaged approximately 1 percentage point

more than the CPI or the GDP deflator.[16] A major factor for this higher inflation rate is the difficulty of increasing faculty productivity without impairing the quality of education. For instance, colleges and universities cannot simply improve efficiency by increasing class size or student-to-faculty ratios. Because faculty compensation typically constitutes a majority portion of higher education operating budgets, many of the costs associated with increasing salaries cannot be offset by efficiency gains. In order to maintain long-term support of an academic program, therefore, a higher education institution must increase spending over time to adjust for inflation that is higher than the CPI or the GDP deflator.

The objective of providing a significant, stable, and sustainable flow of funds to support operating programs provides a useful framework for evaluating investment and spending policies. We may ask questions such as: How do the trade-offs of expected risk and returns relate to meeting endowment objectives? What spending policy makes sense for the institution? What long-term rate of spending can the portfolio support without unduly risking impairment of purchasing power? Conventional mean–variance analysis can help to suggest appropriate asset allocations. Computer simulations using Monte Carlo techniques can be extremely helpful in comparing and assessing investment and spending policies and their ability to meet endowment objectives. Monte Carlo techniques use random numbers to develop multiple, simulated time-series of annual returns given a portfolio's risk and return characteristics. Applying the spending rule to each time series, we can evaluate the interaction of investment choices and spending policy.

Monte Carlo simulations illustrate the effect of investment and spending policies on the likelihood that an endowment will provide a stable and sustainable flow of operating funds for an institution. How do various portfolios and spending rules affect the risk that the endowment will need to severely cut back on spending in the short term? How should the endowment's board set spending policies so as to support the objective of preserving the real purchasing power of the endowment? To answer these questions, an endowment must quantify risk measures. A severe drop in support for the operating budget might be defined as a real reduction of 10 percent from year to year. The risk of a dramatic decline in endowment purchasing power might be defined as the probability of more than a 50 percent real decline over a 50-year horizon. The specific pain threshold or downside risk tolerance would depend on the endowment's role with respect to operations and the endowed institution's ability to adapt to endowment spending declines.

Simulations can demonstrate several key aspects of the interaction of investment and spending policies on managing endowment risk. First, the endowment's spending rate must be lower than its expected rate of return in order to preserve purchasing power long term. For example, if an endowment has a 6 percent simple spending rate and 6 percent expected real returns with 12 percent annual standard deviation of returns, the probability that its purchasing power will fall by more than 50 percent over a 50-year period is 41 percent, according to Monte Carlo simulation. With the same portfolio return of 6 percent and a 5 percent simple spending rate, the long-term risk of such purchasing power impairment falls to 19 percent.

If returns had no volatility, an endowment could set spending at a rate that equated to the real return—that is, the nominal return net of inflation. Returns above spending would be reinvested to compensate for inflation, and the endowment would retain its purchasing power. With the introduction of volatility, however, the endowment's long-term purchasing power would be impaired more than 40 percent of the time

16 According to Research Associates of Washington.

according to the simulations. In order to achieve its objective of maintaining purchasing power, an endowment must keep its long-term average spending rate below its long-term expected real return.

From simulations, we can also observe that the risk of short-term disruptive spending may be reduced with a smoothing rule. For instance, there is a 17 percent risk of a 10 percent real drop in spending in any year with a simple 5 percent spending rule for an endowment with a 6 percent expected real return and 12 percent annual standard deviation of returns. With the same portfolio, a 70/30 smoothing rule (70 percent of last year's spending and 30 percent of 5% of last year's endowment market value) would reduce the risk of a short-term spending drop from 17 percent with a simple 5 percent rule to less than 3 percent.

Finally, a low-volatility, low-return portfolio increases the risk of an endowment failing to meet its objectives. For example, an endowment with a 5 percent spending target, a 70/30 smoothing rule, and a portfolio with a 5 percent real return and a 9 percent annual standard deviation of returns would lose half its purchasing power 34 percent of the time at the end of 50 years. Low investment risk does not equate to low risk of purchasing power impairment.

In summary, an endowment must coordinate its investment and spending policies. An endowment's returns need to exceed the spending rate to protect against a long-term loss of purchasing power. Calculating the return objective as the sum of the spending rate, the expected inflation rate, and the cost of generating investment returns can serve as a starting point for determining an endowment's appropriate return objective (analogous to the approach previously discussed for foundations). As is clear from Monte Carlo analysis in a multi-period setting, however, an endowment may need to set its return objective higher than the above starting point in order to preserve its purchasing power. In addition, an endowed institution should adopt a spending policy that appropriately controls the risk of long-term purchasing power impairment and dampens short-term volatility in spending distributions. Unlike foundations, endowments are not subject to specific payout requirements. The endowment can set a long-term spending rate consistent with its investment approach. Furthermore, spending policies can include a smoothing rule, which gradually adjusts to changes in endowment market values, to dampen the effects of portfolio volatility on spending distributions.

3.2.3 *Liquidity Requirements*

The perpetual nature and measured spending of true endowments limit their need for liquidity. They must, however, have cash to make spending distributions, to meet capital commitments, and to facilitate portfolio-rebalancing transactions. In addition to gifts, an endowment's investment yield, the normal sale of securities, and maturation of bonds meet much of its need for cash. Although the typical endowment maintains more liquidity than required, managers of quasi-endowments should monitor the potential for major capital projects, such as a planned capital outlay for the construction of a building.

In general, endowments are well suited to invest in illiquid, non-marketable securities given their limited need for liquidity. Care and discipline should be exercised in valuing non-marketable investments because endowments must use accurate market values estimates to determine spending, calculate performance, and establish unit values for funds entering and exiting pooled endowment portfolios.

3.2.4 *Time Horizon*

In principle, endowment time horizons are extremely long term because of the objective of maintaining purchasing power in perpetuity. Annual draws for spending, however, may present important short-term considerations, because endowments often use yearly market values to determine spending, and each annual withdrawal of capital

has its specific time horizon. Such considerations, as well as planned decapitalizations (reductions in capital, e.g., to fund large projects) for quasi-endowments, may suggest a multistage time horizon, in certain cases.

3.2.5 *Tax Concerns*

Although taxation may vary by domicile internationally, taxes are not a major consideration for endowments, in general. In the United States, for example, endowments owned by non-profit organizations are exempt from taxation on investment income derived from interest, dividends, capital gains, rents, and royalties. Under certain circumstances, unrelated business taxable income (UBTI) from operating businesses or from assets with acquisition indebtedness may be subject to tax. In addition, a portion of dividends from non-US securities may be subject to withholding taxes that cannot be reclaimed or credited against US taxes.

3.2.6 *Legal and Regulatory Factors*

In the United States, few laws and regulations exist regarding the management and conduct of endowment funds. Most states have adopted UMIFA as the primary governing legislation for endowments. First promulgated in 1972, UMIFA authorizes a broad range of investments for endowments. It also allows for the delegation of investment responsibility to external advisors and managers, as well as for wide discretion in setting the compensation for such services.

An endowed institution's governing board must "exercise ordinary business care and prudence" in dealing with investments. UMIFA explicitly authorizes institutions to spend endowment investment gain as well as income. Endowment spending must, however, respect any use restriction imposed by the donor, and it should not include principal when an endowment fund's market value falls below its historical book value. In other words, only income may be spent when an endowment's market value is less than its original gift value.[17] This requirement can lead to disruptive spending patterns, particularly for new funds or funds with market value at or near book value. To maintain normal spending patterns, institutions may consider an accounting reclassification or transfer of unrestricted FFE to fulfill balance sheet requirements that the market value of an endowment fund not fall below its historical book value.

At the federal level, US endowed institutions must comply with tax and securities laws and reporting requirements. To achieve and maintain tax-exempt status under Section 501(c)(3) of the US Internal Revenue Code, an institution must ensure that no part of its net earnings inure or accrue to the benefit of any private individual. The code provides for intermediate sanctions in the form of excise taxes against individuals in a position to exercise substantial authority who engage in "excess benefit transactions" whereby they receive unreasonably high compensation or inappropriately derive private benefit from the tax-exempt organization. With little governmental oversight, endowed institutions must develop, maintain, and enforce clear guidelines and policies to prohibit improper behavior and manage conflicts of interest.

3.2.7 *Unique Circumstances*

Endowments vary widely in their size, governance, and staff resources, and thus in the investment strategies that they can intelligently and practically pursue. Endowments range from the very small, providing financial aid for a day care center, to the very large, supporting a major university. The responsibility of managing the endowment might fall to an unsophisticated board or to a collection of individuals knowledgeable about investments. Likewise, the investment staff responsible for managing and

17 A few states supplement UMIFA with this fiduciary standard of preserving the purchasing power of endowment values.

administering the endowment may be nonexistent or consist of many highly paid and experienced professionals. This wide variety in expertise and resources suggests that an endowment's specific circumstances may constrain the types of investments its board should consider.

Many large endowments have been leaders in adopting investments in alternative investments, such as private equities, real estate, natural resources, and absolute return strategies. These investments often require significant staff time and expertise to find, evaluate, select, and monitor. Because the **active management** component of returns in these alternative, less-efficient markets is extremely important to long-term success, endowments should have significant resources and expertise before investing in nontraditional asset classes.

Often, alternative investment funds in the United States will seek exemption from registration under the Investment Company Act of 1940 and accept capital commitments only from investors who are Qualified Purchasers. Generally, endowments must have at least $25 million of investments to qualify. In some instances, investments are placed privately without SEC registration and are limited to accredited investors with assets in excess of $5 million. Thus the resources and size of an endowment or foundation can dictate its universe of potential investments.

Some endowed institutions develop ethical investment policies that become constraints to help ensure that portfolio investment activity is consistent with the organization's goals and mores. These policies can guide portfolio managers in voting shareholder proxies on issues of social or political significance. In certain circumstances, such as apartheid in South Africa, ethical investment policies have been used in an attempt to foster change through shareholder resolutions and divestment. Other examples of socially responsible investing include the application of exclusion criteria related to child labor, gambling, tobacco, firearms, and violation of human rights. In Example 13, we show how investment objectives and constraints come together in the formulation of an investment policy statement for an endowment.

EXAMPLE 13

The City Arts School

The City Arts School (CAS) is an independent private school educating 500 children from 9th through 12th grade. Founded in 1920, it is located in a modest-sized city in the northeastern United States with a diverse socioeconomic and racial population. CAS has an outstanding reputation and draws students from the city and surrounding suburban communities. The school has an excellent program in the performing and visual arts; in addition, it offers a broad and innovative curriculum with small class sizes.

CAS has an annual operating budget of approximately $10 million, more than 90 percent of which goes to salaries and benefits for teachers and a small administrative staff. With conservative fiscal management, the school has built and maintained a fine campus over the years without the use of debt. Due to the limited availability of adjacent land or other space, the school is unlikely to expand in the foreseeable future. CAS's inflation rate has averaged 1 percent above that of the economy in general.

CAS has an endowment of $30 million, composed of $10 million for general unrestricted support, $10 million for financial aid, $5 million of small funds with various donor-specified use restrictions, and $5 million of unrestricted funds functioning as endowment.

The CAS board consists of 15 elected directors, each serving three-year terms. In addition, the head of the school serves on the board *ex officio*. The board delegates responsibility for investing the endowment to an investment committee

that includes at least three board members as well as other members of the CAS community who can offer investment expertise and guidance. Investments are monitored and implemented by the school's business and operations manager.

Proposed Statement of Endowment Goals

The goal of the CAS Endowment (and funds that the board has designated as endowment) is to provide significant, stable, and sustainable funding to support the school's annual operating budget and specific donor-designated programs. Endowment funds will be invested with the objective of earning high, long-term returns after inflation without undue risk of permanently impairing the long-term purchasing power of assets or incurring volatile short-term declines in asset values or annual spending flows.

Spending Policy for Endowment

The goal of the CAS Endowment spending policy is to provide a sustainable, stable annual source of income from the endowment to the operating budget of CAS. The spending policy helps provide financial discipline to the school by providing a clear, unequivocal amount of annual funding from the endowment consistent with sustainable long-term operations.

Spending from the endowment (and funds designated as endowment by the board) shall be determined by a spending rule that smoothes the volatility of spending from year to year using a weighted-average formula. The formula takes into account spending from the prior year as well as the endowment's current market value. Spending for a fiscal year shall be calculated by adding 70 percent of the prior year's spending amount to 30 percent of the endowment market value at the beginning of the prior fiscal year times the policy spending rate of 4.5 percent.

$$\text{Spending for fiscal year } t = 70\% \times [\text{Spending for fiscal year } (t-1)] + 30\% \times [4.5\% \times \text{Endowment market value at beginning of fiscal year } (t-1)]$$

Adjustments will be made to incorporate the effects of new gifts, additions, or fund decapitalizations. Spending from new gifts or additions to the endowment in their first year shall be at the same rate as other endowment funds adjusted pro rata to reflect the partial year of inclusion in the endowment.

Given these goals for the endowment, specify appropriate objectives and constraints.

Solution:

Return Objectives

The goal of the CAS Endowment is to provide a significant annual distribution to support the school's programs while maintaining the fund's long-term purchasing power. In general, inflation for the school runs about 1 percent above that of the economy. Therefore, in order to maintain the fund's purchasing power with a 4.5 percent spending rate, net of investment management expenses the portfolio must generate a long-term return greater than 5.5 percent above a broad measure of inflation such as the US CPI.

Risk Objectives

CAS must address two primary risks in investing its endowment. As discussed above, CAS must protect the endowment's long-term purchasing power by generating real returns above spending. In the short term, the CAS Endowment should produce a reliable and somewhat stable flow of funding for programs. This short-term risk is tempered by CAS's spending rule, which smoothes distributions

with a geometric moving average spending rate. In addition, endowment spending is not a very large part of the school's annual budget (less than 14 percent of revenues). Endowment spending could fall by as much as 20 percent and the impact on the budget would be less than 3 percent of revenues. CAS is debt free and has an above-average risk tolerance.

Constraints

Liquidity

Only a small percentage of the fund, approximately 4 or 5 percent, is spent each year, and the fund's historical gift value should remain invested and not spent. A portion of the CAS Endowment pool, however, is composed of funds functioning as endowment. The board, in extraordinary circumstances, may decide to spend the FFE because the monies are not permanently restricted.

Time Horizon

Endowment funds have an extremely long time horizon because they are expected to support activities in perpetuity.

Tax Concerns

CAS is a tax-exempt organization, and returns on its investments are not taxed in most circumstances. The school should carefully consider any investment or gift that generates UBTI, because such an item could dramatically increase tax reporting requirements.

Legal and Regulatory Factors

CAS's investments have very few legal and regulatory constraints. The school should, however, take precautions to avoid conflicts of interest, or the perception of conflicts, involving committee or board members. In addition to being poor and wasteful management, inappropriate transactions with individuals in a supervisory role may lead to sanctions and penalties under IRS regulations. In general, the school's financial and investment activities are under the purview of the state attorney general. Trustees are expected to act prudently, consistent with standards of sound business practice.

Unique Circumstances

CAS is a small school with limited administrative and investment resources. Its endowment portfolio, although meaningful to the school and its operations, is not of sufficient scale to support dedicated internal investment staffing. All investments should be managed externally. CAS should view skeptically any investment that requires extensive monitoring, a close long-term relationship with external investment managers, or a high degree of sophisticated expertise to manage properly. Similarly, CAS should be wary of investments that require a high degree of active management skill to generate satisfactory returns. The school does not have the resources to identify, evaluate, and monitor the top managers in specialized investment areas. Furthermore, the size of its portfolio will not support a diversified investment program in nontraditional alternatives such as private equity. Even an aggressive allocation of 20 percent would amount to only $6 million, barely enough to make a single commitment to a top-tier private equity investment fund.

The investment committee has a relatively high turnover, with members serving only three-year terms. CAS runs the risk that new committee members renounce some long-term investments and act hastily to liquidate or pull

support from worthy but underperforming investments. This risk is greatest with volatile, unconventional investments that may require patience, fortitude, and a contrarian mindset to endure difficult market environments.

THE INSURANCE INDUSTRY

4

The economic significance of the insurance industry lies in its unique role as an absorber of personal and business risks. By providing financial protection, the industry plays a key role in a country's economic growth and development. Because of the risk aspects of the business and the contractual obligations to policyholders, the insurance industry's traditional investment practices have been characterized as conservative. As we will discuss later, however, insurers have shown increasing risk tolerance in recent years.

The insurance industry is complex but can be divided into three broad product categories: life insurance, health insurance, and property and liability insurance. For purposes of considering investment policy, it is sufficient to narrow the categories to life and non-life (casualty) insurance companies. This division is consistent with the major classifications established by the insurance regulatory bodies and some, if not most, taxing authorities in the world's industrialized countries.

Insurance companies, whether life or casualty, are established either as **stock companies** (companies that have issued common equity shares) or as **mutuals** (companies with no stock that are owned by their policyholders). Mutuals traditionally have played a major role in certain segments of the insurance industry, but stockholder-owned companies are now the primary form of entry into the industry. Many of the major mutual insurance companies in the United States, Canada, the United Kingdom, and continental Europe have completed or are in the process of **demutualizing** (converting to stock companies). Although the investment operations of mutual and stock companies differ only slightly, the differences between life and non-life insurers are substantial, as we illustrate in the following sections.

4.1 Life Insurance Companies: Background and Investment Setting

Exposure to interest-rate-related risk is one major characteristic of life insurers' investment setting. Besides fixed-income portfolio gains and losses related to interest rate changes, many life insurance company liabilities such as annuity contracts are interest rate sensitive. In addition, insurers also face the risk of disintermediation, which often becomes acute when interest rates are high.[18]

One type of disintermediation occurs when policyholders borrow against the accumulated cash value in insurance products such as ordinary life insurance.[19] US life insurance companies experienced unprecedented disintermediation in the early 1980s. As interest rates reached record high levels (in the mid to high teens) during that period, policyholders took advantage of the option to borrow some or all of the accumulated cash value in their policies at the below-market policy loan rates

18 **Disintermediation** occurs when individuals withdraw funds from financial intermediaries for deposit or investment in other financial intermediaries or investments offering a higher return (yield).

19 **Ordinary life insurance** (also called **whole life insurance**) is a type of policy that typically provides level death benefits for the whole of the insured's life. The premium is typically a level amount determined by such factors as the insured's sex and age at the time the policy is issued, and the cash value is based on the insurer's estimate of the expected return on the investments that fund policy reserves. In contrast, **term life insurance** provides death benefits for a specified length of time and accumulates little or no cash values.

(generally 5 to 9 percent) that were contractually defined in their insurance policies. The policy loan feature has long been considered an important life insurance policy provision. In the 1980s, the true cost of this option became clear to the industry, as cash available for investment at the then prevailing double-digit interest rates was siphoned off in part to fund policy loans. When interest rates are high, insurers also face another type of disintermediation: the risk that policyholders will surrender their cash value life insurance policies for their accumulated cash values, in order to reinvest the proceeds at a higher interest rate. As a result of these forces, insurers face marketplace pressures to offer competitive cash value accumulation rates or **credited rates** (rates of interest credited to a policyholder's reserve account).

These developments have made the liabilities of life insurers more interest rate sensitive than before and have tended to shorten the duration of liabilities. Policyholders are now more prone to exercise their option to surrender a life insurance policy or annuity contract as they seek the most competitive credited rates and/or policy benefits. Surrender rates triggered by interest rate changes are more difficult to predict than mortality rates and thus are the more critical variable for many interest-sensitive life insurance products. Shorter liability durations have necessitated the shortening of the duration of life insurance company portfolios, or at least those segments designed to fund these interest-rate-sensitive product liabilities.

Universal life, variable life, and variable universal life represent the insurance industry's response to disintermediation.[20] Companies developed these products to offset the competitive appeal of buying term insurance and investing the difference between term insurance premiums and the often higher premiums of ordinary life insurance policies. These new products provide life insurance buyers with a viable means of purchasing varying amounts of insurance protection along with an opportunity to save or invest at rates that vary with capital market and competitive conditions.

Exhibit 3 illustrates the growth of new individual life insurance forms in the United States, based on data provided by the American Council of Life Insurers. As the increase in term life insurance purchases demonstrates, there is a trend toward unbundling insurance risk management and investment management. To attract customers, each of the new policy forms must offer competitive rates of return.

Exhibit 3 Analysis of Life Insurance Purchases in the United States: Selected Years, 1978–2009

	Percentage of Dollar Amount of Life Insurance Purchases				
Policy Type	**1978 (%)**	**1988 (%)**	**1999 (%)**	**2002 (%)**	**2009 (%)**
Term life	52	40	57	69	74
Whole life	45	30	13	10	26
Universal life	na	20	11	9	na
Variable life	na	9	19	12	na

20 **Universal life insurance** provides premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element. The universal life policyholder pays a specified amount for the insurance protection desired and can deposit funds in a savings account, for a fee. **Variable life insurance** (**unit-linked life insurance**) is a type of ordinary life insurance for which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. **Variable universal life** (**flexible-premium variable life**) combines the flexibility of universal life with the investment choice flexibility of variable life.

Exhibit 3 (Continued)

Policy Type	Percentage of Dollar Amount of Life Insurance Purchases				
	1978 (%)	1988 (%)	1999 (%)	2002 (%)	2009 (%)
Other	3	1	0	0	0
Total	100	100	100	100	100

na = not applicable.
Sources: Life Insurance Fact Book (1979, 1989, 2000, 2011) and *ACLI Survey* (2003).

4.1.1 *Risk Objectives*

An insurance company's primary investment objective is to fund future policyholder benefits and claims. Because of the economic importance of the insurance industry, the investment portfolio of an insurer (life or non-life) is looked upon from a public policy viewpoint as a quasi-trust fund. Accordingly, conservative fiduciary principles limit the risk tolerance of an insurance company investment portfolio. Confidence in an insurance company's ability to pay benefits as they come due is a crucial element in the economy's financial foundation. Therefore, insurance companies are sensitive to the risk of any significant chance of principal loss or any significant interruption of investment income.

To absorb some modest loss of principal, US life insurance companies are required to maintain an asset valuation reserve, a reserve established by the National Association of Insurance Commissioners (NAIC). Companies use specific NAIC-developed "quality tests" for each class of invested assets to determine the annual contributions to, and maximum amounts of, the reserve. The maximum reserve rates establish a substantial margin for absorbing investment losses. With a growing portfolio, however, a life company's asset valuation reserves may be inadequate. Surplus is thus vulnerable to write-downs if significant losses occur.[21]

Insurance regulators worldwide have been moving toward risk-based capital (RBC) requirements to assure that companies maintain adequate surplus to cover their risk exposures relating to both assets and liabilities. In the United States, RBC calculations are somewhat complex and attempt to allocate surplus in proportion to the asset and liability risk exposures of each insurance company. By subtracting the risk-based capital required from each company's total surplus, the regulators can estimate whether the company's surplus is sufficient. In addition, applying GAAP to both mutual and stock insurance companies requires the use of market valuation for most classes of assets and thus has increased balance sheet volatility. Absent a requirement that life insurance liabilities be marked to market, however, accounting statement implications may affect a company's risk tolerance in ways that are inconsistent with a market-based-valuation perspective of the company's risk exposure.

Asset/liability risk considerations figure prominently in life insurers' risk objectives, not only because of the need to fund insurance benefits but also because of the importance of interest-rate-sensitive liabilities. Examples of such liabilities are annuities and deposit-type contracts, such as GICs and funding agreements (stable-value instruments similar to GICs).

21 The excess of losses on assets over the assets' valuation reserve is a direct reduction in surplus. A **valuation reserve** is an allowance, created by a charge against earnings, to provide for losses in the value of the assets. **Surplus** is the net difference between the total assets and total liabilities of an insurance company; it is equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company.

The two aspects of interest rate risk are valuation concerns and reinvestment risk:

- **Valuation concerns.** In a period of changing interest rates, a mismatch between the duration of an insurance company's assets and that of its liabilities can lead to erosion of surplus. Life insurance companies are particularly sensitive to the losses that can result during periods of rising interest rates from holding assets with an average duration that exceeds the average duration of liabilities. (Adding to insurers' concerns is the fact that the risk of disintermediation is greatest in such interest rate environments.) In these situations, the existence of valuation reserves alone may be insufficient to prevent a write-down of surplus, possibly creating a capital adequacy problem. Consequently, valuation concerns tend to limit insurers' risk tolerance.
- **Reinvestment risk.** For many life insurance companies, especially those competing for annuity business, yet another risk factor can be significant—reinvestment risk. **Reinvestment risk** is defined as the risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate. For annuity contracts on which no interest is paid until maturity (the terminal date) of the contract, the guarantee rate typically includes the insurance company's best estimate of the rate(s) at which interest payments will be reinvested. If a company does not carefully manage its asset and liability durations, an unexpected decline in interest rates can jeopardize the profitability of these contracts. Thus, controlling reinvestment risk is also an important risk objective.

Asset/liability management is the foundation for controlling both interest rate risk and liquidity for a life insurance company. Risk objectives addressing the mismatch of the duration of assets and liabilities are common.

Credit risk is also important in meeting insurance promises:

- **Credit risk. Credit risk** represents another potential source of income loss for insurance companies, although credit analysis has long been considered one of the industry's strengths. Insurers seek to control this risk through broad diversification and seek adequate compensation for taking risk in terms of the expected return or interest rate spread when investing in various asset classes. Risk objectives may relate to losses caused by credit risk.[22]

Another risk consideration relates to uncertainty in the timing of receipt of cash flows:

- **Cash flow volatility.** Loss of income or delays in collecting and reinvesting cash flow from investments is another key aspect of risk for which life insurance companies have low tolerance. Compounding (interest on interest) is an integral part of the reserve funding formula and a source of surplus growth. Actuaries assume that investment income will be available for reinvestment at a rate at least equal to an assumed (minimum return) rate. Controlling cash flow volatility is thus a risk objective.

22 Recent changes in GAAP have further complicated the management of credit risk by US insurance companies. The Financial Accounting Standard 115 and subsequent interpretative documents require a permanent write-down of the value of securities that have experienced an "Other Than Temporary Impairment" (OTTI). This type of impairment in value is defined as an unrealized loss that results from the decline in the market value of a security below its cost for an extended period of time. This Standard has been controversial and most likely will undergo additional modification because it does not allow for any subsequent write-up in value if the credit quality of the issuer improves and is so recognized in the market value. Also, declines in market value below cost that are caused by an increase in interest rates may require a permanent write-down under the current interpretation of FAS 115.

Despite the above four risk-related considerations, competition has modified the traditional conservatism of life insurance companies, motivating them to accept and manage varying degrees of risk in pursuit of more competitive investment returns.

4.1.2 *Return Objectives*

Historically, a life insurance company's return requirements have been specified primarily by the rates that actuaries use to determine policyholder reserves, i.e., accumulation rates for the funds held by the company for future disbursement.[23] In effect, the rate either continues as initially specified for the life of the contract or may change to reflect the company's actual investment experience, according to the contract terms. Interest is then credited to the reserve account at the specified rate; this rate can thus be defined as the minimum return requirement. If the insurer fails to earn the minimum return, its liabilities will increase by an accrual of interest that is greater than the increase in assets. The shortfall is reflected in a decrease in surplus or surplus reserves, assuming the simplest case. The insurer, in short, desires to earn a positive net interest spread, and return objectives may include a desired net interest spread. (The **net interest spread** is the difference between interest earned and interest credited to policyholders.) Reserve funding adequacy is monitored carefully by management, regulatory commissions, and insurance rating agencies such as A.M. Best, as well as through the claims paying rating services initiated by Moody's Investors Service, Standard & Poor's Corporation, and Fitch Ratings.

In the mid to late 1980s, Japanese life insurance companies issued policies that guaranteed what proved to be unsustainable reserve crediting rates—and guaranteed those rates for as long as 10 years. With the sharp decline in interest rates, stock prices, and real estate values during the 1990s in Japan, these companies sustained unprecedented losses and consequent erosion of the surplus of the Japanese life insurance industry. These events provided an important lesson regarding the setting of return objectives, crediting rates, and guarantee periods in a volatile investment environment.

In the United States, with whole-life insurance policies, the minimum statutory accumulation rate for most life insurance contracts ranges between 3 and 5.5 percent. Thus, in the higher interest rate environment of the 1970s and 1980s, the spread between life insurance companies' return on new investments and even the return on their entire portfolio exceeded the minimum returns by a widening margin. But as growing investor sophistication and competition in insurance markets led to higher credited rates, and as interest rates declined in the 1990s and early 2000s, the net interest spread narrowed quickly and dramatically. As a result, US regulators have permitted minimum statutory accumulation rates to be reduced.

Consistently above-average investment returns should and do provide an insurance company with some competitive advantage in setting premiums. Life insurance companies have found that an improvement as small as 10 basis points (0.10 percent) in the total portfolio yield improves their competitive position and profitability significantly. Portfolio yields for most life portfolios, however, are more similar than different, as Exhibit 4 shows. To a large extent, this similarity reflects the role regulation plays in constraining the asset mix and quality characteristics of every life insurance company portfolio and the historical evolution of portfolio asset allocation in that regulatory environment.

23 **Policyholder reserves** are a balance sheet liability for an insurance company; they represent the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Exhibit 4 Portfolio Yields of US Life Insurance Companies: Selected Years, 1975–2010

	Major Life Insurance Companies			
	Industry Rate (%)	Prudential (%)	Lincoln National (%)	AXA Equitable-NY (%)
1975	6.44	6.47	6.98	6.22
1985	9.87	9.07	8.49	8.72
1995	7.90	7.47	7.87	6.88
2000	7.40	6.41	6.93	6.70
2004	5.93	5.55	5.82	6.23
2010	5.37	5.16	5.48	6.13

Note: Portfolio yield equals the ratio of net investment income (after expenses and before income taxes) to mean cash and invested assets.
Sources: Life Insurance Fact Book (2001); *Best's Insurance Reports* (2005) *Best's Review* (October, 2011).

Some companies have experimented with using total return rather than interest rate spread to measure their investment portfolios' performance and their products' profitability. When only the asset side of a balance sheet reflects market volatility, it is difficult to use total return measures. To the extent that comprehensive fair market value accounting standards are developed in the future, they will greatly enhance asset/liability management and performance and profitability measurement on a total return basis.

For companies selling annuity and guaranteed investment contracts, competitive investment returns have become necessary and spread margins are narrow. The annuity segment of the life insurance business has accounted for approximately two-thirds of total industry reserves for more than a decade (see Exhibit 5).

Exhibit 5 Reserves for Annuities and Guaranteed Investment Contracts for the US Life Insurance Industry: Selected Years, 1970–2009

	Percentage of Total Reserves
1970	26.6%
1980	45.4
1990	66.7
2002	64.6
2009	64.0

Source: Life Insurance Fact Book (2003, 2011).

For these lines of business, competition comes from outside as well as from within the industry. These competitive pressures create a dilemma for insurance companies. While insurance companies are required to control risk, many companies feel compelled to mismatch asset/liability durations or downgrade the credit quality of their investments in an attempt to achieve higher returns for competitive reasons.

Segmentation of insurance company portfolios has promoted the establishment of sub-portfolio return objectives to promote competitive crediting rates for groups of contracts. The major life insurance companies find themselves specifying return requirements by major line of business, the result being that a single company's investment policy may incorporate multiple return objectives.

Another dimension of return objectives for life insurance companies relates to the need to grow surplus to support expanding business volume. Common stocks, equity investments in real estate, and private equity have been the investment alternatives most widely used to achieve surplus growth. Life companies establish return objectives for each of these classes of equity investments to reflect historical and expected returns. Many life insurance companies are evaluating a variety of capital appreciation strategies, as well as financial leverage, to supplement the narrowing contribution to surplus from the newer product lines that are more competitive and have lower profit margins.

4.1.3 *Liquidity Requirements*

Traditionally, life insurance companies have been characterized as needing minimal liquidity. Except during the depression of the 1930s and the disintermediation of the early 1980s, annual cash inflow has far exceeded cash outflow. Thus, the need to liquidate assets has been negligible, reflecting the growing volume of business, the longer-term nature of liabilities, and the rollover in portfolio assets from maturing securities and other forms of principal payments. However, volatile interest rate environments and the ever-increasing importance of annuity products require that life companies pay close attention to their liquidity requirements. Otherwise, insurers may be forced to sell bonds at a loss to meet surrenders of insurance policies in periods of sharply rising interest rates. In assessing their liquidity needs, insurers must address disintermediation and asset marketability risk.

- **Disintermediation.** In the United States, on four different occasions in the past 40 years (1966, 1970, 1974, and 1979–1981), inflation and high interest rates have forced life insurance companies to take measures to accommodate extraordinary net cash outflows. Initially, policy loan drains in conjunction with heavy forward commitment positions forced some remedial but temporary changes in investment strategies. Likewise, the trend of policy surrenders caused 1) actuaries to reevaluate and reduce their estimates of the duration of liabilities and 2) portfolio managers to reduce the average duration of the portfolio and in some cases add to liquidity reserves.

  In a period of rising interest rates, a mismatch between the duration of an insurance company's assets and its liabilities can create a net loss if the assets' duration exceeds that of the liabilities. If disintermediation occurs concurrently, the insurer may need to sell assets at a realized loss to meet liquidity needs. Thus, an asset/liability mismatch can exacerbate the effects of disintermediation.

- **Asset marketability risk.** The marketability of investments is important to insure ample liquidity. Life insurance companies have traditionally invested some portion of their portfolios in less liquid investments, such as private placement bonds, commercial mortgage loans, equity real estate, and venture capital. Increasingly, liquidity considerations are constraining the percentage invested in these asset classes. Also, forward commitment activity has been slowed by liquidity considerations. Such commitments represent agreements by life insurance companies to purchase private placement bonds or mortgages, with part or all of the settlement typically delayed from 6 to 18 months. The traditional stability and growth of cash flow fostered this practice in the 1960s and

1970s, but volatile interest rates and disintermediation have undermined the predictability of life companies' cash flow. Forward committing has thus waned in importance in recent years.

The growth and development of the derivatives market has broadened the life insurance industry's ability to manage interest rate risk and reduced companies' need to hold significant liquidity reserves. Many companies also maintain lines of credit with banks for added liquidity.

4.1.4 *Time Horizon*

Life insurance companies have long been considered the classic long-term investor. Traditionally, portfolio return objectives have been evaluated within the context of holding periods as long as 20 to 40 years. Most life insurance companies have traditionally sought long-term maturities for bond and mortgage investments. In addition, life companies have found equity investments (real estate, common stocks, convertible securities, and venture capital) attractive because of their capital appreciation potential and inflation (purchasing power) risk protection.

One reason that life insurance companies have traditionally segmented their portfolios is the recognition that particular product lines or lines of business have unique time horizons and return objectives. For example, group annuities are generally written with maturities of 2 to 10 years. Therefore, many, if not most, of the assets funding those products have comparable maturities (or, more accurately, durations).

Asset/liability management practices have tended to shorten the overall investment time horizon of the typical life insurance company. Today, portfolio segments have differing time horizons, reflected in each segment's investment policies.

4.1.5 *Tax Concerns*

Unlike pension funds and endowments, insurance companies are tax-paying rather than wholly or partially tax-exempt investors. As commercial enterprises, they are subject to income, capital gains, and other types of taxes in the countries where they operate. The types and application of taxes differ by country, but in all cases, taxes mean that insurance companies must focus on after-tax returns in their investment activities.

In a very simplified context, life insurance companies' investment income can be divided into two parts for tax purposes: the policyholders' share (that portion relating to the actuarially assumed rate necessary to fund reserves) and the corporate share (the balance that is transferred to surplus). Under present US law, only the latter portion is taxed.

One very important tax consideration being watched carefully by the US life insurance industry relates to the tax treatment of the so-called inside buildup of cash values under a life insurance policy or annuity. The deferral of taxes on the accumulation of cash values within a life insurance contract has been a longstanding characteristic of such products. In the United States, Congress periodically reassesses the tax deferral of such inside buildup for life and annuity products. Tax law changes that would reduce or eliminate the tax deferral granted to the inside buildup would create significant competitive issues for the life insurance industry.

4.1.6 *Legal and Regulatory Factors*

Insurance is a heavily regulated industry. In the United States, state rather than federal regulation prevails. The lack of uniformity of state regulation and the cost of meeting the unique requirements imposed by 50 different states impose costs on insurers. Currently, state regulation pervades all aspects of an insurance company's operations—permitted lines of business, product and policy forms, authorized investments, and the like. The NAIC, whose membership includes regulators from all 50 states, promulgates insurance industry accounting rules and financial statement forms. In

1999, the US Congress passed the Financial Modernization Act, which essentially removed barriers to entry for banks, insurance companies, and investment brokerage firms that dated back to the Great Depression of the 1930s. Regulation of financial institutions in the United States is now more closely aligned with prevailing regulation in many other parts of the world. In Canada, regulation is federal, except for those companies doing business only within a specific province. At either level—federal or provincial—Canadian regulation is as pervasive as US regulation. In Japan, the Ministry of Finance regulates insurance companies, while in the United Kingdom, the Financial Services Authority has been the responsible governmental authority, with the Prudential Regulatory Authority (as a subsidiary of the Bank of England) expected to take over that role by the end of 2012.

The relevant insurance department or ministry audit procedures ensure compliance with the regulations of the state or country where the company is domiciled. In most cases, these regulations are the primary constraint affecting investment policy. Important concepts related to regulatory and legal considerations include eligible investments, the prudent investor rule, and valuation methods.[24]

- **Eligible investments.** Insurance laws determine the classes of assets eligible for investment and may specify the quality standards for each asset class. In the United States, for example, many states' insurance laws require that for a bond issue to be eligible for investment, its interest coverage ratio (earnings plus interest divided by interest) must meet minimum standards over a specified time period (e.g., 1.5 times coverage over each of the past five years) or minimum credit ratings. Generally, regulations specify the percentage of an insurance company's assets that may be invested in a specific class of eligible assets. For example, in the United States, most states limit the value (at cost) of life companies' common stock holdings to no more than 20 percent of total admitted assets. Non-US investments are also limited to some extent as a percentage of admitted assets in most states.
- **Prudent investor rule.** Although the scope of regulation is extensive, it is important to note that the prudent investor concept has been adopted in some US states. Replacing traditional "laundry lists" of approved investments with prudent investor logic simplifies the regulatory process and allows life insurance companies much needed flexibility to keep up with the ever-changing array of investment alternatives. New York's leadership in this area is important because, traditionally, regulations of this state have been the model for insurance regulation in the United States. Despite a major effort in the mid-1990s, however, no model law or universal investment standards have been adopted by all US states.
- **Valuation methods.** In the European Union, International Accounting Standards specify a set of valuation procedures. In the United States, uniform valuation methods are established and administered by the NAIC. In fact, the NAIC's *Security Valuation Book*, published at the end of each year, compiles the values or valuation bases to be used by insurance companies for portfolio securities. This book is the source of the valuation data listed in Schedule D of the annual statement that each company files with the insurance departments of the states in which it operates. Schedule D is an inventory of all bond and stock holdings at year-end and a recap of the year's transactions.

24 The scope of regulation is not limited to these areas. Many life insurance and annuity products have investment features. In the United States and the European Union, life insurance companies are subject to anti-money-laundering regulation to prevent the use of such products for illegal purposes.

In summary, regulation has a profound effect on both the risk and return aspects of a life insurance company portfolio, primarily because it constrains two critical aspects of portfolio management—asset allocation and the universe of eligible investments.

4.1.7 *Unique Circumstances*

Each insurance company, whether life or non-life, may have unique circumstances attributable to factors other than the insurance products it provides. These idiosyncrasies may further modify portfolio policies. The company's size and the sufficiency of its surplus position are among the considerations influencing portfolio policy.

To conclude, we provide a sample investment policy statement. Although the format and content of investment policy statements are unique to each insurance company, Example 14 represents a typical IPS for a stock life insurance company.[25]

EXAMPLE 14

Investment Policy Statement for a Stock Life Insurer

ABC Life Insurance Company ("the Company") underwrites and markets life insurance and annuity products. The Company is licensed to do business in all 50 US states. In recent years, the Company has expanded its operations outside the United States and now is licensed and doing business in one Asian and two European countries. The Company's total assets exceed $15 billion; the Company has surplus of more than $1 billion. Competition in its markets is increasing both from traditional insurance company competitors and more recently, from other financial institutions, such as banks and mutual funds. In response to this increased competition, the Company must take more risk and establish higher return objectives for its investment portfolio so as to maintain an adequate margin (spread) between its investment portfolio return and the weighted-average rates of return being credited to its interest-rate-sensitive life insurance policies and annuity contracts. The Company's investment objectives may be defined in terms of its return and risk objectives for each of the portfolio segments (for example, its real estate portfolio). The statement below reflects a common set of objectives that applies in whole or in part to each of the respective portfolio segments. Policy statements exist for each segment that contain details on segment-specific risk and return specifications. Capital market and insurance market conditions shape the achievement of these policy objectives.

Investment Philosophy

The assets of the Company should be invested to provide for the payment of all contractual obligations to policyholders and to contribute to the growth of surplus over the long-term. Therefore, the investment strategy will be based on prudent investment principles within the context of applicable insurance regulations. The strategy will seek to achieve the appropriate balance between: providing investment income to enhance profitability; maintaining liquidity and generating cash flow to meet all obligations; funding policyholder reserves within pricing strategies; and growing the value of surplus over time, thereby contributing to the Company's future growth.

25 A stock life insurance company is organized as a corporation owned by stockholders.

Investment Goals, Objectives and Constraints

The Company's investment goals and objectives will be stated in terms of return expectations and requirements and risk tolerance. The constraints under which the investment portfolio will be managed include liquidity considerations, time horizon, regulatory restrictions, tax considerations and unique requirements.

Return Objectives

The return objectives of the Company are twofold: a) earn a sufficient return to fund all policyholder liabilities and match or exceed the expected returns factored into the pricing of the Company's various products, and b) contribute to the growth of surplus through capital appreciation. The return objectives will be stated in terms of meeting or exceeding projected needs related to investment income, product pricing spreads, and total return. The return requirements may vary by portfolio segments that have been established for certain product lines or groupings of product lines.

Risk Tolerance

The risk tolerance of the Company is based on the competitive requirements of various product lines, asset/liability management factors, risk-based capital considerations, rating agency parameters and the responsibility to fulfill all short-term and long-term obligations to policyholders. Interest rate risk and credit (default) risk need to be monitored and managed to support the competitive position of the Company while providing for its long-term viability. The risk parameters may vary by segment.

Investment Constraints

The Company's investment constraints are defined in terms of the following factors, all or some of which may apply to specific portfolio segments.

Liquidity

The portfolio will be managed to meet the liquidity requirements so as to pay all benefits and expenses in a timely manner. Investment cash flows will be a primary source of liquidity, so as to minimize the need to hold lower yielding cash reserves. In addition, publicly traded securities will provide an additional source of liquidity.

Time Horizon

The Company is a long-term investor and will establish duration targets for the portfolio and any product segments based on appropriate asset/liability management specifications.

Tax

Income tax considerations determine the mix of investments that provides the most favorable after-tax returns. From time to time, operating conditions or corporate tax planning requirements may mandate the realization or postponement of capital gains.

Regulatory

All investments must qualify under the insurance code of the state in which the Company is domiciled and the nondomestic insurance companies' regulations in the countries in which the Company operates.

Unique Circumstance

The Company may invest in less liquid private placement bonds, commercial mortgage loans, real estate and private equity to enhance returns so long as liquidity requirements are not compromised.

Review Schedule

This policy statement will be reviewed at least annually by the Board of Directors and is subject to modification based on significant changes in insurance or tax regulations as well as significant changes in the Company's financial position and/or capital- or insurance-market conditions.

Asset Allocation

The Company's strategic allocation is designed to identify and authorize the strategies for achieving the objectives specified by the investment policy statement. The strategic asset allocation also recognizes the constraints (both regulatory and self-imposed) specified in the investment policy statement. The selection of authorized asset classes and their allocation percentages are recognized as key determinants of the success of the Company's investment activities. The strategic asset allocation will be set out in a separate document.

Rebalancing

Changes in market values and market conditions require periodic portfolio rebalancing on at least a quarterly (and in some cases a more frequent) basis. Cash flow, insofar as it is available, will be used to rebalance. It should be recognized that some asset classes, such as private placement bonds, private equity, commercial mortgage loans, and real estate, are less liquid than publicly traded securities. Therefore, under most conditions, these asset classes should not be allowed to exceed the target allocations specified in the strategic asset allocation.

Investment Responsibilities

The Board of Directors is responsible for overseeing the invested assets and the investment process of the Company. The Board will rely on both Company employees and/or external investment service providers for the ongoing management of the investment portfolio. Because of the number of parties involved, each entity's role must be identified to ensure operational efficiency, clear lines of communication and accountability in all aspects of the management of the investment portfolio of the Company.

Board of Directors

The Board of Directors approves the investment policy statement and asset allocation at least annually. At least quarterly, the Board will review the performance of the investment portfolio and review and approve all transactions for that quarter.

Investment Management Committee

The Investment Management Committee will be composed of investment and financial officers of the Company. They will have ongoing responsibility for the management of the investment portfolio. On a quarterly basis, the Investment Management Committee will review investment performance and cash flow requirements with the Board of Directors. On an annual basis, or when either the Company's financial condition or capital market conditions change, the Investment Management Committee will review the investment policy statement and asset allocation and recommend changes to the Board.

External Investment Advisors

With the approval of the Board of Directors, the Investment Management Committee may retain external investment consultants and advisors to assist in the management of the investment portfolio or subparts thereof. All external investment advisors will be expected to manage all or any part of the portfolio in conformity with the investment policy statement and asset allocation.

Custodian

The Investment Management Committee is authorized to retain the services of a regulated bank or trust company to safeguard the cash and invested assets of the Company. The custodian will also be responsible for the payment and collection of all investment funds.

4.2 Non-Life Insurance Companies: Background and Investment Setting

The second broad insurance category is the non-life (casualty) sector, which includes but is not limited to health, property, liability, marine, surety, and workers' compensation insurance. For purposes of considering investment policy, these non-life companies are really quite similar even though the products they sell are rather diverse. The investment policies of a non-life company differ significantly from those of a life insurance company, however, because the liabilities, risk factors, and tax considerations for non-life companies are distinctly different from those for life companies. For example:

- non-life liability durations tend to be shorter, and claim processing and payments periods are longer, than for life companies;
- some (but not all) non-life liabilities are exposed to inflation risk, although liabilities are not directly exposed to interest rate risk as those of life insurance companies; and
- in general, a life insurance company's liabilities are relatively certain in value but uncertain in timing, while a non-life insurance company's liabilities are relatively uncertain in both value and timing, with the result that non-life insurance companies are exposed to more volatility in their operating results.

As detailed in this section, the investment policies and practices of non-life insurance companies in the United States are evolving, with changes brought on by both operating considerations and new tax laws. In fact, tax planning has dominated the investment policy of non-life companies for decades, reflecting the cyclical characteristics of this segment of the insurance industry. For reasons described in the following pages, asset/liability management is receiving increased attention.

A unique aspect of the casualty insurance industry is what is often described as the "long tail" that characterizes the industry's claims reporting, processing, and payment structure.[26] Whereas life insurance is heavily oriented toward products sold to or for individuals, commercial customers account for a very large portion of the total casualty insurance market. The long tail nature of many types of liability (both individual and commercial) and casualty insurance claims arises from the fact that months and years may pass between the date of the occurrence and reporting of the claim and the actual payment of a settlement to a policyholder. Many casualty industry claims are the subject of lawsuits to determine settlement amounts. Furthermore, some of these claims require expert evaluation to determine the extent of the damages—for example, a fire in a major manufacturing plant or damage to an oceangoing vessel. Thus, the liability structure of a casualty insurance company is very much a function of the products that it sells and the claims reporting and settlement process for those types of products.

From an asset/liability management perspective, most casualty insurance companies traditionally have been classified as having relatively short-term liabilities, even though the spectrum of casualty insurance policies covers a wide range of liability durations.

26 "Long tail" refers to the possibly long time span between the liability-triggering event and the filing of a claim related to it.

One of the primary factors that limits the duration of a non-life company's assets is the so-called **underwriting (profitability) cycle**, generally averaging three to five years. These cycles typically result from adverse claims experience and/or periods of extremely competitive pricing. They often coincide with general business cycles and, in the low part of the cycle, frequently require companies to liquidate investments to supplement cash flow shortfalls.

Estimating the duration of a casualty insurance company's liabilities introduces a different set of issues than with life insurance liabilities. Using multiscenario and multifactor models, casualty actuaries attempt to capture 1) the underwriting cycle, 2) the liability durations by product line, and 3) any unique cash outflow characteristics. For non-life companies, business cycles and not interest rate cycles, per se, determine a company's need for liquidity through appropriate durations and maturities of assets.

4.2.1 *Risk Objectives*

Like life insurance companies, casualty insurance companies have a quasi-fiduciary role; thus the ability to meet policyholders' claims is a dominant consideration influencing investment policy. The risks insured by casualty companies, however, are less predictable. In fact, for companies exposed to catastrophic events—such as hurricanes, tornadoes, and explosions—the potential for loss may be significantly greater. Furthermore, casualty policies frequently provide replacement cost or current cost coverage; thus inflation adds to the degree of risk. In setting risk objectives, casualty companies must consider both cash flow characteristics and the common stock to surplus ratio.

- **Cash flow characteristics.** Not surprisingly, cash flows from casualty insurance operations can be quite erratic. Unlike life insurance companies, which historically have been able to project cash flows and make forward commitments, casualty companies must be prepared to meet operating cash gaps with investment income or maturing securities. Therefore, for the portion of the investment portfolio relating to policyholder reserves, casualty companies have low tolerance for loss of principal or diminishing investment income. Investment maturities and investment income must be predictable in order to directly offset the unpredictability of operating trends.

  Interestingly, no regulations require casualty insurance companies to maintain an asset valuation reserve, although risk-based capital requirements have been established in the United States. Regulators and rating agencies closely monitor the ratio of a casualty insurance company's premium income to its total surplus. Generally, this ratio is maintained between 2-to-1 and 3-to-1.

- **Common stock to surplus ratio.** Inflation worldwide has further reduced investment risk tolerance among many casualty insurers. In fact, volatile stock market conditions in the 1970s persuaded many casualty companies to reduce the percentage of surplus invested in common stock. Until then, it was not uncommon for a casualty insurance company to hold common stock investments equal to or greater than its total surplus. Regulators in the United States forced several major companies to liquidate large portions of their common stock holdings near the end of the 1974 bear market because of significant erosion of surplus. This liquidation impaired these companies' ability to increase volume and, in some cases, their ability to provide sufficient financial stability for existing volume of business.

  Essentially, the regulators gave such companies the option of reducing common stock holdings or of temporarily ceasing or curtailing the issuance of new policies. Needless to say, this experience reduced casualty companies' risk tolerance for the portion of the investment portfolio related to surplus. Unlike the life insurance industry, the casualty industry has almost no absolute limits

imposed by regulation (in the United States, some states do limit commons stocks as a percentage of surplus). However, many casualty companies have adopted self-imposed limitations restricting common stocks at market value to some significant but limited portion (frequently one-half to three-quarters) of total surplus. During the bull market of the 1990s, many companies modified those self-imposed limits. Nevertheless, the attention paid to stock market risk exposure has prevented a repeat of the mid-1970s experience.

4.2.2 *Return Objectives*

Historically, most casualty insurance companies have not implicitly taken investment earnings into account when calculating premiums, in striking contrast to the accumulation rates long factored into life insurance premiums. For this reason, casualty insurance companies were once thought to be operating as if they were two separate organizations—an insurance company and an investment company operating a balanced fund (a fund holding a mixture of bonds and stocks). However, times have changed and the investment and operating functions are much more closely coordinated now. Factors influencing return objectives include competitive pricing policy, profitability, growth of surplus, tax considerations, and total return management.

- **Competitive policy pricing.** Low insurance policy premium rates, due to competition, provide an incentive for insurance companies to set high desired investment return objectives. The flip side is that high investment returns may induce insurance companies to lower their policy rates, even though a high level of returns cannot be sustained. In the late 1970s and early 1980s, for example, many casualty insurance companies, especially the larger ones, took advantage of the high interest rates being earned on new investments to lower insurance premiums or to delay the normal pass-through of cost increases to their customers. As a result of this strategy, casualty insurance premiums lagged the otherwise high rate of inflation that characterized the early 1980s. Once interest rates began to fall, projections of high investment returns became suspect. The operating margin decline that many casualty insurance companies experienced in the mid-1980s resulted, in part, from the mispricing of their products because of expected returns that did not materialize. The low interest rate and weak stock market environment of 2000–2002 reinforced the perception that insurers cannot rely on investment returns to cover underwriting losses and that underwriting quality and profitable pricing are important. Thus any influence of competitive policy pricing on a casualty company's return objectives needs to be assessed in light of well-thought-out capital market assumptions and the insurance company's ability to accept risk.
- **Profitability.** Investment income and the investment portfolio return are primary determinants of continuing profitability for the typical casualty company and, indeed, the industry. The underwriting cycle influences the volatility of both company and industry earnings. Return requirements for casualty companies are not framed in reference to a crediting rate for their policies; rather, casualty insurance portfolios are managed to maximize return on capital and surplus to the extent that prudent asset/liability management, surplus adequacy considerations, and management preferences will allow.

  Given the underwriting uncertainties inherent in the casualty insurance business, investment income obviously provides financial stability for the insurance reserves. In fact, investment earnings are expected to offset periodic underwriting losses (claims and expenses in excess of premium income) from the insurance side of the company. Most casualty insurance products are priced competitively, and thus casualty premium rates are generally not sufficiently

ample or flexible to eliminate the loss aspects of the underwriting cycle. The insurance industry measures underwriting profitability using the "combined ratio," the percentage of premiums that an insurance company spends on claims and expenses. Over the past 25 years, the combined ratio for US-based non-life insurance companies has been above 100 percent, reflecting underwriting losses, in over 60 percent of the years.

- **Growth of surplus.** An important function of a casualty company's investment operation is to provide growth of surplus, which in turn provides the opportunity to expand the volume of insurance the company can write. As mentioned earlier, the risk-taking capacity of a casualty insurance company is measured to a large extent by its ratio of premiums to capital and surplus. Generally, companies maintain this ratio between 2-to-1 and 3-to-1, although many well capitalized companies have lower ratios. Casualty companies have invested in common stocks, convertible securities, and alternative investments to achieve growth of surplus. These investments' return and marketability characteristics fit well within the industry's underwriting cycles.
- **Tax considerations.** Over the years, non-life insurance companies' investment results have been very sensitive to the after-tax return on the bond portfolio and to the tax benefits, when they exist, of certain kinds of investment returns. In the United States, these returns have included dividend income (through the exclusion of a portion of the dividends received by one corporation on stock issued by another corporation), realized long-term capital gains, and tax-exempt bonds. US casualty insurance companies have historically favored the latter, especially when underwriting is profitable, to achieve the highest after-tax return. For many casualty companies, the flexibility to shift between taxable and tax-exempt bonds has long been an important consideration as a key element of managing and optimizing after-tax income through the operating loss carryback and carryforward provisions of the US tax code. Most companies have maintained some balance of taxable and tax-exempt bonds in their portfolios, shifting that mix as tax considerations warranted. Recent changes in the tax laws have diminished most of the tax benefits available to casualty insurance companies. Outside of the United States, tax-exempt securities for insurance companies either do not exist or are more limited in supply. For non-US insurance companies, therefore, taxes are even more of a constraint.
- **Total return management.** Active bond portfolio management strategies designed to achieve total return, rather than yield or investment income goals only, have gained popularity among casualty insurance companies, especially large ones. Because GAAP and statutory reporting require that realized capital gains and losses flow through the income statement, the decline in interest rates and increase in bond prices since 1982 have encouraged casualty insurance portfolio managers to trade actively for total return in at least some portion of their bond portfolios.

One of the most interesting characteristics of casualty insurance companies is that their investment returns vary significantly from company to company. This variation reflects 1) the latitude permitted by insurance regulations; 2) differences in product mix, and thus in the duration of liabilities; 3) a particular company's tax position; 4) the

emphasis placed on capital appreciation versus the income component of investment return; and 5) the strength of the company's capital and surplus positions. Exhibit 6 illustrates this contrast.[27]

Exhibit 6 Pretax Portfolio Yields of US Casualty Insurance Companies: Selected Years, 1975–2009

	Allstate (%)	CNA Financial (%)	State Farm (%)	Travelers (%)
1975	5.1	5.3	5.5	7.3
1985	6.8	9.7	8.2	7.2
1995	6.0	6.4	5.7	5.9
2000	5.5	6.4	6.0	6.8
2004	5.3	4.3	4.6	5.5
2009	3.8	5.3	3.9	4.7

Source: Best's Insurance Reports (2005); *Best's Review* (October, 2011).

4.2.3 *Liquidity Requirements*

Given the uncertainty of the cash flow from casualty insurance operations, liquidity has always been a paramount consideration for non-life companies, in sharp contrast with life insurance companies which face relatively certain cash flows, excluding policy loans and surrenders. In addition to its use in meeting cash flow needs, liquidity has also been a necessary adjunct of a casualty company's variable tax position. Historically, casualty companies have found it necessary to liquidate portions of their bond portfolios to increase tax-exempt income during periods of underwriting profits and to increase taxable income during periods of underwriting losses. Liquidity remains a necessity for casualty companies, providing portfolio flexibility under changing tax, underwriting, and interest rate conditions.

To meet its liquidity needs, the typical casualty company does several things related to the marketability and maturity schedule of its investments. Quite often it maintains a portfolio of short-term securities, such as commercial paper or Treasury bills, as an immediate liquidity reserve. In addition, it may also hold a portfolio of readily marketable government bonds of various maturities; maintain a balanced or laddered maturity schedule to ensure a sufficient rollover of assets; match some assets against seasonal cash flow needs; or concentrate some portion of its bond portfolio in higher-quality bonds that are generally more marketable. Needless to say, such attention to maturity and marketability complements the limited risk tolerance and further modifies the return objectives of casualty insurers.

4.2.4 *Time Horizon*

The time horizon of casualty insurance companies is a function of two primary factors. First, the durations of casualty liabilities are typically shorter than those of life insurance liabilities. Second, underwriting cycles affect the mix of taxable and tax-exempt bond holdings. Because the tax-exempt **yield curve** in the United States tends to be

27 Because insurers' portfolios are heavily weighted toward fixed income, the variation in yields for four major companies shown in Exhibit 6 provides evidence for variation in total returns (data for which are not readily available).

more positively sloped than the taxable curve, casualty companies find that they must invest in longer maturities (15 to 30 years) than the typical life company to optimize the yield advantage offered by tax-exempt securities (see Exhibit 7).

Exhibit 7 Comparison of Average Maturity of Bond Portfolios of Selected US Non-Life and Life Insurance Companies: Year-End 2004

Company	Average Maturity of Bond Portfolio (Years)
Casualty	
Allstate	13
CNA Financial	14
State Farm	7
Travelers	7
Life	
AXA Equitable-NY	11
Lincoln National	9
Prudential	8

Source: Best's Insurance Reports (2005).

Differences in the average maturity of bond portfolios between casualty and life insurance companies may also reflect the companies' willingness to accept interest rate risk via asset/liability duration mismatches and trade at least some portion of their portfolios through a market or underwriting cycle.

In terms of common stock investments, casualty companies historically have been long-term investors, with growth of surplus being the primary return objective of their portfolios' stock portion. As noted earlier, realized gains and losses flow through the income statement. Currently, the long-term equity investor status of the industry has been modified by objectives related to current reported earnings that have in turn led to some additional turnover in the common stock portfolio and more active management of the total portfolio.

4.2.5 *Tax Concerns*

Tax considerations are a very important factor in determining casualty insurance companies' investment policy. Prior to changes in the tax law in 1986, US casualty insurance companies operated under a relatively simple and straightforward set of tax provisions. Under those laws, their investment policy was directed toward achieving the appropriate balance between taxable and tax-exempt income on one hand, and taking advantage of the lower capital gains tax rate and corporate dividend exclusion, where possible, on the other.

As a result of the 1986 changes, tax-exempt bond income became subject to tax for US casualty insurance companies. Applying the current tax provisions requires a series of calculations to determine the net tax being levied on tax-exempt bond income. Because the equations must factor in both the operating profit or loss characteristics of the casualty company and alternative minimum tax provisions of the code, a computer model is generally needed to determine the appropriate asset allocation, if any, between tax-exempt and taxable securities for both new purchases and existing holdings. The complexities and implications of the taxation of tax-exempt bond income for casualty companies are beyond the scope of this reading.

As in the life insurance industry, casualty insurers are likely to be subjected to further tax code modification, which increases uncertainty for the investment manager as to the tax consequences of certain portfolio activities or alternatives when measured over a long time horizon. Tax considerations also shape the investment policy of non-US casualty insurance companies. Portfolio managers typically work closely with the companies' tax advisors to measure and monitor the tax implications of various portfolio strategies.

4.2.6 *Legal and Regulatory Factors*

Although the insurance industry in general is heavily regulated, casualty company investment regulation is relatively permissive. On the one hand, classes of eligible assets and quality standards for each class are specified just as they are for life companies. In the United States, New York state law, which is considered the most restrictive, requires that assets equal to 50 percent of unearned premium and loss reserves combined be maintained in "eligible bonds and mortgages." Beyond these general restrictions, however, casualty insurance companies are permitted to invest the remainder of their assets in a relatively broad array of bonds, mortgages, stocks, and real estate, without restriction as to the amount invested in any particular asset class (except in certain states that limit common stock and/or real estate holdings).

A casualty company is not required to maintain an asset valuation reserve. In essence, then, the surplus of a casualty company reflects the full impact of increases and decreases in the market value of stocks. The United States, however, has recently established risk-based capital regulations for the casualty industry. US risk-based capital regulations for casualty insurers specify the minimum amount of capital that an insurer must hold as a function of the size and degree of the asset risk, credit risk, underwriting risk, and off-balance sheet risk that the insurer takes.[28]

4.2.7 *Determination of Portfolio Policies*

As in the case of life insurance companies, casualty companies' limited investment risk tolerance is the dominant factor in determining their investment policy. Because of contractual liabilities and difficulty in forecasting the cash flow from insurance operations, casualty companies seek some degree of safety from the assets offsetting insurance reserves. Indeed, casualty companies' willingness to assume investment risk with the assets offsetting surplus has been moderated, or is at least subject to more careful management, as a result of market volatility in recent years.

Over and above liquidity needs, which are clearly important, casualty insurance companies develop a significant portfolio of stocks and bonds and generate a high level of income to supplement or offset insurance underwriting gains and losses. Capital appreciation also builds the surplus base and supports additional investment in the business. The structure of a casualty company's bond portfolio between taxable and tax-exempt securities depends on the company's underwriting experience and current tax policy. A casualty company's investment and business operating policies and strategies must be closely coordinated given the volatility of both the capital markets and the casualty insurance markets.

To conclude, we provide a sample investment policy statement. The format and content of investment policy statements are of course unique to each insurance company; however, Example 15 details an investment policy statement for a typical casualty insurance company.

---

28 Asset risk addresses fluctuation in market value. **Credit risk** addresses probability of default. Underwriting risk arises from underestimating liabilities from business already written or inadequately pricing current or prospective business. Off-balance sheet risk addresses the risk from items not reflected in the balance sheet.

EXAMPLE 15

Investment Policy Statement for a Casualty Insurance Company

Cornish Casualty Insurance Company ("the Company") underwrites auto and homeowners insurance. The company is licensed to do business in all 50 US states. In recent years, the Company's business has been growing steadily, and its board of directors has approved a strategic plan for increasing its growth rate and profitability. The Company's total assets exceed $5 billion, and its surplus approaches $2 billion. The company is facing increased competition in its markets from companies selling auto and homeowners insurance through the Internet, as well as from other direct sellers. This competitive environment has focused the board and management's attention on increasing the after-tax return on the bond portfolio and enhancing the growth of surplus. The company's chief investment officer has been asked to revise the Company's investment policy statement to reflect the changes that will be necessary to meet the new growth targets. The CIO has revised the return and risk objectives for the overall portfolio and various portfolio segments. Following are the investment objectives and constraints under which the Company's investment portfolio will be managed.

Investment Philosophy

The assets of the Company should be invested to provide for the payment of all contractual obligations to policyholders and to contribute to the growth of surplus over the long-term. Therefore, the investment strategy will be based on prudent investment principles within the context of applicable insurance regulations. The strategy will seek to achieve the appropriate balance among the following: providing investment income to enhance profitability; maintaining liquidity and generating cash flow to meet all obligations; and growing the value of assets over time, thereby contributing to the Company's ability to write additional business and grow premium income.

Investment Goals, Objectives, and Constraints

The Company's investment goals and objectives will be stated in terms of return expectations and requirements and risk tolerance. The constraints under which the investment portfolio will be managed include liquidity considerations, time horizon, regulatory restrictions, tax considerations and unique requirements.

Return Objectives

The return objectives of the Company are threefold: a) earn a sufficient return to fund all policyholder liabilities, b) support the competitive pricing of all products, and c) contribute to the growth of surplus through capital appreciation. The return objectives will be measured in terms of meeting or exceeding projections of investment income and total return.

Risk Tolerance

The risk tolerance of the Company is based on the competitive requirements of various product lines, risk-based capital considerations, and the responsibility to fulfill all short-term and long-term obligations to policyholders. Credit (default) risk and stock market risk need to be monitored and managed so as to support the competitive position of the Company while providing for its long-term viability.

Investment Constraints

The Company's investment constraints can be defined in terms of the following factors.

Liquidity

The portfolio will be managed to meet the liquidity requirements to pay all benefits and expenses in a timely manner. Investment cash flows will be a primary source of liquidity, to minimize lower yielding cash reserves. In addition, publicly traded securities will provide an important additional source of liquidity.

Time Horizon

The Company is a long-term investor but will adjust the average maturity of the bond portfolio in line with the relative attractiveness of the after tax return on taxable versus tax-exempt bonds.

Tax

Tax considerations determine the optimal allocation within the bond portfolio between taxable and tax-exempt bonds. Tax considerations may also play a role in the realization of gains and losses for both the bond and stock portfolios.

Regulatory

All investments must qualify under the insurance law of the state in which the Company is domiciled.

Unique Circumstances

Private placement bonds are not authorized and investments in commercial mortgage loans and real estate are limited, due to liquidity considerations.

Review Schedule

This policy statement will be reviewed at least annually by the Board of Directors and is subject to modification based on significant changes in insurance or tax regulations as well as significant changes in the Company's financial position and/or capital or insurance market conditions.

[Other parts of the investment policy statement are omitted.]

BANKS AND OTHER INSTITUTIONAL INVESTORS

5

The final type of institutional investor that we discuss in detail is banks.

5.1 Banks: Background and Investment Setting

Banks are financial intermediaries involved in taking deposits and lending money. Nearly everywhere, however, the scope of banks' activities has evolved and widened over time, although distinct regional and national traditions remain. Western Europe and Canada follow the model of universal banking, in which traditional banking (involving deposit-taking and lending), securities underwriting, and insurance (in Europe) are organized under one corporate roof.[29] In this universal banking model, banks can provide one-stop shopping for financial services. In contrast to this model, in the 20th century the United States and Japan evolved regulatory separations between commercial

29 **Bancassurance** is the term that has developed to describe the sale of insurance by banks. As of 2004, more than 50 percent of life insurance is sold through banks in Spain, France, and Italy, and about 20 percent is sold through banks in the United Kingdom and Germany. Although banks in Japan have been permitted to sell insurance products since 2002 and in the United States since 1999, banks constitute a minor share of the insurance market in these countries.

banking and investment banking (security underwriting) activities. Gradually, this separation has eroded in the United States, as highlighted by the 1998 merger of Citicorp (a holding company that included Citibank) and Travelers Group (a holding company that included Travelers Insurance and Salomon Smith Barney) and by the Gramm-Leach-Bliley Act of 1999, which permits affiliations under a financial holding company structure. Nevertheless, important differences in regulatory constraints and business structures persist among banks internationally.

Banks' liabilities consist chiefly of time and demand deposits[30] (as much as 90 percent of total liabilities and capital for smaller banks) but also include purchased funds and sometimes publicly traded debt. The asset side of the balance sheet consists of loan and securities portfolios as well as an assortment of other assets. For Federal Deposit Insurance Corporation insured US commercial banks, in recent years loans and leases have represented on average slightly less than 60 percent of assets. Loans may include real estate, commercial, individual, and agricultural loans. Securities have represented about 20 percent of total assets; other assets (trading accounts, bank premises and fixed assets, and other real estate owned) have been about 15 percent; and cash and Federal funds have accounted for the remainder of assets.

Traditionally, a bank's portfolio of investment securities has been a residual use of funds after loan demand has been met. The securities portfolio nevertheless plays a key role in managing a bank's risk and liquidity positions relative to its liabilities. Consequently, a bank's asset/liability risk management committee (ALCO) is generally in charge of overseeing the bank's securities portfolio. Exhibit 8 sets a context for understanding a bank's ALCO's concerns. Although banks have fee and other non-interest sources of income, and, of course, non-interest expenses, interest revenues and costs are the chief financial variables affecting bank profitability. The quantity, duration, and credit quality of both the loan and securities portfolio affects a bank's interest revenues. On the market-value balance sheet, interest rate risk affects the market value of net worth representing the value of equity claims on the bank. Observing the bank's financial performance, the ALCO can make needed changes in assets and liabilities.

Exhibit 8 Elements of the ALM Process

30 A **time deposit** is a deposit requiring advance notice prior to a withdrawal; a **demand deposit** is one that can be drawn upon without prior notice, such as a checking account.

Some more detail is helpful. Among the profitability measures that the ALCO will monitor are the following:

- The **net interest margin**, already mentioned, equals net interest income (interest income minus interest expense) divided by average earning assets. Net interest margin is a summary measure of the net interest return earned on income-producing assets such as loans and bonds.[31]
- The **interest spread** equals the average yield on earning assets minus the average percent cost of interest-bearing liabilities. The interest spread is a measure of the bank's ability to invest in assets yielding more than the cost of its sources of funding.

Because both interest income and interest expense fluctuate in response to interest rate changes, net interest margin and interest spread are key indicators of a bank's ability to profitably manage interest rate risk. Among the risk measures the ALCO will monitor are the following:

- The **leverage-adjusted duration gap** is defined as $D_A - kD_L$, where D_A is the duration of assets, D_L is the duration of liabilities, and $k = L/A$, the ratio of the market value of liabilities (L) to the market value of assets (A). The leverage-adjusted duration gap measures a bank's overall interest rate exposure. For a positive interest rate shock (unexpected increase in rates), the market value of net worth will decrease for a bank with a positive gap; be unaffected for a bank with a zero gap (an immunized balance sheet); and increase for a bank with a negative gap.[32]
- Position and aggregate **Value at Risk (VaR)** are money measures of the minimum value of losses expected over a specified time period (for example, a day, a quarter, or a year) at a given level of probability (often 0.05 or 0.01). As a result of risk-based capital regulatory initiatives internationally, nearly all banks track this measure of exposure to large losses.
- Credit measures of risk may include both internally developed and commercially available measures such as CreditMetrics.

A bank's securities portfolio plays an important role in achieving its financial performance objectives. According to one survey, banks' objectives in managing securities portfolios include the following, listed in order of importance:[33]

- **To manage overall interest rate risk of the balance sheet.** In contrast to business, consumer, and mortgage loans, bank-held securities are negotiable instruments trading in generally liquid markets that can be bought and sold quickly. Therefore, securities are the natural adjustment mechanism for interest rate risk. For example, if the duration of equity is higher than desired, a bank can shorten it by shortening the maturity of its securities portfolio.
- **To manage liquidity.** Banks use their securities portfolios to assure adequate cash is available to them. The rationale for selling securities to meet liquidity needs is again the ready marketability of securities.

31 Earning assets include all assets that generate explicit interest income (plus lease receipts) but exclude discount instruments such as acceptances.
32 The change in the market value of net worth for an interest rate shock is approximately equal to the leverage-adjusted duration gap times the size of the bank (measured by A) times the size of the interest rate shock. Bankers also use other gap concepts in measuring interest rate risk. See Koch and MacDonald (2003).
33 BAI Foundation (1995).

- **To produce income.** Banks' securities portfolios frequently account for a quarter or more of total revenue.
- **To manage credit risk.** The securities portfolio is used to modify and diversify the overall credit risk exposure to a desired level. Banks frequently assume substantial credit risk in their loan portfolios; they can balance that risk by assuming minimal credit risk in their securities portfolio. Additionally, they can use the securities portfolio to diversify risk when the loan portfolio is not adequately diversified.

Banks also use their securities portfolios to meet other needs. For example, in the United States, banks must hold (pledge) government securities against the uninsured portion of deposits (an example of a **pledging requirement**—i.e., a required collateral use of assets).

Just as a bank's liabilities are interest-rate sensitive (as is its loan portfolio, on the asset side), a bank's security portfolios consist almost exclusively of fixed-income securities. This characteristic, as well as the bias toward low-credit risk holdings, is reinforced by regulatory constraints on securities holdings. Exhibit 9 gives the average asset class weights of US commercial banks' securities portfolios (because of rounding weights they do not sum to exactly 100). We note that Exhibit 9 does not show off-balance-sheet derivatives used to manage interest rate and credit risk.

The major trend in banks' securities holdings during the last 10 years or more has been the decline in holdings of tax-exempt bonds and the increase in holdings of mortgage-backed securities, which are included under corporate securities in Exhibit 9.

Exhibit 9 US Commercial Banks: Investment Securities Weights (Trading Account Not Included): Year-End 2009

Asset Class	All Commercial Banks (%)
US Treasury securities	3
US government agency and corporate securities	51.4
Municipal securities	6.5
Asset-backed securities	6.6
Other domestic debt securities	21.1
Non-US debt securities	9.2
Equities	0.9

Source: 2011 *Financial Services Fact Book.*

5.1.1 *Risk Objectives*

As already emphasized, banks' risk objectives are dominated by ALM considerations that focus on funding liabilities. Therefore, risk relative to liabilities, rather than absolute risk, is of primary concern. Although banks would like to earn high interest margins, they must not assume a level of risk that jeopardizes their ability to meet their liabilities to depositors and other entities. Overall, banks have below-average risk tolerance as concerns the securities portfolio.

5.1.2 *Return Objectives*

A bank's return objectives for its securities portfolio are driven by the need to earn a positive return on invested capital. For the interest-income part of return, the portfolio manager pursues this objective by attempting to earn a positive spread over the cost of funds.

5.1.3 *Liquidity Requirements*

A bank's liquidity position is a key management and regulatory concern. Liquidity requirements are determined by net outflows of deposits, if any, as well as demand for loans.

5.1.4 *Time Horizon*

A bank's time horizon for its securities portfolio reflects its need to manage interest rate risk while earning a positive return on invested capital. A bank's liability structure typically reflects an overall shorter maturity than its loan portfolio, placing a risk management constraint on the time horizon length for its securities portfolio. This time horizon generally falls in the three- to seven-year range (intermediate term).

5.1.5 *Tax Concerns*

Banks' securities portfolios are fully taxable. In the United States prior to 1983, the full amount of interest used to finance the purchase of tax-exempt securities was tax deductible, and banks were major buyers of municipal bonds. Since 1986, such deductions have been completely disallowed for the purchase of most municipal bonds, and US banks' portfolios have been concentrated in taxable securities. In the United States since 1983 securities gains and losses affect net operating income. Thus realized securities losses decrease reported operating income, while securities gains increase reported operating income. According to some observers, this accounting treatment creates an incentive not to sell securities showing unrealized losses, providing a mechanism by which earnings can be managed.

5.1.6 *Legal and Regulatory Factors*

Regulations place restrictions on banks' holdings of common shares and below-investment-grade risk fixed-income securities. To meet legal reserve and pledging requirements banks may need to hold substantial amounts of short-term government securities. Risk-based capital (RBC) regulations are a major regulatory development worldwide affecting banks' risk-taking incentives. RBC requirements restrain bank risk-taking by linking the formula for required capital to the credit risk of the bank's assets, both on and off balance sheet. To illustrate this type of regulation, following the Basel Accord, in 1993 bank assets were placed in one of four risk categories involving risk weights of 0%, 20%, 50%, and 100%, respectively.[34] A risk weight of 100, for example, applied to most bank loans. That weight means that 100 percent of the loan is subject to the baseline minimum 8 percent capital requirement. Under Basel II, implemented in 2008, banks placed assets in risk-exposure categories involving weights of 0%, 20%, 50%, 100%, and 150%, respectively. In contrast to the original Basel Accord, Basel II accounted for credit-quality differences within a given security type. Basel III, agreed upon in 2010-11, further strengthened bank capital requirements and introduced new regulatory requirements on bank liquidity and leverage.

34 The Basel Accord, sponsored by the Bank for International Settlements, applies to the banks of a group of major industrialized countries.

5.1.7 *Unique Circumstances*

There are no common unique circumstances to highlight relative to banks' securities investment activities. That situation stands in contrast to banks' lending activities, in which banks may consider factors such as historical banking relationships and community needs, which may be viewed as unique circumstances.

Example 16 excerpts the investment policy statement of a hypothetical small commercial bank. We incorporated this reading's investment objectives and constraints framework in its format, and we included a section on authorized investments that typically is found in such documents. The IPS excerpts cover many of the major topics that would be included in an IPS for a typical US commercial bank (referred to as the "Bank").

EXAMPLE 16

Investment Policy Statement for a Commercial Bank

A. Purpose

The purpose of the investment policy statement (IPS) is to set forth the policies and procedures that govern the administration of all the Bank's investment activities. The Bank's Money Market Account is subject to additional constraints set forth in a later section of the IPS.

B. Responsibility

The Bank's Board of Directors (the "Board") is responsible for formulating and implementing investment policies. The Board delegates authority for making specific investments to the Bank's officers ("Management") designated in Exhibit A attached to this IPS, for investments consistent with this IPS. The Board also appoints an Investment Committee (the "Committee") to act as a liaison between the Board and Management and to carry out the following functions:

1. Monitor and review all investment decisions for compliance with the IPS and with federal and state regulations.
2. Review the IPS and recommend changes to it to the Board when appropriate.

C. Investment Objectives and Constraints

The primary purposes of the investment portfolio are to provide liquidity and to control the overall interest rate and credit risk exposures of the Bank. The portfolio will convert excess cash resulting from net deposit inflows and/or slack loan demand into earning assets. The portfolio will be drawn down when needed to meet net deposit outflows, loan demand, or other contingencies.

Return Requirements

The Bank will attempt to earn an average positive spread over the cost of funds.

Risk Objectives

- Because of the need to be able to satisfy depositor and other liabilities at short notice and taking account of the typical characteristics of its loan portfolio, the Bank's tolerance for interest rate, credit, and liquidity risk in its securities portfolio is below average.
- The yield on investments is secondary to liquidity and safety of principal.
- To limit the risk of loss as a result of an individual issuer default, the Bank will maintain adequate diversification in its holdings.

Tax

As a taxable corporation the Bank will appraise taxable and tax-exempt investments on an after-tax basis.

Regulatory

All investments must qualify under state and federal banking regulations governing the investment activities of the Bank.

Unique Circumstances

None.

D. Authorized Investments

The following investments are legally permitted by Federal Regulations and authorized by the Board.

1. US Treasury securities
2. US government agency and agency-guaranteed securities
3. Certificates of deposit and bankers acceptances
   - **a** Insured CDs. Negotiable and nonnegotiable CDs of any domestic commercial bank or savings and loan association may be purchased.
   - **b** Uninsured CDs. Investment in excess of $250,000 in the CDs of a single domestic bank may be made only in those banks shown on the Approved List (Exhibit B).
   - **c** Eurodollar CDs. Investments may be made only in such CDs issued by banks on the Approved List.
   - **d** Yankee CDs. Investments may be made only in such CDs issued by banks on the Approved List.
   - **e** Banker's acceptances. Investments are limited to accepting banks on the Approved List.
   - **f** Federal funds sold. Sales of federal funds may be made only to those institutions on the Approved List.
   - **g** Repurchase agreements (repos).
     - **i.** The term shall not exceed 30 days, although a continuous agreement (remaining in effect until cancelled) is allowed.
     - **ii.** The securities acceptable for purchase under a repo are those issued by the US Treasury and agencies of the US government.
     - **iii.** The institutions with which repos may be made are limited to those on the Approved List.
   - **h** Reverse repurchase agreements (reverse repos). Reverse repos may be used so long as no more than 40 percent of the funds so obtained are used to purchase additional securities.

E. Maturity of Investments

To control the risk of loss resulting from an increase in the level of interest rates, Management is restricted to investments that mature within five years. This restriction does not apply to securities repurchased under the provisions of a repurchase agreement.

F. Diversification Requirements

1 US Treasury and agency securities. These may be held in unlimited quantities.

2 Securities not guaranteed by the US Government, its agencies, or instrumentalities are subject to an overall maximum 10% commitment at cost.

G. Unauthorized Transactions

1 Short sales.

2 Adjusted Trades. The Bank may not hide an investment loss by an adjusted trade—that is, selling a security at a fictitiously high price to a dealer and simultaneously buying another overpriced security from the same dealer.

[Exhibits and other sections omitted.]

5.2 Other Institutional Investors: Investment Intermediaries

As we define the term, institutional investors are financial intermediaries in various legal forms with relatively large amounts of money to invest. The institutional investors previously discussed in this reading (pension plans, foundations, endowments, insurance companies, and banks) have well-defined purposes besides investing. Banks take deposits and make loans, for example; pension plans have the specific purpose of providing retirement income.

Investment companies constitute another type of institutional investor that is important in financial markets. Investment companies include such investment vehicles as mutual funds (open-end investment companies), closed-end funds (closed-end investment companies), unit trusts, and exchange-traded funds. All these vehicles represent pooled investor funds invested in equity and fixed-income markets. Investment companies are pure investment vehicles in the sense that they have no other corporate purpose besides investing. We might aptly call them investment intermediaries. Each investment company selects its specific investment objectives and describes objectives, constraints, and costs in legally prescribed formats (e.g., a prospectus) and draws in funds from investors who are attracted to it for various portfolio purposes. Commodity pools serve similar purposes, but in futures rather than equity and fixed-income markets. Hedge funds are another type of investment vehicle that falls under the rubric of institutional investors. Hedge funds differ from investment companies in that they market to other institutional investors and to high-net-worth individuals exclusively; in addition, they are subject to fewer regulations.

One cannot generally characterize the investment objectives and constraints of a given type of investment intermediary with the expectation that it will apply to all members of the group. Mutual funds, for example, cover the range of equity and fixed-income investment styles; one cannot characterize the return requirement and risk tolerance of "a mutual fund" in general, as we have done for other institutional investors such as life insurers. Readers who may be involved in managing equity or fixed-income mutual funds will find relevant guidance in the readings on equity portfolio management and fixed-income portfolio management, respectively.

Nonfinancial corporations (i.e., businesses), although not financial intermediaries, are major investors in **money markets** (markets for fixed-income securities with maturities of one year or less) to manage their cash positions. "Cash," of course, includes "liquid cash" such as funds held in demand deposits and very short-term money market securities, and "long-term" or "core" cash, which is invested in longer-term

money market instruments. These investments are part of the corporate function of cash management, which typically falls under the responsibilities of an organization's corporate treasurer. For most companies, liquidity and safety of principal are paramount investment considerations in cash management. Companies with very large cash positions will actively manage the composition of the cash position relative to anticipated cash needs (including seasonal needs), nondomestic currency needs, and tax concerns. Cash management is an important function for all the institutional investors previously discussed as well as for governmental units.[35]

SUMMARY

This reading has described the investment contexts in which institutional investors operate. Our chief focus has been the development of an investment policy statement for defined-benefit pension plans, defined-contribution pension plans, endowments, foundations, life insurance companies, non-life insurance companies, and banks. We have discussed the specific considerations that enter into the development of appropriate return and risk objectives. We then addressed liquidity requirements, time horizon, tax concerns, legal and regulatory factors, and unique circumstances.

- The two major types of pension plan are defined-benefit (DB) plans and defined-contribution (DC) plans. A defined-benefit plan specifies the plan sponsor's obligations in terms of the benefit to plan participants. In contrast, a defined-contribution plan specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to participants.
- DB pension assets fund the payment of pension benefits (liabilities). The investment performance of a DB plan should be judged relative to its adequacy in funding liabilities even if it is also judged on an absolute basis. The funded status of a DB plan is the relationship of the plan assets to the present value of plan liabilities, and is usually measured with respect to the projected benefit obligation (PBO) definition of plan liabilities.
- In setting a risk objective, DB plan sponsors need to consider plan funded status, sponsor financial status and profitability, sponsor and pension fund common risk exposures, plan features (such as provision for lump-sum distributions), and workforce characteristics.
- A DB pension plan's broad return objective is to achieve returns that adequately fund its pension liabilities on an inflation-adjusted basis. An appropriate return requirement for a fully funded plan is the discount rate applied to pension liabilities. The pension fund's stated return desire may be higher and may reflect considerations relating to reducing pension contributions or increasing pension income.
- For DB plans, liquidity requirements relate to the number of retired lives, the size of contributions in relation to disbursements, and plan features. Factors affecting the time horizon length include whether the plan is a going concern, the age of the workforce, and the proportion of retired lives.
- Defined-contribution plans fall into two types: those in which the plan sponsor sets investment policy, and those in which the plan participants individually set policy. The investment process for the sponsor-directed plans is a simpler version of the process for DB plans.

35 See Kallberg and Parkinson (1993) for more on cash management.

- For participant-directed DC plans, the principal issues are offering participants sufficient investment choices and avoiding inadequate diversification because of holdings of the sponsor company's stock.
- Hybrid pension plans combine features of DB and DC plans. A cash balance plan is a hybrid plan in which the promised benefit is shown as a balance in a participant-individualized statement. Another important type of hybrid plan is the Employee Stock Ownership Plan (ESOP), a type of DC plan entirely or primarily invested in the employer's stock.
- Foundations are grant-making institutions. Private foundations are typically subject to a payout requirement that specifies a minimum level of spending. Endowments are generally not subject to a legal spending requirement. Endowments typically provide vital support of ongoing operations and programs of institutions such as universities, hospitals, museums, and religious organizations.
- The return objective for most foundations (and endowments) can be stated as the sum of the annual spending rate, the cost of generating returns (managing assets), and the expected inflation rate. A multiplicative formulation of the components is more precise than an additive one in specifying the return level that should allow the foundation or endowment to preserve the inflation-adjusted value of assets over many periods.
- A foundation's investment policy can often be more risk tolerant than the investment policy of DB plans because foundation assets need not be managed with respect to a stream of legal liabilities, in general. Endowment risk tolerance often depends on the importance of the endowment to the supported institution's operating budget as reflected in the spending rate, and the use of a smoothing rule for spending, which dampens the portfolio's sensitivity to short-run volatility.
- A foundation or endowment's liquidity requirements come from both anticipated and unanticipated cash needs in excess of contributions received. Anticipated needs are captured in the periodic distributions prescribed by a foundation's or endowment's spending rate. Generally time horizons are long. A variety of legal and regulatory issues can affect a foundation or endowment's investment activities.
- Insurance companies play a role in absorbing personal and business risks. Insurers are broadly divided into life insurers and non-life insurers (casualty insurers); the two groups have distinct investment concerns.
- Historically, return requirements for life insurers have been tied to the interest rates used by actuaries to determine policyholder reserves or accumulation rates for the funds being held by a company for future disbursement. Actual return objectives have been less clearly defined but may relate to an interest rate spread concerning liabilities.
- Insurers have moved towards segmenting their portfolios in relation to associated liabilities and setting return objectives by major line of business. The result is that a single company's investment policy may incorporate multiple return objectives. Furthermore, many companies have established separate investment policies, and strategies, for each segment of their portfolios.
- Because of public policy concerns related to payment of insurance benefits, insurer portfolios are viewed as quasi-trust funds from a public policy perspective. As a result, conservative fiduciary principles limit the risk tolerance of both life and non-life insurers.

- As one consequence of the need for managing risk with respect to their contractual liabilities, insurers use a variety of asset/liability management techniques.
- Life insurance companies have valuation concerns (related to prescribed valuation reserves), reinvestment risk, credit risk, and cash flow volatility.
- The liquidity concerns associated with disintermediation of cash value policies, asset/liability mismatch, and asset marketability risk have increased insurers' traditionally relatively minimal liquidity requirements.
- Life insurers have been viewed as the classic long-term investor. As a result of portfolio segmentation, life insurers may establish relatively shorter time horizons for some portfolio segments (e.g., group annuities).
- As a regulated industry, life insurers face many regulatory and legal constraints including those relating to eligible investments, the prudent investor rule, and valuation methods.
- In contrast to life insurers, non-life insurers typically have shorter-term liabilities. The underwriting (profitability) cycle may require non-life insurers to liquidate investments to supplement cash flow shortfalls. For both of these reasons, non-life insurers have much shorter investment time horizons than do life insurers.
- Return requirements reflect competitive pricing policy, profitability concerns, and the requirement for a growing surplus to support the writing of new business.
- A bank's portfolio investments are a residual use of funds after loan demand has been met. The portfolio's overall objectives are to manage the interest rate risk of the balance sheet, manage liquidity, produce income, and manage credit risk. The bank's return objective is to earn a positive spread over the cost of funds. Banks typically have below-average risk tolerance, and liquidity is a key concern. Bank investment is subject to a range of legal and regulatory factors.
- Investment companies such as mutual funds as well as commodity pools and hedge funds are institutional investors that function as investment intermediaries. In contrast to other types of institutional investors, one cannot generalize about the investment objectives and constraints of these types of investors.
- Among institutional investors, ALM considerations are particularly important for DB pension funds, insurance companies, and banks.

PRACTICE PROBLEMS

1 ***Worden Technology, Inc.***

Based in London, Worden Technology, Inc. is an established company with operations in North America, Japan, and several European countries. The firm has £16 billion in total assets and offers its employees a defined-benefit pension plan.

Worden's pension plan currently has assets of £8.88 billion and liabilities of £9.85 billion. The plan's goals include achieving a minimum expected return of 8.4 percent with expected standard deviation of return no greater than 16.0 percent. Next month, Worden will reduce the retirement age requirement for full benefits from 60 years to 55 years. The median age of Worden Technology's workforce is 49 years.

Angus Williamson, CFA, manages the pension plan's investment policy and strategic asset allocation decisions. He has heard an ongoing debate within Worden Technology about the pension plan's investment policy statement. Exhibit 1 compares two IPSs under consideration.

Exhibit 1 Investment Policy Statements

	IPS X	IPS Y
Return requirement	Plan's objective is to outperform the relevant benchmark return by a substantial margin.	Plan's objective is to match relevant benchmark return.
Risk tolerance	Plan has a high risk tolerance because of the long-term nature of the plan and its liabilities.	Plan has a low risk tolerance because of its limited ability to assume substantial risk.
Time horizon	Plan has a very long time horizon because of its infinite life.	Plan has a shorter time horizon than in the past because of plan demographics.
Liquidity requirement[a]	Plan has moderate liquidity needs to fund monthly benefit payments.	Plan has minimal liquidity needs.

[a] Assume Worden will not contribute to its pension plan over the next several years.

Identify which investment policy statement, X or Y, contains the appropriate language for each of the following components of Worden Technology's pension plan:

i. Return requirement.

ii. Risk tolerance.

iii. Time horizon.

iv. Liquidity.

Practice Problems and Solutions: *Managing Investment Portfolios: A Dynamic Process*, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

Justify your choice in each instance.

2 ***LightSpeed Connections***

Hugh Donovan is chief financial officer of LightSpeed Connections (LSC), a rapidly growing US technology company with a traditional defined-benefit pension plan. Because of LSC's young workforce, Donovan believes the pension plan has no liquidity needs and can thus invest aggressively to maximize returns. He also believes that US Treasury bills and bonds, yielding 5.4 percent and 6.1 percent, respectively, have no place in a portfolio with such a long time horizon. His strategy, which has produced excellent returns for the past two years, has been to invest the portfolio as follows:

- 50 percent in a concentrated pool (15 to 20 stocks) of initial public offerings in technology and Internet companies, managed internally by Donovan;
- 25 percent in a small-capitalization growth fund;
- 10 percent in a venture capital fund;
- 10 percent in an S&P 500 index fund; and
- 5 percent in an international equity fund.

Working with LSC's Investment Committee, the firm's president, Eileen Jeffries, has produced a formal investment policy statement, which reads as follows:

> "The LSC Pension Plan's return objective should focus on real total returns that will fund its long-term obligations on an inflation-adjusted basis. The "time-to-maturity" of the corporate workforce is a key element for any defined pension plan; given our young workforce, LSC's Plan has a long investment horizon and more time available for wealth compounding to occur. Therefore, the Plan can pursue an aggressive investment strategy and focus on the higher return potential of capital growth. Under present US tax laws, pension portfolio income and capital gains are not taxed. The portfolio should focus primarily on investments in businesses directly related to our main business to leverage our knowledge base."

A Evaluate Donovan's investment strategy with respect to its effect on each of the following:

i. LSC's pension plan beneficiaries.

ii. Managing pension assets in relation to LSC's corporate strength.

B Evaluate LSC's investment policy statement in the context of the following:

i. Return requirement.

ii. Risk tolerance.

iii. Time horizon.

iv. Liquidity.

3 ***Gwartney International***

US-based Gwartney International (GI) is a financially healthy, rapidly growing import/export company with a young workforce. Information regarding GI's defined-benefit pension plan (which is subject to ERISA) appears in Exhibits 2 and 3.

Exhibit 2

Asset Class	Actual and Target Allocation (%)	Prior-Year Total Return (%)
Large-capitalization US equities	35	10.0
Small-capitalization US equities	10	12.0
International equities	5	7.0
Total equities	50	
US Treasury bills (1-year duration)	10	4.5
US intermediate-term bonds and mortgage-backed securities (4-year duration)	17	1.0
US long-term bonds (10-year duration)	23	19.0[a]
Total fixed income	50	
Total	100	10.0

[a] Income element 7.0%; price gain element 12.0%.

Exhibit 3

Present value of plan liabilities	$298 million
Market value of plan assets	$300 million
Surplus	$2 million
Duration of liabilities	10 years
Actuarial return assumption	7.0%
GI board's long-term total return objective	9.0%

In accordance with GI policy, the plan discounts its liabilities at the market interest rate for bonds of the same duration. GI's risk objectives include a limitation on volatility of surplus.

Giselle Engle, the newly appointed chief financial officer, must explain to the board of directors why the surplus declined in a year when the actual investment return was 100 basis points more than the long-term objective stated by the board.

A Explain how the plan surplus could decline in a given year despite an actual return in excess of the long-term return objective.

B Explain the importance of an appropriate investment time horizon when setting investment policy for GI's corporate pension plan.

C Discuss the risk tolerance of GI's corporate pension plan.

4 ***Food Processors, Inc.***

Food Processors, Inc. (FPI) is a mature US company with declining earnings and a weak balance sheet. Its defined-benefit pension plan (which is subject to ERISA) has total assets of $750 million. The plan is underfunded by $200 million by US standards—a cause for concern by shareholders, management, and the board of directors.

The average age of plan participants is 45 years. FPI's annual contribution to the plan and the earnings on its assets are sufficient to meet pension payments to present retirees. The pension portfolio's holdings are equally divided between large-capitalization US equities and high-quality, long-maturity US corporate bonds. For the purpose of determining FPI's contribution to the pension plan, the assumed long-term rate of return on plan assets is 9 percent per year; the discount rate applied to determine the present value of plan liabilities, all of which are US-based, is 8 percent. As FPI's Treasurer, you are responsible for oversight of the plan's investments and managers and for liaison with the board's Pension Investment Committee.

At the committee's last meeting, its chair observed that US stocks had relatively poor performance over the past decade. He then made a pointed comment: "Given this experience, and as there is a tendency for returns to revert to the mean, we seem to be overly conservative in using only a 9 percent future return assumption. Why don't we raise the rate to 10 percent? This would be consistent with the expectation of subsequent higher returns, would help our earnings, and should make the stockholders feel a lot better."

You have been directed to examine the situation and prepare a recommendation for next week's committee meeting. Your assistant has provided you with the background information shown in Exhibit 4.

Exhibit 4 Capital Markets Data

Asset Class	Total Return 1926–2010 (%)	Total Return 2001–2010 (%)	Annualized Monthly Standard Deviation 2001–2010 (%)	Consensus Forecast Total Return 2001–2010 (%)
US Treasury bills	3.6	2.2	0.2	2.5
Intermediate-term Treasury bonds	5.4	5.6	5.4	5.0
Long-term Treasury bonds	5.5	6.6	13.5	6.0
US corporate bonds (AAA rated)	5.9	7.6	12.9	6.0
US common stocks (S&P 500)	9.9	1.4	16.9	8.5
US inflation rate (annual rate)	3.0	2.3	1.6	3.0

Source for Data: Ibbotson SBBI 2011 Classic Yearbook

Assume that consensus forecast total returns for bonds are at least approximately equal to the bonds' yields.

A Explain what is meant when a pension plan is said to be "underfunded" and use FPI to illustrate.

B Discuss the risk–return dilemma that FPI faces.

C Explain a rationale for reducing the discount rate for determining the PV of plan liabilities from its current level of 8 percent.

D Explain how the underfunded condition of FPI's plan would be affected if the discount rate were reduced to 7 percent from the current 8 percent.

5 ***Medical Research Foundation***

The Medical Research Foundation (MRF), based in the United States, was established to provide grants in perpetuity. MRF has just received word that the foundation will receive a $45 million cash gift three months from now. The gift will greatly increase the size of the foundation's endowment from its current $10 million. The foundation's grant-making (spending) policy has been to pay out virtually all of its annual net investment income. Because its investment approach has been conservative, the endowment portfolio now consists almost entirely of fixed-income assets. The finance committee understands that these actions are causing the real value of foundation assets and the real value of future grants to decline because of inflation effects. Until now, the finance committee believed it had no alternative to these actions, given the large immediate cash needs of the research programs being funded and the small size of the foundation's capital base. The foundation's annual grants must at least equal 5 percent of its assets' market value to maintain MRF's US tax-exempt status, a requirement that is expected to continue indefinitely. The foundation anticipates no additional gifts or fundraising activity for the foreseeable future.

Given the change in circumstances that the cash gift will make, the finance committee wishes to develop new grant-making and investment policies. Annual spending must at least meet the 5 percent of market value requirement, but the committee is unsure how much higher spending can or should be. The committee wants to pay out as much as possible because of the critical nature of the research being funded; however, it understands that preserving the real value of the foundation's assets is equally important in order to preserve its future grant-making capabilities. You have been asked to assist the committee in developing appropriate policies.

A Identify and discuss the three key elements that should determine the foundation's grant-making (spending) policy.

B Formulate and justify an investment policy statement for the foundation.

6 ***James Children's Hospital***

The James Children's Hospital (JCH), based in Washington, DC, has an operating budget of $15 million and has been operating at a budget surplus for the last two years. JCH has a $20 million endowment (JCHE) whose sole purpose is to provide capital equipment for the hospital. The endowment's long-term expected total return is 8.6%, which includes a 3.3% income component. JCHE has no minimum payout requirement and expects no future contributions. Traditionally, the JCHE board of directors has determined the annual payout based on current needs. Payouts have been rising steadily—to $1,375,000 two years ago and to $1,400,000 last year.

Michelle Parker, chief financial officer of JCHE, has asked the board's guidance in establishing a long-term spending policy for JCHE. She has received $1,600,000 in requests to buy equipment and is concerned about the inflation rate for medical equipment prices, which is 4%, versus 2.5% for the US Consumer Price Index.

A Discuss the implications of the current pressure on JCHE to increase spending.

B Discuss how JCHE's time horizon affects its risk tolerance.

C Determine a long-term spending policy for JCHE, including a spending rate as a percentage of assets, and justify the policy.

7 ***Donner Life Insurance***

Susan Leighton, treasurer for US-based Donner Life Insurance, has just joined the board of a charitable organization that has a large endowment portfolio. She is researching how the investment policy for an endowment differs from that of life insurance companies and has thus far reached the following conclusions:

A Both endowments and life insurance companies have aggressive return requirements.

B Endowments are less willing to assume risk than life insurance companies because of donor concerns about volatility and loss of principal.

C Endowments are less able to assume risk than life insurance companies because of expectations that endowments should provide stable funding for charitable operations.

D Endowments have lower liquidity requirements than life insurance companies because endowment spending needs are met through a combination of current income and capital appreciation.

E Both endowments and life insurance companies are subject to stringent legal and regulatory oversight.

Evaluate each of Leighton's statements in terms of accuracy and justify your conclusions.

8 ***Hannibal Insurance Company***

US-based Hannibal Insurance Company sells life insurance, annuities, and guaranteed investment contracts (GICs) and other protection-based and savings-based products. The company has traditionally managed its investments as a single portfolio, neither segmenting the assets nor segregating the surplus. The following data describe the portfolio:

Exhibit 5 Hannibal Insurance Portfolio Data

	Four Years Ago	Last Year
Assets (reserves and surplus portfolio)	$450 million	$500 million
Duration of assets	6.0 years	6.0 years
Liabilities	$390 million	$470 million
Estimated duration of liabilities	5.5 years	4.0 years

The company attributes the decline in the duration of its liabilities to increases in interest rates and the passage of time.

Hannibal's chief financial officer (CFO) has instructed the portfolio manager as follows: "The rapidly increasing popularity of our two-year fixed rate GIC product has increased our asset base substantially during the last year. Interest rates have been rising and will probably rise another 100 basis points this year. You should continue to take advantage of this situation by investing in higher-yielding, investment-grade, longer-duration bonds in order to maximize our spread and maintain a constant duration of the assets. This strategy will ensure the delivery of a competitive return to our customers."

A Judge the appropriateness of Hannibal's investment strategy as stated by the CFO. Prepare two arguments that support your position.

B Evaluate two factors that would affect liability duration for a life insurance company other than changes in interest rates and the passage of time. Relate the two factors to the specific situation at Hannibal. Assume stable mortality rates.

C Determine the suitability of the segmentation approach to portfolio management at Hannibal Insurance Company. Prepare three arguments that support your position.

D Contrast the return requirement of the surplus portfolio to the return requirement of policyholder reserves, in regard to US life insurance companies in general.

9 ***Winthrop Bank***

Winthrop Bank is a commercial bank with operations in North America. Evaluate the effect of each of the following scenarios on the bank's investment objectives, constraints, or risk-taking ability.

A The target average maturity of loans is increased, with overall risk tolerance unchanged.

B The ALCO decides to increase Winthrop Bank's credit standards for loans although Winthrop Bank's overall risk tolerance is unchanged.

C Winthrop decides to sell its mortgage loans as soon as they are booked.

D More opportunities exist for expanding net interest margins with low risk in Winthrop's loan portfolio than in its securities portfolio.

SOLUTIONS

1 ***Worden Technology, Inc.***

IPS Y and IPS X offer different components that are appropriate for Worden Technology's pension plan:

i. *Return requirement.* IPS Y has the appropriate return requirement for Worden's pension plan. Because the plan is currently underfunded, the manager's primary objective should be to make it financially stronger. The risk inherent in attempting to maximize total returns would be inappropriate.

ii. *Risk tolerance.* IPS Y has the appropriate risk tolerance for Worden's plan. Because of its underfunded status, the plan has a limited risk tolerance; a substantial loss in the fund could further jeopardize payments to beneficiaries.

iii. *Time horizon.* IPS Y has the appropriate time horizon for Worden's plan. Although going-concern pension plans usually have long time horizons, the Worden plan has a comparatively short time horizon because of the company's reduced retirement age and relatively high median age of its workforce.

iv. *Liquidity.* IPS X has the appropriate liquidity constraint for Worden's plan. Because of the early retirement feature starting next month and the age of the workforce (which indicates an increasing number of retirees in the near future), the plan needs a moderate level of liquidity to fund monthly payments.

2 ***LightSpeed Connections***

A **i.** Concentrating LSC's pension assets as Donovan has done subjects the plan beneficiaries to an extraordinarily high level of risk because of the high correlation between the market values of the portfolio and LSC's business results.

ii. By concentrating the pension assets heavily in technology and Internet companies, Donovan has increased the company's risk as the pension plan's sponsor. LightSpeed now faces the prospect of having to provide additional funding to the pension plan at a time when the company's own cash flow and/or earnings position may be weakened. A more prudent approach would be to invest in assets expected to be less highly correlated with the company's market value, so in the event additional funding for the pension plan becomes necessary, it will be less likely to occur when LSC is in a weakened financial position.

B **i.** The IPS drafted by Jeffries and the investment committee correctly identifies that the return requirement should be total return, with a need for inflation protection that is sufficient to fund the plan's long-term obligations. The IPS is weak in that it neglects to state a specific return requirement.

ii. The IPS fails to address the pension plan's risk tolerance, one of the two main objectives of a complete investment policy statement. Consequently, the IPS does not provide the guidance on risk tolerance that would highlight the potential risk to the beneficiaries and the company of LSC's current aggressive investment strategy.

iii. The IPS correctly addresses the time horizon constraint by stating that the assets are long-term in nature, both because of LSC's young workforce and the normal long-term nature of pension investing.

iv. The IPS fails to address the liquidity constraint; although liquidity is a minimal concern in this case, the IPS should nonetheless address that fact.

3 ***Gwartney International***

A The amount of surplus will decline when the present value of plan liabilities rises faster than the market value of the assets. According to the information provided, GI's liabilities have a duration of 10 years, the same as US long-term bonds which returned a total of 19% for the previous year (7% income, 12% from capital gains associated with a decline in interest rates for the period). The decline in interest rates for long-term bonds translates into a lower discount rate for the plan's liabilities. The 12% gain in bonds implies that the plan's liabilities would have increased by the same amount. The combination of a 12% gain in liabilities and a 10% return on assets resulted in a decrease in the pension plan's surplus.

B Investment time horizon is a primary determinant of an investor's risk tolerance. GI has a young workforce with many years until retirement, indicating a long time horizon. GI should thus adopt a long investment horizon, allowing investment in higher-risk, higher-expected-return asset classes.

C The plan's risk tolerance embodies the plan sponsor's ability and willingness to absorb the consequences of adverse investment outcomes and/or prolonged subpar investment performance (i.e., its sensitivity to the possibility of being required to increase contributions at unpredictable times and intervals). The less risk an investor can tolerate, the less return will be achieved in the long run.

GI is financially healthy and growing. Given its financial health, the company has the ability to increase contributions when necessary. Because of GI's young workforce, the pension plan has a long time horizon, allowing for investment in riskier assets. The plan is also currently fully funded, and GI is financially strong. All these considerations point to GI having an above-average risk tolerance.

4 ***Food Processors, Inc. (FPI)***

A In the United States, every ERISA-qualified defined-benefit pension plan has a projected benefit obligation, which represents the discounted present value of the retirement benefits that the plan is obligated by law to make, given certain assumptions about future rates of pay and workforce factors. If the plan assets at fair market value exceed the PBO, the plan is said to be overfunded. Conversely, if the value of the plan assets falls short of the PBO, the plan is said to be underfunded. Given that FPI's plan is underfunded by $200 million and its assets total $750 million, its PBO must be $950 million.

B FPI faces a dilemma. On the one hand, it needs to improve returns in order to "catch up" on its underfunding; this necessity implies that more risk should be taken. On the other hand, FPI cannot afford to have the underfunding become worse, which it would if FPI incurs more risk that does not produce higher returns in the short run. Alternatively, the company might be tempted, as the chair suggests, to raise the actuarial assumption of what future return levels will be, thereby making the asset base automatically more productive simply by declaring it to be so. Future returns, however, are generated not by actuaries or other individuals but by markets, by asset-class exposures within markets, and by long-term relationships between economic and market factors—all taking place in the context of funding, allocation, and payout decisions unique to FPI's pension plan.

Of primary importance is that the return expected must be consistent with the return the various alternative investment instruments available to the plan can reasonably offer in the long term.

C A US pension plan's discount rate is the rate applied in determining the present value of its pension obligations. Because pension liabilities are typically long term, the discount rate should bear some rational relationship to the long-term interest rates in the marketplace at the time of the calculation. The usual model for the discount rate is the rate at which high-quality, long-term bonds such as the long Treasury bond are quoted, reflecting consensus expectations of long-run inflation plus a real rate of return. Thus, a manager may decide to reduce the discount rate to make it consistent with current market yields for long-term Treasury bonds. Based on the consensus forecasts for long-term Treasury bonds and inflation shown in Exhibit 4, a discount rate of 6 to 7 percent would be reasonable. FPI is currently using an 8 percent discount rate, which is out of line with current capital market conditions. FPI should thus consider adopting a lower discount rate.

D Reducing the discount rate applied to FPI's PBO would have the effect of increasing the present value of FPI's pension benefit obligations. Because the market value of the assets available to liquidate this obligation remains unchanged, the underfunded situation would be made worse by a reduction in the discount rate. The size of the gap between the PBO and the value of the assets, now $200 million, would increase.

5 ***Medical Research Foundation***

A Key elements that should determine the foundation's grant-making (spending) policy are as follows:

- average expected inflation over a long horizon;
- average expected nominal return on the endowment portfolio over the same long horizon; and
- the 5 percent of asset value payout requirement imposed by the tax authorities as a condition for ongoing tax exemption.

To preserve the real value of its assets and to maintain its spending in real terms, the foundation cannot pay out more, on average over time, than the average real return it earns from its portfolio net of investment management expenses. The portion of the total return representing the inflation rate must be retained and reinvested if the foundation's principal is to grow with inflation. Because of the minimum 5 percent spending policy mandated by tax considerations, the real return of the portfolio will have to equal or exceed 5 percent plus the cost of earning investment returns in order to preserve the foundation's tax-exempt status and maintain its real value of principal and future payouts.

B The new IPS should include the following components:

- *Return objective.* A total return approach is recommended to meet the foundation's objective of maintaining real value after grants. The required annual return shall be the sum of the spending rate plus the expected inflation rate.[1]

1 This additive return objective is easy to understand; as discussed in the reading, a multiplicative return objective would be more precise.

- *Risk tolerance.* The adoption of a clear-cut spending policy will permit cash flows to be planned with some precision, adding stability to annual budgeting and reducing the need for liquidity. Based on its long time horizon, low liquidity needs, and (now) ample assets, the foundation's risk tolerance is above average.
- *Liquidity requirements.* Based on asset size and the predictable nature of cash payouts, liquidity needs are low.
- *Time horizon.* The foundation, with an unlimited lifespan, has a very long time horizon.
- *Tax considerations.* The foundation is tax-exempt under present US law as long as the annual minimum payout of 5 percent is met.
- *Legal and regulatory constraints.* The foundation is governed by the Uniform Management of Institutional Funds Act (UMIFA) as well as IRS regulations.
- *Unique circumstances.* None apply, other than those previously discussed.

6 ***James Children's Hospital (JCH)***

A The current spending request of $1,600,000 represents $1,600,000/$20,000,000 = 0.08 or 8% of the value of the endowment. This level of spending is high given the endowment's long-term expected total return of 8.6 percent per year (in nominal terms) and expected 4 percent inflation rate for medical equipment prices. If such spending is permitted, the current beneficiaries of the JCHE (for example, the patients of JCH) may receive benefits at the expense of future beneficiaries, because the endowment is unlikely to be able to maintain its value in inflation-adjusted terms.

B JCHE has a perpetual time horizon; it can thus tolerate a higher risk level (in terms of volatility of returns) than a fund with a shorter time horizon. The higher risk tolerance results from the longer period available to make up for any market downturns. With a higher risk tolerance, JCHE can target a higher expected return.

C JCHE's long-term spending policy should balance the needs of current and future beneficiaries. Its spending policy should balance income needs and the need to build the payout stream to preserve purchasing power. JCHE balances these conflicting objectives only when future beneficiaries receive the same inflation-adjusted distribution that current beneficiaries receive. With zero real growth, intergenerational neutrality exists. Because market returns are variable, JCHE should use a smoothing mechanism that will apply the spending rate to a moving average of market value:

Expected total return	8.6%
– Inflation	–4.0
Real expected return	4.6
– Spending rate	–4.6
Expected real growth	0.0%
Recommended spending rate	4.6%

7 ***Donner Life Insurance***

Leighton made both incorrect and correct statements about life insurance and endowment portfolios:

A *Both endowments and life insurance companies have aggressive return requirements* is an inaccurate statement. The return requirements of life insurance companies are first and foremost liability driven, matching assets with fixed obligations, and must be consistent with their conservative stance toward risk. Life insurance companies' return requirements also include, as an objective, the earning of a competitive return on the assets that fund surplus.

The return requirements of endowments, although subject to a range of risk tolerances, are driven by the endowment's spending rate, the need to preserve purchasing power, and the need to provide a growing financial contribution to the endowed organization.

B *Endowments are less willing to assume risk than life insurance companies because of donor concerns about volatility and loss of principal* is an inaccurate statement. Life insurance companies tend to have a lower tolerance for risk than endowments do. Confidence in a life insurance company's ability to pay its benefits (obligations) as they come due is a crucial element in the industry's financial viability. Life insurance companies thus are sensitive to the risk of any significant chance of principal loss or any significant interruption of investment income.

Endowments, by contrast, tend to have a higher tolerance for risk. Their long-term time horizons and predictable cash flows, relative to their spending rate requirements, enable them to pursue more aggressive strategies than life companies can.

C *Endowments are less able to assume risk than life insurance companies because of expectations that endowments should provide stable funding for charitable operations* is an inaccurate statement. Life insurance companies' ability to assume risk is circumscribed by their need to ensure the funding of liabilities to policyholders. The ALM focus of life insurance companies typically requires major holdings of bonds to offset the interest-sensitive nature of most life insurance liabilities. Regulations, including risk-based capital requirements, generally constrain the ability of life insurance companies to invest in higher risk assets.

In contrast, the main risk facing an endowment is loss of purchasing power over time. Endowments have very long time horizons and are not focused on funding liabilities. Therefore, endowments should be able to accept higher volatility than life insurance companies in the short term to maximize long-term total returns.

D *Endowments have lower liquidity requirements than life insurance companies because endowment spending needs are met through a combination of current income and capital appreciation* is an accurate statement. Life insurance companies face the need for liquidity as a key investment constraint, because life insurance products are promises to pay money depending on certain expected or unexpected events.

Endowments typically have low liquidity needs, except to fund periodic distributions and to cover emergency needs. Distributions are usually foreseeable and can usually be met from a combination of investment income and the sale of readily marketable securities.

E *Both endowments and life insurance companies are subject to stringent legal and regulatory oversight* is an inaccurate statement. Life insurance companies are subject to relatively rigorous legal and/or regulatory oversight with respect to their portfolio composition and investment strategies.

In contrast, endowments are relatively unburdened with legal and/or regulatory restraints, at least at the federal level in the United States, although some states do have specific rules and regulations regarding management of endowment assets.

8 ***Hannibal Insurance Company***

A The investment strategy of Hannibal Insurance Company is inappropriate, because the company is ignoring interest rate risk and the strategy threatens both the surplus and policyholder reserves.

Hannibal's investment strategy has three key negative consequences. First, the company faces major interest rate risk, as evidenced by the duration mismatch. Second, a focus on short-duration products will accelerate the mismatch. Finally, the company has not generated sufficient reserves and surplus relative to liabilities, given the risks it faces; thus it is increasing its risk of insolvency.

Given the interest rate sensitivity of many life insurance products, controlling interest rate risk is one of the most challenging tasks facing portfolio managers in the insurance industry. Although tolerance for interest rate risk, or level of mismatch, varies from company to company, duration mismatch can become an acute problem in periods of rising interest rates. Meeting the return objective of earning a significant spread is important, but assets and liabilities must be managed in a way that offsets the effects of changes in interest rates.

Confidence in an insurance company's ability to meet its obligations is so vital to the company's survival that special care must be taken to avoid any significant losses of principal. Hannibal has taken on a substantial amount of interest rate risk in recent years. Continuing a spread-maximization strategy in the face of rising interest rates threatens the firm's financial stability.

The mismatch must be corrected. Continuing along the path outlined by the CFO will magnify the interest rate risk, which the CFO is ignoring because of the "increasing popularity" of a short-duration product. As the duration of the assets is held steady through the CFO's urging to invest in higher-yielding, longer-duration bonds, the duration of the liabilities will shrink. The CFO is focusing on a spread-maximization strategy and mistakenly relying on investment-grade securities to provide policyholder security. The real danger lies in another direction—namely the potential forced sale of assets, with sizable losses resulting from interest rate increases, to pay off short-duration liabilities.

The company has a relatively small surplus portfolio. Surplus is an indicator of an insurance company's financial health and is vital to expansion of the business. If interest rates continue to rise as expected, the market value of the portfolio assets will decline, which may wipe out the surplus and a portion of policyholder reserves. With the company unable to expand or meet its obligations, its viability becomes questionable.

B Two additional factors that affect liability duration for a life insurance company are 1) the duration of products sold and 2) policy surrenders and/or loans.

- The *duration of products sold* is a main driving force influencing the overall duration of liabilities. The extent to which a company directs marketing efforts toward short- or long-duration products will tilt overall duration. In this case, the company is placing a heavy emphasis on a two-year guaranteed investment contract product. The duration of this product will be much shorter than that of the overall portfolio.

Management indicates that this product is popular, with sales increasing in recent years. This increase, all else being equal, will contribute to a decline in the duration of liabilities.

- Duration of liabilities is also driven by *policy surrender and/or loans*, either of which can be triggered by interest rate changes. Surrender rates triggered by interest rate changes are more difficult to predict than mortality rates and have become a critical variable for many life insurance companies. During periods of rising interest rates, policyholder redemptions accelerate as policyholders seek the most competitive rate. Such behavior would be typical in an environment in which "interest rates are rising and are expected to rise another 100 basis points." Accelerating surrenders could also influence an actuary to reduce the assumed duration of a company's liabilities.

C Because of the varied features in life and annuity contracts, most life insurance companies segment their portfolios to group liabilities with similar interest-rate-sensitivity characteristics. Portfolios are then constructed by segment in such a way that the most appropriate securities fund each product segment. This practice also recognizes that particular product lines have unique time horizons and return objectives and should be managed accordingly.

Segmentation would be appropriate at Hannibal because of the problems arising from the popularity of a short-duration product. The portfolio manager could construct a portfolio targeted to the liabilities created by this product. Three arguments for the segmentation approach could be chosen from the following. Segmentation:

- aids in managing liabilities of similar characteristics;
- assists in the selection of the most appropriate assets to fund product segments (liabilities);
- aids in the management and/or measurement of interest rate risk and duration mismatch by product line;
- provides a framework for meeting return objectives by product line;
- provides for accurate measurement of the profitability of product lines and/or manager performance;
- provides for the allocation of investment income by line of business;
- provides for the measurement of risk-adjusted returns; and
- facilitates accountability and allays regulatory concerns.

D The focus of the return requirement for policyholder reserves is on earning a competitive return on the assets used to fund estimated liabilities. Life insurance companies are considered spread managers, in that they manage the difference between the return earned on investments and the return credited to policyholders. Spread management can take various forms, such as a yield approach versus a total-return approach, but the objective remains the same.

The focus of the return requirement for the surplus is on long-term growth. An expanding surplus is an important indicator of financial stability and the base for building the lines of business. When selecting investments for the surplus portfolio, managers typically seek assets with the potential for capital appreciation, such as common stocks, venture capital, and equity real estate.

9 ***Winthrop Bank***

A Because the loan portfolio is now subject to greater interest rate risk, although overall risk tolerance has not changed, the target maturity of the securities portfolio must be reduced to offset the loan portfolio's greater risk.

B Winthrop Bank should have more leeway to invest in below-investment-quality debt in its bond portfolio as a result.

C Winthrop's decision decreases the need for liquidity in its securities portfolio.

D The development suggests taking less risk in its securities portfolio.

Glossary

Absolute return benchmark A minimum target return that an investment manager is expected to beat.

Absolute return vehicles Investments that have no direct benchmark portfolio.

Accounting defeasance Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

Accounting risk The risk associated with accounting standards that vary from country to country or with any uncertainty about how certain transactions should be recorded.

Accumulated benefit obligation (ABO) The present value of pension benefits, assuming the pension plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date.

Accumulated service Years of service of a pension plan participant as of a specified date.

Active investment strategies An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active-lives The portion of a pension fund's liabilities associated with active workers.

Active management An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active return The portfolio's return in excess of the return on the portfolio's benchmark.

Active risk The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

Active risk budgeting Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

Actual extreme events A type of scenario analysis used in stress testing. It involves evaluating how a portfolio would have performed given movements in interest rates, exchange rates, stock prices, or commodity prices at magnitudes such as occurred during past extreme market events (e.g., the stock market crash of October 1987).

Ad valorem fees Fees that are calculated by multiplying a percentage by the value of assets managed; also called assets under management (AUM) fees.

Adaptive markets hypothesis (AMH) A hypothesis that applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives.

Adverse selection risk The risk associated with information asymmetry; in the context of trading, the risk of trading with a more informed trader.

Algorithmic trading Automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints.

Allocation/selection interaction return A measure of the joint effect of weights assigned to both sectors and individual securities; the difference between the weight of the portfolio in a given sector and the portfolio's benchmark for that sector, times the difference between the portfolio's and the benchmark's returns in that sector, summed across all sectors.

Alpha Excess risk-adjusted return.

Alpha and beta separation An approach to portfolio construction that views investing to earn alpha and investing to establish systematic risk exposures as tasks that can and should be pursued separately.

Alpha research Research related to capturing excess risk-adjusted returns by a particular strategy; a way investment research is organized in some investment management firms.

Alternative investments Groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments.

Anchoring and adjustment An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring and adjustment bias An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring trap The tendency of the mind to give disproportionate weight to the first information it receives on a topic.

Angel investor An accredited individual investing chiefly in seed- and early-stage companies.

Anomalies Apparent deviations from market efficiency.

Ask price The price at which a dealer will sell a specified quantity of a security. Also called *ask*, *offer price*, or *offer*.

Ask size The quantity associated with the ask price.

Aspirational risk bucket In goal-based portfolio planning, that part of wealth allocated to investments that have the potential to increase a client's wealth substantially.

Asset covariance matrix The covariance matrix for the asset classes or markets under consideration.

Asset/liability management The management of financial risks created by the interaction of assets and liabilities.

Asset location The type of account an asset is held within, e.g., taxable or tax deferred.

Asset-only With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

Assurity of completion In the context of trading, confidence that trades will settle without problems under all market conditions.

Assurity of the contract In the context of trading, confidence that the parties to trades will be held to fulfilling their obligations.

Asynchronism A discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

AUM fee A fee based on assets under management; an *ad valorem* fee.

Authorized participants Broker/dealers who enter into an agreement with the distributor of the fund.

Automated trading Any form of trading that is not manual, including trading based on algorithms.

Availability bias An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

Average effective spread A measure of the liquidity of a security's market. The mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study.

Back office Administrative functions at an investment firm such as those pertaining to transaction processing, record keeping, and regulatory compliance.

Backtesting A method for gaining information about a model using past data. As used in reference to VaR, it is the process of comparing the number of violations of VaR thresholds over a time period with the figure implied by the user-selected probability level.

Backwardation With respect to the futures curve in a commodity futures market, the condition of being downward sloping.

Balance of payments An accounting of all cash flows between residents and nonresidents of a country.

Bancassurance The sale of insurance by banks.

Barbell A fixed income portfolio combining securities concentrated in short and long maturities relative to the benchmark.

Base With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in "one unit of a currency."

Base-rate neglect A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

Basis point value (BPV) The change in the bond price for a 1 basis point change in yield. Also called *present value of a basis point* or *price value of a basis point (PVBP)*.

Basis risk The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

Batch auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Bayes' formula A mathematical rule explaining how existing probability beliefs should be changed given new information; it is essentially an application of conditional probabilities.

Bear spread An option strategy that involves selling a put with a lower exercise price and buying a put with a higher exercise price. It can also be executed with calls.

Behavioral finance An approach to finance based on the observation that psychological variables affect and often distort individuals' investment decision making.

Behavioral finance macro A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

Behavioral finance micro A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

Benchmark In an investments context, a standard or point of reference for evaluating the performance of an investment portfolio.

Benchmark spread The yield on a credit security over the yield on a security with little or no credit risk (benchmark bond) and with a similar duration.

Best efforts order A type of order that gives the trader's agent discretion to execute the order only when the agent judges market conditions to be favorable.

Beta A measure of the sensitivity of a given investment or portfolio to movements in the overall market.

Beta research Research related to systematic (market) risk and return; a way investment research is organized in some investment management firms.

Bid The price at which a dealer will buy a specified quantity of a security. Also called *bid price*.

Bid–ask spread The difference between the current bid price and the current ask price of a security.

Bid price In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

Bid size The quantity associated with the bid price.

Block order An order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets.

Bond-yield-plus-risk-premium method An approach to estimating the required return on equity which specifies that required return as a bond yield plus a risk premium.

Bottom-up Focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development.

Bottom-up approach A credit strategy approach that involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features.

Bounded rationality The notion that people have informational and cognitive limitations when making decisions and do not necessarily optimize when arriving at their decisions.

Box spread An option strategy that combines a bull spread and a bear spread having two different exercise prices, which produces a risk-free payoff of the difference in the exercise prices.

Broad market indexes An index that is intended to measure the performance of an entire asset class. For example, the S&P 500 Index, Wilshire 5000, and Russell 3000 indexes for US common stocks.

Broker An agent of a trader in executing trades.

Brokered markets Markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.

Bubbles Episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value.

Buffering With respect to style index construction, rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style.

Build-up approach Synonym for the risk premium approach.

Bull spread An option strategy that involves buying a call with a lower exercise price and selling a call with a higher exercise price. It can also be executed with puts.

Bullet A fixed income portfolio made up of securities targeting a single segment of the curve.

Business cycle Fluctuations in GDP in relation to long-term trend growth, usually lasting 9–11 years.

Business risk The equity risk that comes from the nature of the firm's operating activities.

Butterfly spread An option strategy that combines two bull or bear spreads and has three exercise prices, or, a measure of yield curve curvature.

Buy side Investment management companies and other investors that use the services of brokerages.

Buy-side traders Professional traders that are employed by investment managers and institutional investors.

Calendar-and-percentage-of-portfolio rebalancing Monitoring a portfolio at regular frequencies, such as quarterly. Rebalancing decisions are then made based upon percentage-of-portfolio principles.

Calendar rebalancing Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

Calmar ratio The compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period.

Cap A combination of interest rate call options designed to hedge a borrower against rate increases on a floating-rate loan.

Cap weighting See *capitalization weighting*.

Capital adequacy ratio A measure of the adequacy of capital in relation to assets.

Capital flows forecasting approach An exchange rate forecasting approach that focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment.

Capital market expectations (CME) Expectations concerning the risk and return prospects of asset classes.

Capitalization weighting The most common security weighting scheme in which constituents are held in proportion to their market capitalizations, calculated as price times available shares. Also known as *market value*, *market cap*, or *cap weighting*.

Caplet Each component call option in a cap.

Carried interest A private equity fund manager's incentive fee; the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital.

Carry trade A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

Cash balance plan A defined-benefit plan whose benefits are displayed in individual recordkeeping accounts.

Cash flow at risk A variation of VaR that measures the risk to a company's cash flow, instead of its market value; the minimum cash flow loss expected to be exceeded with a given probability over a specified time period.

Cash flow matching Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps.

Cell approach See *stratified sampling*.

Certainty equivalent The maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in an opportunity.

Chain-linking A process for combining periodic returns to produce an overall time-weighted rate of return.

Cheapest-to-deliver A bond in which the amount received for delivering the bond is largest compared with the amount paid in the market for the bond.

Civil law A legal system derived from Roman law, in which judges apply general, abstract rules or concepts to particular cases. In civil systems, law is developed primarily through legislative statutes or executive action.

Clawback provision With respect to the compensation of private equity fund managers, a provision that specifies that money paid to the fund manager be returned to the investors if, at the end of a fund's life, the investors have not received back their capital contributions and contractual share of profits.

Closed-book markets Markets in which a trader does not have real-time access to all quotes in a security.

Closeout netting In a bankruptcy, a process by which multiple obligations between two counterparties are consolidated into a single overall value owed by one of the counterparties to the other.

Cobb-Douglas model A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cobb-Douglas production function A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cognitive dissonance The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

Cognitive errors Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

Collar An option strategy involving the purchase of a put and sale of a call in which the holder of an asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. Collars also can be used to provide protection against rising interest rates on a floating-rate loan by giving up gains from lower interest rates.

Commingled real estate funds (CREFs) Professionally managed vehicles for substantial commingled (i.e., pooled) investment in real estate properties.

Commitment period The period of time over which committed funds are advanced to a private equity fund.

Commodities Articles of commerce such as agricultural goods, metals, and petroleum; tangible assets that are typically relatively homogeneous in nature.

Commodity trading advisers (CTAs) Registered advisers who manage futures funds.

Common law A legal system which draws abstract rules from specific cases. In common law systems, law is developed primarily through decisions of the courts.

Community property regime A marital property regime under which each spouse has an indivisible one-half interest in property received during marriage.

Company-specific risk The non-systematic or idiosyncratic risk specific to a particular company's operations, reputation, and business environment.

Completeness fund A portfolio that, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.

Confidence band With reference to a quality control chart for performance evaluation, a range in which the manager's value-added returns are anticipated to fall a specified percentage of the time.

Confirmation bias A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

Confirming evidence trap The bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it.

Conjunction fallacy An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

Conservatism bias A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

Consistent growth A growth investment substyle that focuses on companies with consistent growth having a long history of unit-sales growth, superior profitability, and predictable earnings.

Constant returns to scale A characteristic of a production function such that a given percentage increase in capital stock and labor input results in an equal percentage increase in output.

Contingent immunization Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

Continuous auction markets Auction markets where orders can be executed at any time during the trading day.

Contrarian A value investment substyle focusing on stocks that have been beset by problems.

Controlled foreign corporation A company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law.

Convexity A measure of how interest rate sensitivity changes with a change in interest rates.

Core capital The amount of capital required to fund spending to maintain a given lifestyle, fund goals, and provide adequate reserves for unexpected commitments.

Core–satellite A way of thinking about allocating money that seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles.

Core-satellite portfolio A portfolio in which certain investments (often indexed or semi-active) are viewed as the core and the balance are viewed as satellite investments fulfilling specific roles.

Corporate governance The system of internal controls and procedures used to define and protect the rights and responsibilities of various stakeholders.

Corporate venturing Investments by companies in promising young companies in the same or a related industry.

Covered call An option strategy involving the holding of an asset and sale of a call on the asset.

Creation units Large blocks of ETF shares often traded against a basket of underlying securities.

Credit default swap A swap used to transfer credit risk to another party. A protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event.

Credit derivative A contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

Credit method When the residence country reduces its taxpayers' domestic tax liability by the amount of taxes paid to a foreign country that exercises source jurisdiction.

Credit risk The risk of loss caused by a counterparty's or debtor's failure to make a timely payment or by the change in value of a financial instrument based on changes in default risk. Also called *default risk*.

Credit spread forward A forward contract used to transfer credit risk to another party; a forward contract on a yield spread.

Credit spread option An option based on the yield spread between two securities that is used to transfer credit risk.

Credit VaR A variation of VaR related to credit risk; it reflects the minimum loss due to credit exposure with a given probability during a period of time.

Credited rates Rates of interest credited to a policyholder's reserve account.

Cross-default provision A provision stipulating that if a borrower defaults on any outstanding credit obligations, the borrower is considered to be in default on all obligations.

Cross hedge A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

Currency overlay programs A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

Current credit risk The risk of credit-related events happening in the immediate future; it relates to the risk that a payment currently due will not be paid. Also called *jump-to-default risk*.

Custom security-based benchmark Benchmarks that are custom built to accurately reflect the investment discipline of a particular investment manager. Also called *strategy benchmarks* because they reflect a manager's particular strategy.

Cyclical stocks The shares of companies whose earnings have above-average sensitivity to the business cycle.

Cyclically Adjusted P/E Ratio (CAPE) A price-to-earnings ratio in which the numerator (in a US context) is defined as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings on the S&P 500.

Day traders Traders that rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are prepared to hold a position. Day traders hold a position open somewhat longer than a scalper but closing all positions at the end of the day.

Dealer A business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order. Also called *market maker*.

Decision price The prevailing price when the decision to trade is made. Also called *arrival price* or *strike price*.

Decision-reversal risk The risk of reversing a chosen course of action at the point of maximum loss.

Decision risk The risk of changing strategies at the point of maximum loss.

Deduction method When the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income.

Deemed dispositions Tax treatment that assumes property is sold. It is sometimes seen as an alternative to estate or inheritance tax.

Deemed distribution When shareholders of a controlled foreign corporation are taxed as if the earnings were distributed to shareholders, even though no distribution has been made.

Default risk The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.

Default risk premium Compensation for the possibility that the issue of a debt instrument will fail to make a promised payment at the contracted time and in the contracted amount.

Defaultable debt Debt with some meaningful amount of credit risk.

Deferred annuity An annuity that enables an individual to purchase an income stream that will begin at a later date.

Defined-benefit plan A pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants.

Defined-contribution plan A pension plan that specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants.

Deflation A decrease in the general level of prices; an increase in the purchasing power of a unit of currency.

Delay costs Implicit trading costs that arise from the inability to complete desired trades immediately due to order size or market liquidity. Also called *slippage*.

Delta The relationship between the option price and the underlying price, which reflects the sensitivity of the price of the option to changes in the price of the underlying.

Delta hedge An option strategy in which a position in an asset is converted to a risk-free position with a position in a specific number of options. The number of options per unit of the underlying changes through time, and the position must be revised to maintain the hedge.

Delta hedging Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

Delta-normal method A measure of VaR equivalent to the analytical method but that refers to the use of delta to estimate the option's price sensitivity.

Demand deposit A deposit that can be drawn upon without prior notice, such as a checking account.

Demutualizing The process of converting an insurance company from mutual form to stock.

Descriptive statistics Methods for effectively summarizing data to describe important aspects of a dataset.

Differential returns Returns that deviate from a manager's benchmark.

Diffusion index An index that measures how many indicators are pointing up and how many are pointing down.

Direct commodity investment Commodity investment that involves the cash market purchase of physical commodities or exposure to changes in spot market values via derivatives, such as futures.

Direct market access Platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker.

Disability income insurance A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

Discounted cash flow models (DCF models) Valuation models that express the idea that an asset's value is the present value of its (expected) cash flows.

Discretionary trust A trust structure in which the trustee determines whether and how much to distribute in the sole discretion of the trustee.

Disintermediation To withdraw funds from financial intermediaries for placement with other financial intermediaries offering a higher return or yield. Or, to withdraw funds from a financial intermediary for the purposes of direct investment, such as withdrawing from a mutual fund to make direct stock investments.

Dispersion The weighted *variance* of the times to receipt of cash flow; it measures the extent to which the payments are spread out around the duration.

Disposition effect As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

Distressed debt arbitrage A distressed securities investment discipline that involves purchasing the traded bonds of bankrupt companies and selling the common equity short.

Distressed securities Securities of companies that are in financial distress or near bankruptcy; the name given to various investment disciplines employing the securities of companies in distress.

Diversification effect In reference to VaR across several portfolios (for example, across an entire firm), this effect equals the difference between the sum of the individual VaRs and total VaR.

Dividend recapitalization A method by which a buyout fund can realize the value of a holding; involves the issuance of debt by the holding to finance a special dividend to owners.

Domestic asset An asset that trades in the investor's domestic currency (or home currency).

Domestic currency The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

Domestic-currency return A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

Donor-advised fund A fund administered by a tax-exempt entity in which the donor advises on where to grant the money that he or she has donated.

Double inflection utility function A utility function that changes based on levels of wealth.

Downside deviation A measure of volatility using only rate of return data points below the investor's minimum acceptable return.

Due diligence Investigation and analysis in support of an investment action or recommendation, such as the scrutiny of operations and management and the verification of material facts.

Duration A measure of the approximate sensitivity of a security to a change in interest rates (i.e., a measure of interest rate risk).

Duration matching Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

Dynamic asset allocation A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

Dynamic hedge A hedge requiring adjustment as the price of the hedged asset changes.

Earnings at risk (EAR) A variation of VaR that reflects the risk of a company's earnings instead of its market value.

Earnings momentum A growth investment substyle that focuses on companies with earnings momentum (high quarterly year-over-year earnings growth).

Earnings risk The risk associated with the earning potential of an individual.

Econometrics The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

Economic balance sheet A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet.*

Economic exposure The risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.

Economic indicators Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

Effective convexity A second-order effect that describes how a bond's interest rate sensitivity changes with changes in yield. Effective convexity is used when the bond has cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities).

Effective duration Duration adjusted to account for embedded options.

Effective spread Two times the distance between the actual execution price and the midpoint of the market quote at the time an order is entered; a measure of execution costs that captures the effects of price improvement and market impact.

Electronic communications networks (ECNs) Computer-based auctions that operate continuously within the day using a specified set of rules to execute orders.

Emerging market debt The sovereign debt of nondeveloped countries.

Emotional biases Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Empirical duration A measure of interest rate sensitivity that is determined from market data.

Endogenous variable A variable whose values are determined within the system.

Endowment bias An emotional bias in which people value an asset more when they hold rights to it than when they do not.

Endowments Long-term funds generally owned by operating nonprofit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Enhanced derivatives products companies A type of subsidiary separate from an entity's other activities and not liable for the parent's debts. They are often used by derivatives dealers to control exposure to ratings downgrades. Also called *special purpose vehicles.*

Enhanced indexing strategy Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

Enterprise risk management An overall assessment of a company's risk position. A centralized approach to risk management sometimes called firmwide risk management.

Environmental, social, and corporate governance (ESG) Also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.

Equal probability rebalancing Rebalancing in which the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor.

Equal weighted In an equal-weighted index, each stock in the index is weighted equally.

Equal weighting Security weighting scheme in which all constituents are held at equal weights at specified rebalancing times.

Equitized Given equity market systematic risk exposure.

Equity forward sale contract A private contract for the forward sale of an equity position.

Equity monetization The realization of cash for an equity position through a manner other than an outright sale.

Equity *q* The ratio of a company's equity market capitalization divided by net worth measured at replacement cost.

Equity risk premium Compensation for the additional risk of equity compared with debt.

ESG risk The risk to a company's market valuation resulting from environmental, social, and governance factors.

Estate All of the property a person owns or controls; may consist of financial assets, tangible personal assets, immovable property, or intellectual property.

Estate planning The process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime.

Estate tax freeze A plan usually involving a corporation, partnership, or limited liability company with the goal to transfer *future* appreciation to the next generation at little or no gift or estate tax cost.

Eurozone The region of countries using the euro as a currency.

Evaluated pricing See *matrix pricing.*

***Ex post* alpha** (or Jensen's alpha) The average return achieved in a portfolio in excess of what would have been predicted by CAPM given the portfolio's risk level; an after-the-fact measure of excess risk-adjusted return.

Excess capital An investor's capital over and above that which is necessary to fund their lifestyle and reserves.

Excess return The difference between the benchmark return and the portfolio return, which may be either positive or negative.

Exchange A regulated venue for the trading of investment instruments.

Exchange fund A fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself.

Exchange-traded funds Exchange-traded Funds or ETFs are hybrid investment products with many features of mutual funds combined with the trading features of common stocks or bonds. Essentially, ETFs are typically portfolios of stocks or bonds or commodities that trade throughout the day like common stocks.

Execution uncertainty Uncertainty pertaining to the timing of execution, or if execution will even occur at all.

Exemption method When the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, in effect having only one jurisdiction impose tax.

Exogenous shocks Events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example.

Exogenous variable A variable whose values are determined outside the system.

Extended portfolio assets and liabilities Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

Externality Those consequences of a transaction (or process) that do not fall on the parties to the transaction (or process).

Factor covariance matrix The covariance matrix of factors.

Factor-model-based benchmark Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

Factor push A simple stress test that involves pushing prices and risk factors of an underlying model in the most disadvantageous way to estimate the impact of factor extremes on the portfolio's value.

Factor sensitivities In a multifactor model, the responsiveness of the dependent variable to factor movements. Also called *factor betas* or *factor loadings*.

Fallen angels Debt that has crossed the threshold from investment grade to high yield.

Fed model An equity valuation model that relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds.

Federal funds rate The interest rate on overnight loans of reserves (deposits) between US Federal Reserve System member banks.

Fee cap A limit on the total fee paid regardless of performance.

Fiduciary A person or entity standing in a special relation of trust and responsibility with respect to other parties.

Financial buyers Buyers who lack a strategic motive.

Financial capital The tangible and intangible assets (excluding human capital) owned by an individual or household.

Financial equilibrium models Models describing relationships between expected return and risk in which supply and demand are in balance.

Financial risk Risks derived from events in the external financial markets, such as changes in equity prices, interest rates, or currency exchange rates.

Fiscal policy Government activity concerning taxation and governmental spending.

Fixed trust A trust structure in which distributions to beneficiaries are prescribed in the trust document to occur at certain times or in certain amounts.

Flexible-premium variable life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *variable universal life*.

Floating supply of shares The number of shares outstanding that are actually available to investors. Also called *free float*.

Floor A combination of interest rate options designed to provide protection against interest rate decreases.

Floor broker An agent of the broker who, for certain exchanges, physically represents the trade on the exchange floor.

Floorlet Each component put option in a floor.

Forced heirship rules Legal ownership principles whereby children have the right to a fixed share of a parent's estate.

Foreign assets Assets denominated in currencies other than the investor's home currency.

Foreign currency Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

Foreign-currency return The return of the foreign asset measured in foreign-currency terms.

Formal tools Established research methods amenable to precise definition and independent replication of results.

Forward conversion with options The construction of a synthetic short forward position against the asset held long.

Forward rate bias Persistent violation of uncovered interest rate parity that is exploited by the carry trade.

Foundations Typically, grant-making institutions funded by gifts and investment assets.

Fourth market A term occasionally used for direct trading of securities between institutional investors; the fourth market would include trading on electronic crossing networks.

Framing An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Framing bias An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Front office The revenue generating functions at an investment firm such as those pertaining to trading and sales.

Front-run To trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions.

Full replication When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Full replication approach When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Fully funded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is 100 percent or greater.

Fund manager The professional manager of separate accounts or pooled assets structured in a variety of ways.

Fund of funds A fund that invests in a number of underlying funds.

Fundamental law of active management The relation that the information ratio of a portfolio manager is approximately equal to the information coefficient multiplied by the square root of the investment discipline's breadth (the number of independent, active investment decisions made each year).

Fundamental weighting Patented by Research Affiliates LLC, this scheme uses company characteristics such as sales, cash flow, book value, and dividends to weight securities.

Funded status The relationship between the value of a plan's assets and the present value of its liabilities.

Funding currencies The low-yield currencies in which borrowing occurs in a carry trade.

Funding risk The risk that liabilities funding long asset positions cannot be rolled over at reasonable cost.

G-spread The yield on a credit security over the yield of an actual or interpolated government bond.

Gain-to-loss ratio The ratio of positive returns to negative returns over a specified period of time.

Gamblers' fallacy A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

Gamma A numerical measure of the sensitivity of delta to a change in the underlying's value.

Global custodian An entity that effects trade settlement, safekeeping of assets, and the allocation of trades to individual custody accounts.

Global investable market A practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.

Goals-based With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

Goals-based investing An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

Gordon (constant) growth model A version of the dividend discount model for common share value that assumes a constant growth rate in dividends.

Government structural policies Government policies that affect the limits of economic growth and incentives within the private sector.

Grinold–Kroner model An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

Growth in total factor productivity A component of trend growth in GDP that results from increased efficiency in using capital inputs; also known as technical progress.

H-model A variant of the two-stage dividend discount model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate that holds in perpetuity.

Hague Conference on Private International Law An intergovernmental organization working toward the convergence of private international law. Its 69 members consist of countries and regional economic integration organizations.

Halo effect An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

Health insurance A type of insurance used to cover health care and medical costs.

Health risk The risk associated with illness or injury.

Hedge funds A historically loosely regulated, pooled investment vehicle that may implement various investment strategies.

Hedge ratio The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

Hedging A general strategy usually thought of as reducing, if not eliminating, risk.

Herding When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

High-water mark A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

High yield A value investment substyle that focuses on stocks offering high dividend yield with prospects of maintaining or increasing the dividend.

High-yield investing A distressed securities investment discipline that involves investment in high-yield bonds perceived to be undervalued.

Hindsight bias A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

Historical simulation method The application of historical price changes to the current portfolio.

Holdings-based style analysis An approach to style analysis that categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time.

Holistic balance sheet See *economic balance sheet.*

Home bias A preference for securities listed on the exchanges of one's home country.

Home-country bias The favoring of domestic over non-domestic investments relative to global market value weights.

Home currency See *domestic currency.*

Horizon matching Hybrid approach that combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short-and long-term liabilities.

Human capital An implied asset; the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital.*

Hybrid markets Combinations of market types, which offer elements of batch auction markets and continuous auction markets, as well as quote-driven markets.

Hypothetical events A type of scenario analysis used in stress testing that involves the evaluation of performance given events that have never happened in the markets or market outcomes to which we attach a small probability.

I-spread The yield on a credit security over the swap rate (denominated in the same currency as the credit security). Also known as interpolated spread.

Illiquidity premium Compensation for the risk of loss relative to an investment's fair value if an investment needs to be converted to cash quickly.

Illusion of control A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Illusion of control bias A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Immediate annuity An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

Immunization An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

Implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return.

Implementation shortfall strategy A strategy that attempts to minimize trading costs as measured by the implementation shortfall method. Also called *arrival price strategy*.

Implied yield A measure of the yield on the underlying bond of a futures contract implied by pricing it as though the underlying will be delivered at the futures expiration.

Incremental VaR A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.

Indexing A common passive approach to investing that involves holding a portfolio of securities designed to replicate the returns on a specified index of securities.

Indifference curve analysis A decision-making approach whereby curves of consumption bundles, among which the decision-maker is indifferent, are constructed to identify and choose the curve within budget constraints that generates the highest utility.

Indirect commodity investment Commodity investment that involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production.

Inferential statistics Methods for making estimates or forecasts about a larger group from a smaller group actually observed.

Inflation An increase in the general level of prices; a decrease in the purchasing power of a unit of currency.

Inflation hedge An asset whose returns are sufficient on average to preserve purchasing power during periods of inflation.

Inflation premium Compensation for expected inflation.

Information coefficient The correlation between forecast and actual returns.

Information-motivated traders Traders that seek to trade on information that has limited value if not quickly acted upon.

Information ratio The mean excess return of the account over the benchmark (i.e., mean active return) relative to the variability of that excess return (i.e., tracking risk); a measure of risk-adjusted performance.

Infrastructure funds Funds that make private investment in public infrastructure projects in return for rights to specified revenue streams over a contracted period.

Initial public offering The initial issuance of common stock registered for public trading by a formerly private corporation.

Input uncertainty Uncertainty concerning whether the inputs are correct.

Inside ask The lowest available ask price. Also called *market ask*.

Inside bid The highest available bid price. Also called *market bid*.

Inside bid–ask spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *market spread*.

Inside quote Combination of the highest available bid price with the lowest available ask price. Also called *market quote*.

Inside spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside bid–ask spread*, or *market spread*.

Institutional investors Corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets.

Interest rate management effect With respect to fixed-income attribution analysis, a return component reflecting how well a manager predicts interest rate changes.

Interest spread With respect to banks, the average yield on earning assets minus the average percent cost of interest-bearing liabilities.

Internal rate of return The growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows; money-weighted rate of return is a synonym.

Intestate Having made no valid will; a decedent without a valid will or with a will that does not dispose of their property is considered to have died intestate.

Intrinsic value The difference between the spot exchange rate and the strike price of a currency option.

Inventory cycle A cycle measured in terms of fluctuations in inventories, typically lasting 2–4 years.

Inverse floater A floating-rate note or bond in which the coupon is adjusted to move opposite to a benchmark interest rate.

Investment currencies The high-yielding currencies in a carry trade.

Investment skill The ability to outperform an appropriate benchmark consistently over time.

Investment style A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

Investment style indexes Indexes that represent specific portions of an asset category. For example, subgroups within the US common stock asset category such as large-capitalization growth stocks.

Investment universe The set of assets that may be considered for investment.

Investor's benchmark The benchmark an investor uses to evaluate performance of a given portfolio or asset class.

Irrevocable trust A trust arrangement wherein the settlor has no ability to revoke the trust relationship.

J factor risk The risk associated with a judge's track record in adjudicating bankruptcies and restructurings.

Joint ownership with right of survivorship Jointly owned; assets held in joint ownership with right of survivorship automatically transfer to the surviving joint owner or owners outside the probate process.

Justified P/E The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.

Key rate duration A method of measuring the interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

Knock-in/knock-out Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

Lagging economic indicators A set of economic variables whose values correlate with recent past economic activity.

Leading economic indicators A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

Legal/contract risk The possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake; for example, if a contract is voided through litigation.

Leverage-adjusted duration gap A leverage-adjusted measure of the difference between the durations of assets and liabilities which measures a bank's overall interest rate exposure.

Leveraged floating-rate note (leveraged floater) A floating-rate note or bond in which the coupon is adjusted at a multiple of a benchmark interest rate.

Leveraged recapitalization A leveraging of a company's balance sheet, usually accomplished by working with a private equity firm.

Liability-based benchmark A benchmark structured to accurately reflect the return required to meet the future obligations of an investor and to mimic the volatility of the liabilities.

Liability-driven investing An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

Liability glide path A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

Liability insurance A type of insurance used to manage liability risk.

Liability-relative With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

Liability risk The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

Life-cycle finance A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

Life insurance A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

Lifetime gratuitous transfer A lifetime gift made during the lifetime of the donor; also known as *inter vivos* transfers.

Limit order An instruction to execute an order when the best price available is at least as good as the limit price specified in the order.

Liquidity The ability to trade without delay at relatively low cost and in relatively large quantities.

Liquidity-motivated traders Traders that are motivated to trade based upon reasons other than an information advantage. For example, to release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs.

Liquidity risk Any risk of economic loss because of the need to sell relatively less liquid assets to meet liquidity requirements; the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.

Lock-up period A minimum initial holding period for investments during which no part of the investment can be withdrawn.

Locked up Said of investments that cannot be traded at all for some time.

Logical participation strategies Protocols for breaking up an order for execution over time. Typically used by institutional traders to participate in overall market volumes without being unduly visible.

Longevity risk The risk associated with living to an advanced age in retirement, including the uncertainty surrounding how long retirement will last; the risk of outliving one's financial resources.

Loss-aversion bias A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

Loss given default See *loss severity*.

Loss severity The amount of loss if a default occurs. Also called *loss given default*.

Low P/E A value investment substyle that focuses on shares selling at low prices relative to current or normal earnings.

M^2 A measure of what a portfolio would have returned if it had taken on the same total risk as the market index.

Macaulay duration The percentage change in price for a percentage change in yield. The term, named for one of the economists who first derived it, is used to distinguish the calculation from modified duration. (See also *modified duration*).

Macro attribution Performance attribution analysis conducted on the fund sponsor level.

Macro expectations Expectations concerning classes of assets.

Managed futures Pooled investment vehicles, frequently structured as limited partnerships, that invest in futures and options on futures and other instruments.

Managed futures funds Pools of private capital managed by commodity trading advisers.

Manager continuation policies Policies adopted to guide the manager evaluations conducted by fund sponsors. The goal of manager continuation policies is to reduce the costs of manager turnover while systematically acting on indications of future poor performance.

Manager monitoring A formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations; used to identify warning signs of adverse changes in existing managers' organizations.

Manager peer group See *manager universe*.

Manager review A detailed examination of a manager that currently exists within a plan sponsor's program. The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired.

Manager universe A broad group of managers with similar investment disciplines. Also called *manager peer group*.

Market-adjusted implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return, adjusted using beta to remove the effect of the return on the market.

Market ask The lowest available ask price.

Market bid The best available bid; highest price any buyer is currently willing to pay.

Market bid–ask spread Market ask price minus market bid price. Also called *inside bid–ask spread*, *inside spread*, or *market spread*.

Market cap weighting See *capitalization weighting*.

Market fragmentation A condition whereby a market contains no dominant group of sellers (or buyers) that are large enough to unduly influence the market.

Market impact The effect of the trade on transaction prices. Also called *price impact*.

Market index Represents the performance of a specified security market, market segment, or asset class.

Market integration The degree to which there are no impediments or barriers to capital mobility across markets.

Market microstructure The market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Market model A regression equation that specifies a linear relationship between the return on a security (or portfolio) and the return on a broad market index.

Market-not-held order A variation of the market order designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the floor broker is not required to trade at any specific price or in any specific time interval.

Market on close order A market order to be executed at the closing of the market.

Market on open order A market order to be executed at the opening of the market.

Market order An instruction to execute an order as soon as possible in the public markets at the best price available.

Market oriented With reference to equity investing, an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth.

Market quote Combination of the highest available bid price with the lowest available ask price. Also called *inside quote*.

Market risk The risk associated with interest rates, exchange rates, and equity prices.

Market risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to maintain the client's current standard of living.

Market segmentation The degree to which there are some meaningful impediments to capital movement across markets.

Market spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *inside bid–ask spread*.

Market value weighting See *capitalization weighting*.

Marking to market A procedure used primarily in futures markets in which the parties to a contract settle the amount owed daily. Also known as the *daily settlement*.

Mass affluent An industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services.

Matrix prices Prices determined by comparisons to other securities of similar credit risk and maturity; the result of matrix pricing.

Matrix pricing An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

Maturity premium Compensation for the increased sensitivity of the market value of debt to a change in market interest rates as maturity is extended.

Maximum loss optimization A stress test in which we would try to optimize mathematically the risk variable that would produce the maximum loss.

Mega-cap buyout funds A class of buyout funds that take public companies private.

Mental accounting bias An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

Micro attribution Performance attribution analysis carried out on the investment manager level.

Micro expectations Expectations concerning individual assets.

Middle-market buyout funds A class of buyout funds that purchase private companies whose revenues and profits are too small for them to access capital from the public equity markets.

Midquote The halfway point between the market bid and ask prices.

Minimum-variance hedge ratio A mathematical approach to determining the optimal cross hedging ratio.

Mismatch in character The potential tax inefficiency that can result if the instrument being hedged, and the tool that is being used to hedge it, produce income and loss of a different character.

Missed trade opportunity costs Unrealized profit/loss arising from the failure to execute a trade in a timely manner.

Model risk The risk that a model is incorrect or misapplied; in investments, it often refers to valuation models.

Model uncertainty Uncertainty concerning whether a selected model is correct.

Modified duration An adjustment of the duration for the level of the yield. Contrast with *Macaulay duration*.

Monetary policy Government activity concerning interest rates and the money supply.

Monetize To access an item's cash value without transferring ownership of it.

Money duration A measure of the price change in units of the currency in which the bond is denominated given a change in its yield-to-maturity.

Money markets Markets for fixed-income securities with maturities of one year or less.

Money-weighted rate of return Same as the internal rate of return; the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows.

Multifactor model A model that explains a variable in terms of the values of a set of factors.

Multiperiod Sharpe ratio A Sharpe ratio based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment.

Mutual funds A professionally managed investment pool in which investors in the fund typically each have a pro-rata claim on the income and value of the fund.

Mutuals With respect to insurance companies, companies that are owned by their policyholders, who share in the company's surplus earnings.

Natural liquidity An extensive pool of investors who are aware of and have a potential interest in buying and/or selling a security.

Net asset value Value established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.

Net employment capital See *human capital*.

Net interest margin With respect to banks, net interest income (interest income minus interest expense) divided by average earning assets.

Net interest spread With respect to the operations of insurers, the difference between interest earned and interest credited to policyholders.

Net wealth The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

Net worth tax or net wealth tax A tax based on a person's assets, less liabilities.

Nominal default-free bonds Conventional bonds that have no (or minimal) default risk.

Nominal gross domestic product A money measure of the goods and services produced within a country's borders. Also called *nominal GDP*.

Nominal risk-free interest rate The sum of the real risk-free interest rate and the inflation premium.

Non-deliverable forwards Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

Nonfinancial risk Risks that arise from sources other than the external financial markets, such as changes in accounting rules, legal environment, or tax rates.

Nonparametric Involving minimal probability-distribution assumptions.

Nonstationarity A property of a data series that reflects more than one set of underlying statistical properties.

Normal portfolio A portfolio with exposure to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Objective function A quantitative expression of the objective or goal of a process.

Offer price The price at which a counterparty is willing to sell one unit of the base currency.

Open market operations The purchase or sale by a central bank of government securities, which are settled using reserves, to influence interest rates and the supply of credit by banks.

Open outcry auction market Public auction where representatives of buyers and sellers meet at a specified location and place verbal bids and offers.

Operational risk The risk of loss from failures in a company's systems and procedures (for example, due to computer failures or human failures) or events completely outside of the control of organizations (which would include "acts of God" and terrorist actions).

Opportunistic participation strategies Passive trading combined with the opportunistic seizing of liquidity.

Optimization With respect to portfolio construction, a procedure for determining the best portfolios according to some criterion.

Option-adjusted spread The constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price.

Order-driven markets Markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices.

Ordinary life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *whole life insurance*.

Orphan equities investing A distressed securities investment discipline that involves investment in orphan equities that are perceived to be undervalued.

Orphan equity The newly issued equity of a company emerging from reorganization.

Output gap The difference between the value of GDP estimated as if the economy were on its trend growth path (potential output) and the actual value of GDP.

Overall trade balance The sum of the current account (reflecting exports and imports) and the financial account (consisting of portfolio flows).

Overbought When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

Overconfidence bias A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

Overconfidence trap The tendency of individuals to overestimate the accuracy of their forecasts.

Oversold The opposite of overbought; see *overbought*.

Pairs trade A basic long–short trade in which an investor is long and short equal currency amounts of two common stocks in a single industry. Also called *pairs arbitrage*.

Panel method A method of capital market expectations setting that involves using the viewpoints of a panel of experts.

Partial correlation In multivariate problems, the correlation between two variables after controlling for the effects of the other variables in the system.

Partial fill Execution of a purchase or sale for fewer shares than was stipulated in the order.

Participate (do not initiate) order A variant of the market-not-held order. The broker is deliberately low-key and waits for and responds to the initiatives of more active traders.

Passive investment Investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

Passive investment strategies A buy-and-hold strategy to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive management A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive traders Traders that seek liquidity in their rebalancing transactions, but are much more concerned with the cost of trading.

Payment netting A means of settling payments in which the amount owed by the first party to the second is netted with the amount owed by the second party to the first; only the net difference is paid.

Pension funds Funds consisting of assets set aside to support a promise of retirement income.

Pension surplus Pension assets at market value minus the present value of pension liabilities.

Percent-range rebalancing An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

Percentage-of-portfolio rebalancing Rebalancing is triggered based on set thresholds stated as a percentage of the portfolio's value.

Percentage-of-volume strategy A logical participation strategy in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Perfect markets Markets without any frictional costs.

Performance appraisal The evaluation of portfolio performance; a quantitative assessment of a manager's investment skill.

Performance attribution A comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns.

Performance-based fee Fees specified by a combination of a base fee plus an incentive fee for performance in excess of a benchmark's.

Performance evaluation The measurement and assessment of the outcomes of investment management decisions.

Performance measurement A component of performance evaluation; the relatively simple procedure of calculating an asset's or portfolio's rate of return.

Performance netting risk For entities that fund more than one strategy and have asymmetric incentive fee arrangements with the portfolio managers, the potential for loss in cases where the net performance of the group of managers generates insufficient fee revenue to fully cover contractual payout obligations to all portfolio managers with positive performance.

Periodic auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Permanent income hypothesis The hypothesis that consumers' spending behavior is largely determined by their long-run income expectations.

Permanent life insurance A type of life insurance that provides lifetime coverage.

Personal risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to protect the client from a drastic decrease in lifestyle.

Plan sponsor The trustee, company, or employer responsible for a public or private institutional investment plan.

Pledging requirement With respect to banks, a required collateral use of assets.

Point estimate A single-valued estimate of a quantity, as opposed to an estimate in terms of a range of values.

Policyholder reserves With respect to an insurance company, an amount representing the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Political risk The risk of war, government collapse, political instability, expropriation, confiscation, or adverse changes in taxation. Also called *geopolitical risk*.

Portable Moveable. With reference to a pension plan, one in which a plan participant can move his or her share of plan assets to a new plan, subject to certain rules, vesting schedules, and possible tax penalties and payments.

Portable alpha A strategy involving the combining of multiple positions (e.g., long and short positions) so as to separate the alpha (unsystematic risk) from beta (systematic risk) in an investment.

Portfolio trade A trade in which a number of securities are traded as a single unit. Also called *program trade* or *basket trade*.

Position a trade To take the other side of a trade, acting as a principal with capital at risk.

Post-trade transparency Degree to which completed trades are quickly and accurately reported to the public.

Potential output The value of GDP if the economy were on its trend growth path.

Preferred return With respect to the compensation of private equity fund managers, a hurdle rate.

Premature death risk The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

Premium Regarding life insurance, the asset paid by the policy holder to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy.

Prepackaged bankruptcy A bankruptcy in which the debtor seeks agreement from creditors on the terms of a reorganization before the reorganization filing.

Prepaid variable forward A collar and loan combined within a single instrument.

Present value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Present value of distribution of cash flows methodology Method used to address a portfolio's sensitivity to rate changes along the yield curve, this approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

Pretrade transparency Ability of individuals to quickly, easily, and inexpensively obtain accurate information about quotes and trades.

Price discovery Adjustment of transaction prices to balance supply and demand.

Price improvement Execution at a price that is better than the price quoted at the time of order placement.

Price uncertainty Uncertainty about the price at which an order will execute.

Price value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Price weighted With respect to index construction, an index in which each security in the index is weighted according to its absolute share price.

Price weighting Security weighting scheme in which constituents are weighted in proportion to their prices.

Priced risk Risk for which investors demand compensation.

Primary capital Assets held outside a concentrated position that are at least sufficient to provide for the owner's lifetime spending needs.

Prime brokerage A suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

Principal trade A trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell.

Private equity Ownership interests in non-publicly traded companies.

Private equity funds Pooled investment vehicles that generally invest in highly illiquid assets; include venture capital funds and buyout funds.

Private exchange A method for handling undiversified positions with built-in capital gains in which shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.

Private placement memorandum A document used to raise venture capital financing when funds are raised through an agent.

Probate The legal process to confirm the validity of a will so that executors, heirs, and other interested parties can rely on its authenticity.

Profit-sharing plans A defined-contribution plan in which contributions are based, at least in part, on the plan sponsor's profits.

Projected benefit obligation (PBO) A measure of a pension plan's liability that reflects accumulated service in the same manner as the ABO but also projects future variables, such as compensation increases.

Property insurance A type of insurance used by individuals to manage property risk.

Property risk The possibility that a person's property may be damaged, destroyed, stolen, or lost.

Prospect theory An alternative to expected utility theory, it assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses.

Protective put An option strategy in which a long position in an asset is combined with a long position in a put.

Proxy hedge See *cross hedge*.

Prudence trap The tendency to temper forecasts so that they do not appear extreme; the tendency to be overly cautious in forecasting.

Public good A good that is not divisible and not excludable (a consumer cannot be denied it).

Purchasing power parity The theory that movements in an exchange rate should offset any difference in the inflation rates between two countries.

Pure indexing Method investors use to match an underlying market index in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk.

Pure sector allocation return A component of attribution analysis that relates relative returns to the manager's sector-weighting decisions. Calculated as the difference between the allocation (weight) of the portfolio to a given sector and the portfolio's benchmark weight for that sector, multiplied by the difference between the sector benchmark's return and the overall portfolio's benchmark return, summed across all sectors.

Put spread A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

Quality control charts A graphical means of presenting performance appraisal data; charts illustrating the performance of an actively managed account versus a selected benchmark.

Quantitative easing A policy measure in which a central bank buys financial assets to inject a predetermined quantity of money in the financial system.

Quote-driven markets Markets that rely on dealers to establish firm prices at which securities can be bought and sold. Also called *dealer markets*.

Quoted depth The number of shares available for purchase or sale at the quoted bid and ask prices.

Ratio spread An option strategy in which a long position in a certain number of options is offset by a short position in a certain number of other options on the same underlying, resulting in a risk-free position.

Rational economic man A self-interested, risk-averse individual who has the ability to make judgments using all available information in order to maximize his/her expected utility.

Re-base With reference to index construction, to change the time period used as the base of the index.

Real estate Interests in land or structures attached to land.

Real estate investment trusts (REITs) Publicly traded equities representing pools of money invested in real estate properties and/or real estate debt.

Real option An option involving decisions related to tangible assets or processes.

Real risk-free interest rate The single-period interest rate for a completely risk-free security if no inflation were expected.

Rebalancing In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

Rebalancing range A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

Rebate rate The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

Recallability trap The tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory.

Recession A broad-based economic downturn, conventionally defined as two successive quarterly declines in GDP.

Regime A distinct governing set of relationships.

Regret The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

Regret-aversion bias An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

Regulatory risk The risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change.

Reinvestment risk The risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate.

Relative economic strength forecasting approach An exchange rate forecasting approach that suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate.

Relative strength indicators A price momentum indicator that involves comparing a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.

Remaindermen Beneficiaries of a trust; having a claim on the residue.

Repo rate The interest rate on a repurchase agreement.

Representativeness bias A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

Repurchase agreements (repos) In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount, while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

Repurchase yield The negative of the expected percent change in number of shares outstanding, in the Grinold–Kroner model.

Residence jurisdiction A framework used by a country to determine the basis for taxing income, based on residency.

Residence–residence conflict When two countries claim residence of the same individual, subjecting the individual's income to taxation by both countries.

Residence–source conflict When tax jurisdiction is claimed by an individual's country of residence and the country where some of their assets are sourced; the most common source of double taxation.

Residue With respect to trusts, the funds remaining in a trust when the last income beneficiary dies.

Resistance levels Price points on dealers' order boards where one would expect to see a clustering of offers.

Retired-lives The portion of a pension fund's liabilities associated with retired workers.

Returns-based benchmarks Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

Returns-based style analysis An approach to style analysis that focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns.

Reverse repos Repurchase agreement from the standpoint of the lender.

Revocable trust A trust arrangement wherein the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets.

Risk budgeting The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

Risk exposure A source of risk. Also, the state of being exposed or vulnerable to a risk.

Risk premium approach An approach to forecasting the return of a risky asset that views its expected return as the sum of the risk-free rate of interest and one or more risk premiums.

Risk reversal With respect to foreign exchange option strategies, one involving a long position in a call option and a short position in a put option.

Risk tolerance The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

Rolling return The moving average of the holding-period returns for a specified period (e.g., a calendar year) that matches the investor's time horizon.

Sale and leaseback A transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rate and term acceptable to the new owner and on financial terms consistent with the marketplace.

Sample estimator A formula for assigning a unique value (a point estimate) to a population parameter.

Sample-size neglect A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or "real" data).

Sandwich spread An option strategy that is equivalent to a short butterfly spread.

Satisfice A combination of "satisfy" and "suffice" describing decisions, actions, and outcomes that may not be optimal, but are adequate.

Savings–investment imbalances forecasting approach An exchange rate forecasting approach that explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate.

Scenario analysis A risk assessment technique involving the examination of the performance of a portfolio under specified situations.

Seagull spread An extension of the risk reversal foreign exchange option strategy that limits downside risk.

Secondary offering An offering after the initial public offering of securities.

Sector/quality effect In a fixed-income attribution analysis, a measure of a manager's ability to select the "right" issuing sector and quality group.

Security selection effect In a fixed-income attribution analysis, the residual of the security's total return after other effects are accounted for; a measure of the return due to ability in security selection.

Segmentation With respect to the management of insurance company portfolios, the notional subdivision of the overall portfolio into sub-portfolios each of which is associated with a specified group of insurance contracts.

Self-attribution bias A bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control.

Self-control bias A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

Sell side Broker/dealers that sell securities and make recommendations for various customers, such as investment managers and institutional investors.

Semi-active management A variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark with tightly controlled risk relative to the benchmark. Also called *enhanced indexing* or *risk-controlled active management.*

Separate property regime A marital property regime under which each spouse is able to own and control property as an individual.

Settlement netting risk The risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.

Settlement risk When settling a contract, the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.

Settlor (or grantor) An entity that transfers assets to a trustee, to be held and managed for the benefit of the trust beneficiaries.

Shari'a The law of Islam. In addition to the law of the land, some follow guidance provided by Shari'a or Islamic law.

Sharpe ratio A measure of risk-adjusted performance that compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. Also called *reward-to-variability*.

Short sale against the box Shorting a security that is held long.

Shortfall probability The probability of failing to meet a specific liability or goal.

Shortfall risk The risk that portfolio value will fall below some minimum acceptable level during a stated time horizon; the risk of not achieving a specified return target.

Shrinkage estimation Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

Shrinkage estimator The formula used in shrinkage estimation of a parameter.

Smart beta Involves the use of simple, transparent, rules-based strategies as a basis for investment decisions.

Smart routing The use of algorithms to intelligently route an order to the most liquid venue.

Smoothing rule With respect to spending rates, a rule that averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

Social proof A bias in which individuals tend to follow the beliefs of a group.

Socially responsible investing An approach to investing that integrates ethical values and societal concerns with investment decisions. Also called *ethical investing*.

Soft dollars The use of commissions to buy services other than execution services. Also called *soft dollar arrangements* or *soft commissions*.

Sole ownership Owned by one person; assets held in sole ownership are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will through the probate process.

Solow residual A measure of the growth in total factor productivity that is based on an economic growth model developed by economist Robert M. Solow.

Sortino ratio A performance appraisal ratio that divides the difference between a portfolio's return and a minimum acceptable return by downside deviation.

Source jurisdiction A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Source–source conflict When two countries claim source jurisdiction of the same asset; both countries may claim that the income is derived from their jurisdiction.

Sovereign risk A form of credit risk in which the borrower is the government of a sovereign nation.

Spread curve The fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Spread duration A measure used in determining a portfolio's sensitivity to changes in credit spreads.

Stale price bias Bias that arises from using prices that are stale because of infrequent trading.

Static hedge A hedge that is not sensitive to changes in the price of the asset hedged.

Stationary A series of data for which the parameters that describe a return-generating process are stable.

Status quo bias An emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change.

Status quo trap The tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past.

Sterling ratio The compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%.

Stock companies With respect to insurance companies, companies that have issued common equity shares.

Stock index futures Futures contracts on a specified stock index.

Stops Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

Straddle An option strategy involving the purchase of a put and a call on the same underlying with the same exercise price and expiration date. If the put and call are held long, it is a long straddle; if they are held short, it is a short straddle.

Straight-through processing Systems that simplify transaction processing through the minimization of manual and/or duplicative intervention in the process from trade placement to settlement.

Strangle A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

Strap An option strategy involving the purchase of two calls and one put.

Strategic asset allocation 1) The process of allocating money to IPS-permissible asset classes that integrates the investor's return objectives, risk tolerance, and investment constraints with long-run capital market expectations. 2) The result of the above process, also known as the policy portfolio.

Strategic buyers Buyers who have a strategic motive (e.g., realization of synergies) for seeking to buy a company.

Strategy benchmarks See custom security-based benchmarks.

Stratified sampling A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

Strip An option strategy involving the purchase of two puts and one call.

Structural level of unemployment The level of unemployment resulting from scarcity of a factor of production.

Structural risk Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

Structured note A variation of a floating-rate note that has some type of unusual characteristic such as a leverage factor or in which the rate moves opposite to interest rates.

Style drift Inconsistency in style.

Style index A securities index intended to reflect the average returns to a given style.

Stylized scenario A type of analysis often used in stress testing. It involves simulating the movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio.

Sunshine trades Public display of a transaction (usually high-volume) in advance of the actual order.

Support levels Price points on dealers' order boards where one would expect to see a clustering of bids.

Surplus The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

Surplus capital Capital that is in excess of primary capital.

Survey method A method of capital market expectations setting that involves surveying experts.

Survival probability The probability an individual survives in a given year; used to determine expected cash flow required in retirement.

Survivorship bias Bias that arises in a data series when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain; when a data series as of a given date reflects only entities that have survived to that date.

Swap rate The interest rate applicable to the pay-fixed-rate side of an interest rate swap.

Tactical asset allocation Asset allocation that involves making short-term adjustments to asset class weights based on short-term predictions of relative performance among asset classes.

Tactical rebalancing A variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals.

Tail risk The risk that there are more actual events in the tail of a probability distribution than would be predicted by probability models.

Tail value at risk (or conditional tail expectation) The VaR plus the expected loss in excess of VaR, when such excess loss occurs.

Target covariance matrix A component of shrinkage estimation; allows the analyst to model factors that are believed to influence the data over periods longer than observed in the historical sample.

Tax avoidance Developing strategies that minimize tax, while conforming to both the spirit and the letter of the tax codes of jurisdictions with taxing authority.

Tax efficiency The proportion of the expected pretax total return that will be retained after taxes.

Tax evasion The practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

Tax premium Compensation for the effect of taxes on the after-tax return of an asset.

Tax risk The uncertainty associated with tax laws.

Taylor rule A rule linking a central bank's target short-term interest rate to the rate of growth of the economy and inflation.

Temporary life insurance A type of life insurance that covers a certain period of time, specified at purchase. Commonly referred to as "term" life insurance.

Term life insurance A type of life insurance policy that provides coverage for a specified length of time and accumulates little or no cash values.

Territorial tax system A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Testamentary gratuitous transfer The bequeathing or transfer of assets upon one's death. From a recipient's perspective, it is called an inheritance.

Testator A person who makes a will.

Theta The change in price of an option associated with a one-day reduction in its time to expiration; the rate at which an option's time value decays.

Tick The smallest possible price movement of a security.

Time deposit A deposit requiring advance notice prior to a withdrawal.

Time-series estimators Estimators that are based on lagged values of the variable being forecast; often consist of lagged values of other selected variables.

Time to expiration The time remaining in the life of a derivative, typically expressed in years.

Time value The difference between the market price of an option and its intrinsic value, determined by the uncertainty of the underlying over the remaining life of the option.

Time-weighted average price (TWAP) strategy A logical participation strategy that assumes a flat volume profile and trades in proportion to time.

Time-weighted rate of return The compound rate of growth over a stated evaluation period of one unit of money initially invested in the account.

Tobin's *q* An asset-based valuation measure that is equal to the ratio of the market value of debt and equity to the replacement cost of total assets.

Top-down Proceeding from the macroeconomy, to the economic sector level, to the industry level, to the firm level.

Top-down approach A credit strategy approach that involves formulating a view on major macroeconomic trends and then selecting the bonds that the investor expects to perform best in the expected environment.

Total factor productivity (TFP) A variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

Total future liability With respect to defined-benefit pension plans, the present value of accumulated and projected future service benefits, including the effects of projected future compensation increases.

Total rate of return A measure of the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized).

Total return equity swap A swap contract that involves a series of exchanges of the total return on a specified asset or equity index in return for specified fixed or floating rate payments.

Total return payer Party responsible for paying the reference obligation cash flows and return to the receiver, but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Total return receiver Party receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread.

Total return swap A swap in which one party agrees to pay the total return on a security. Often used as a credit derivative, in which the underlying is a bond.

Tracking error The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking risk*.

Tracking risk The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking error*.

Trade blotter A device for entering and tracking trade executions and orders to trade.

Trade settlement Completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller.

Trading activity In fixed-income attribution analysis, the effect of sales and purchases of bonds over a given period; the total portfolio return minus the other components determining the management effect in an attribution analysis.

Transaction exposure The risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale.

Translation exposure The risk associated with the conversion of foreign financial statements into domestic currency.

Transparency Availability of timely and accurate market and trade information.

Trigger points In the context of portfolio rebalancing, the endpoints of a rebalancing range (corridor).

Twist With respect to the yield curve, a movement in contrary directions of interest rates at two maturities; a nonparallel movement in the yield curve.

Type I error With respect to manager selection, keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct).

Type II error With respect to manager selection, firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect).

Underfunded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is less than 100 percent.

Underwriting (profitability) cycle A cycle affecting the profitability of insurance companies' underwriting operations.

Unit-linked life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *variable life insurance*.

Universal life insurance A type of life insurance policy that provides for premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element.

Unrelated business income With respect to the US tax code, income that is not substantially related to a foundation's charitable purposes.

Unstructured modeling Modeling without a theory on the underlying structure.

Uptick rules Trading rules that specify that a short sale must not be on a downtick relative to the last trade at a different price.

Urgency of the trade The importance of certainty of execution.

Utility The level of relative satisfaction received from the consumption of goods and services.

Utility theory Theory whereby people maximize the present value of utility subject to a present value budget constraint.

Valuation reserve With respect to insurance companies, an allowance, created by a charge against earnings, to provide for losses in the value of the assets.

Value The amount for which one can sell something, or the amount one must pay to acquire something.

Value at risk (VaR) A probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy over a specified period of time.

Value-motivated traders Traders that act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range.

Value weighted With respect to index construction, an index in which each security in the index is weighted according to its market capitalization. Also called *market-capitalization weighted*.

Variable life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *unit-linked life insurance*.

Variable prepaid forward A monetization strategy that involves the combination of a collar with a loan against the value of the underlying shares. When the loan comes due, shares are sold to pay off the loan and part of any appreciation is shared with the lender.

Variable universal life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *flexible-premium variable life*.

Vega A measure of the sensitivity of an option's price to changes in the underlying's volatility.

Venture capital The equity financing of new or growing private companies.

Venture capital firms Firms representing dedicated pools of capital for providing equity or equity-linked financing to privately held companies.

Venture capital fund A pooled investment vehicle for venture capital investing.

Venture capital trust An exchange-traded, closed-end vehicle for venture capital investing.

Venture capitalists Specialists who seek to identify companies that have good business opportunities but need financial, managerial, and strategic support.

Vested With respect to pension benefits or assets, said of an unconditional ownership interest.

Vintage year With reference to a private equity fund, the year it closed.

Vintage year effects The effects on returns shared by private equity funds closed in the same year.

Volatility Represented by the Greek letter sigma (σ), the standard deviation of price outcomes associated with an underlying asset.

Volatility clustering The tendency for large (small) swings in prices to be followed by large (small) swings of random direction.

Volume-weighted average price (VWAP) The average price at which a security is traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade.

Volume-weighted average price (VWAP) strategy A logical participation strategy that involves breaking up an order over time according to a prespecified volume profile.

Wealth relative The ending value of one unit of money invested at specified rates of return.

Whole life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *ordinary life insurance*.

Will A document associated with estate planning that outlines the rights others will have over one's property after death. Also called *testament*.

Within-sector selection return In attribution analysis, a measure of the impact of a manager's security selection decisions relative to the holdings of the sector benchmark.

Worst-case scenario analysis A stress test in which we examine the worst case that we actually expect to occur.

Yardeni model An equity valuation model, more complex than the Fed model, that incorporates the expected growth rate in earnings.

Yield beta A measure of the sensitivity of a bond's yield to a general measure of bond yields in the market that is used to refine the hedge ratio.

Yield curve The relationship between yield and time to maturity.

Yield to worst The yield on a callable bond that assumes a bond is called at the earliest opportunity.

Z-spread The yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. Also known as zero-volatility spread.

Zero-cost collar A transaction in which a position in the underlying is protected by buying a put and selling a call with the premium from the sale of the call offsetting the premium from the purchase of the put. It can also be used to protect a floating-rate borrower against interest rate increases with the premium on a long cap offsetting the premium on a short floor.

Zero-premium collar A hedging strategy involving the simultaneous purchase of puts and sale of call options on a stock. The puts are struck below and the calls are struck above the underlying's market price.

CUSTOMER SERVICE

68

Index

A
ABO. *see* accumulated benefit obligation
ACCF. *see* American Council for Capital Formation
accrual equivalent returns, 243–245
accrual equivalent tax rates, 244–245
accrual taxes, on interest and dividends, 233–234
accrued defined benefits, 387
accumulated benefit obligation (ABO), 465
accumulated service, 465
accumulation
  of tax-exempt investment accounts, 246–247
  using long- vs. short-term capital gains tax rate, 258–260
accumulation phase of life (accumulation stage), 163–164
Active Accumulators, 113–114, 116
active investors, 109
  in behavioral alpha process, 111–112
  trading behavior of, 254
active-lives portion of pension liability, 465, 469, 471–472
active management
  of endowment investments, 496
  with index-tracking strategies, 355
  and semi-strong-form EMH, 31–32
active trading, tax drag and, 254, 258
actual cost value policy, 419
actuaries, 409
adaptive markets hypothesis (AMH), 41
adjustment bias. *see* anchoring and adjustment bias
advanced life deferred annuities (ALDAs), 426
Adventurer (BB&K classification), 110
adverse selection, 409
advertising, availability bias and, 68
advice. *see* financial advice
adviser-client relations, 117–120
  client expectations, 118
  consistency of approach, 118
  and estate planning, 272
  financial goals, 118
  limitations of risk tolerance questionnaires, 119–120
  mutual benefits, 119
after-tax accumulations and returns, 232–245
  accrual equivalent returns, 243–245
  accrual equivalent tax rates, 244–245
  blended tax environments, 239–243
    after tax returns, 241
    future long term accumulation, 242–243
  for investor types, 254–255
  simple tax environments, 232–239
    accrual taxes on interest and dividends, 233–234
    cost basis, 237–238
    deferred capital gains, 234–237
    returns-based taxes, 232–237
    wealth-based taxes, 238–239
  and tax-exempt accounts vs. TDAs, 248–250
after-tax asset allocation
  in estate planning, 292–293
  and investment accounts, 247–248
after-tax liquidation value, 326
after-tax mean–variance optimization, 260
after tax returns, 241
after-tax wealth, 225–226
age, workforce, 471–472
aggregate family portfolios, 291–293
aging, behavioral changes and, 117
Albania, 304
ALCO. *see* asset/liability risk management committee
ALDAs. *see* advanced life deferred annuities
all-risks homeowner's insurance policy, 418
Allstate Corporation, 515, 516
alpha. *see also* behavioral alpha (BA) process
  and semi-strong-form EMH, 32
  tax, 251
  zero-alpha mutual funds, 58–59
A.M. Best, 503
American Council for Capital Formation (ACCF), 245–246
American Express, 464
AMH. *see* adaptive markets hypothesis
amygdala, 20
analysts, biases of, 125–136
  in conducting research, 133–136
  conservatism bias, 53–54
  and management's influence on analysis, 131–133
  overconfidence in forecasting skills, 126–131
anchoring and adjustment bias, 63–64, 94–95, 332
  consequences of, 63
  detection and methods of overcoming, 63–64
  diagnostic questions, 87, 93
  and forecasting, 132–133
  and market bubbles, 143
  and momentum effect, 140
anchor points, 63
Anglo-Saxon law, 158
annuities, 422–431. *see also specific types, e.g.:* fixed annuities
  advantages and disadvantages of fixed and variable annuities, 426–428
  appropriateness of, 429–431
  classifications of, 423–426
    advanced life deferred annuities, 426
    deferred fixed annuities, 424
    deferred variable annuities, 423–424
    immediate fixed annuities, 424–426
    immediate variable annuities, 424
  comparing, 426
  from insurance companies, 504
  as non-publicly traded marketable assets, 389
  parties to, 423
  payout methods of, 428–429
  tax benefits of, 429
annuitization, 427
anomalies. *see* market anomalies
appreciation, of gifted assets, 290, 291
appropriateness
  of annuities, 429–431
  of life insurance, 416
arbitrage
  limited, 35–36
  for pension funds, 252–253
Argentina
  in Hague Conference, 304
  interest income taxation, 227
  tax-advantaged savings accounts, 246
  tax regime, 231, 347
aspirational risk bucket, 334, 335
aspiration levels, 23
asset allocation. *see also* behaviorally-modified asset allocation
  after-tax, 247–248, 292–293
  and availability bias, 68
  effect of human capital on, 440–443
  and endowment bias, 79
  glide path, 121
  for individual investors, 188–199
    case studies, 188–196
    examples, 188–191, 193–196
    Monte Carlo simulation, 196–199
    process of elimination for, 188–196
  and risk reduction, 443–446
  simulations of, 196
  statements of, 192–193
  and sustainability of spending rates, 285–287
asset class(es)
  concentrated positions in, 323–324
  human capital as, 442
  in Monte Carlo simulations, 198, 199
  selection for asset allocation, 195
  tax profiles of, 251–252
asset integration, 165
asset/liability management, 467
asset/liability risk management committee (ALCO), 520–521
asset location
  and asset allocation, 196
  and concentrated positions, 337
  defined, 188
  and real estate monetization, 367
  and wealth management, 251–254
asset location decision, 337
asset marketability risk, 505–506

asset pricing
behavioral approach to, 38–39, 145
in behavioral finance, 167
CAPM, 34, 38
in traditional finance, 166
asset protection, trusts for, 301
assets
business, 389
current, 386
on economic balance sheets, 396
investment, 388
mixed, 387
non-core, 360
non-current, 386
non-marketable, 389–390
employer pension plans, 389–390
government pensions, 390
non-publicly traded marketable, 388–389
annuities, 389
business assets, 389
cash-value life insurance, 389
collectibles, 389
real estate, 388
personal, 387
portable, 464
on traditional balance sheets, 395
asset segregation, in behavioral finance, 166
attitudes toward risk, 17–19
Australia
capital gains taxes, 236, 240n.5
corporate estate tax freeze, 338
deemed disposition regimes, 298
defined-benefit pension plans, 473
exit taxes, 306–307
franking in, 228
in Hague Conference, 304
market bubbles, 142
tax-advantaged savings accounts, 246
tax regime, 231, 347
wealth taxes, 238
Austria
capital gains tax, 228
and EUSD, 311
in Hague Conference, 304
tax regime, 231, 347
automobile insurance, 420
autopilot strategies, 120
availability bias, 67–69, 332
of analysts, 126, 128
consequences of, 68
detection and methods of overcoming, 69
diagnostic questions, 87
and forecasting, 132
and momentum effect, 140
AXA Equitable-NY, 504, 516

B
Bachelier, Louis, 30
back-end loaded tax benefits, 246
Bahamas, 276
Bailard, Biehl, and Kaiser (BB&K) model of investor behavior, 109–110
bancassurance, 519n.29
banks
investment policy statements for, 524–526
portfolio management for, 519–526
legal and regulatory factors, 523
liquidity requirements, 523
return objectives, 523
risk objectives, 522
tax concerns, 523
time horizon, 523
unique circumstances, 524
BA process. *see* behavioral alpha process
Barnewall, Marilyn MacGruder, 108–109
Barnewall two-way model of investor behavior, 108–109
Basel Accord, 523
Basel II, 523
Basel III, 523
base-rate neglect, 56–57
base rates, forecasting and, 129–131
basis, cost, 235, 237–238, 329
Bayes' formula, 9–11, 129
BB&K model of investor behavior. *see* Bailard, Biehl, and Kaiser model of investor behavior
behavioral alpha (BA) process, 111–116
Active Accumulators, 116
classifying investors as behavioral investor types, 113–116
Friendly Followers, 115
Independent Individualists, 115–116
Passive Preservers, 114–115
plotting on risk tolerance and active/passive scale, 112
testing for behavioral biases, 112–113
testing for risk tolerance and active/passive traits, 111–112
behavioral biases, 49–105
of analysts, 125–136
in conducting research, 133–136
and management's influence on analysis, 131–133
overconfidence in forecasting skills, 126–131
behaviorally-modified asset allocation, 81–96
about, 82–83
amount to moderate or adapt, 84–86
case studies, 86–96
guidelines, 83–84
and investment policy development, 81–82
and BFMI/BFMA, 7–8, 49–50
categorizations of, 50–52
cognitive errors, 52–69
belief perseverance biases, 52–63
confirmation bias, 55–56
conservatism bias, 52–55
emotional biases vs., 51–52
hindsight bias, 62
illusion of control bias, 61
information-processing biases, 63–69
representativeness bias, 56–60
in committee decision making, 136–138
emotional biases, 70–81
cognitive errors vs., 51–52
endowment bias, 78–79
loss-aversion bias, 70–73
overconfidence bias, 73–76
regret-aversion bias, 79–80
self-control bias, 76–77
status quo bias, 77–78
practice problems, 99–101
solutions to problems, 102–105
testing for, 112–113
behavioral factors in investment processes, 107–154
adviser-client relations, 117–120
client expectations, 118
consistency of approach, 118
financial goals, 118
limitations of risk tolerance questionnaires, 119–120
mutual benefits, 119
analysts' forecasts, 125–136
biases in conducting research, 133–136
management's influence on analysis, 131–133
overconfidence in forecasting skills, 126–131
committee decision making, 136–138
investment committee dynamics, 137
techniques for structuring and operating committees, 137–138
and decision-making process, 107–108
investor types, 108–117
Barnewall two-way model, 108–109
BB&K model, 109–110
limitations of classification, 116–117
psychographic modeling, 110–116
market behavior, 138–145
bubbles and crashes, 141–144
market anomalies, 138–139
momentum, 140–141
value and growth stocks, 144–145
portfolio construction, 120–125
and behavioral portfolio theory, 124–125
company stock, 122–123
excessive trading, 123–124
home bias, 124
inertia and default options, 120–121
naïve diversification, 122
target date funds, 121
practice problems, 148–152
solutions to problems, 153–154
behavioral finance, 5–47. *see also* behavioral factors in investment processes
about, 5–7
decision making in, 20–28
bounded rationality, 22–24
decision theory, 20–22
prospect theory, 24–28
individual behavior in, 7–20
attitudes toward risk, 17–19
BFMA and BFMI, 7–8
challenges to rational economic man, 15
and neuro-economics, 19–20
traditional perspectives on, 8–14
utility maximization, 15–17
market behavior in, 28–41
adaptive markets hypothesis, 41
asset pricing, 38–39
and behavioral portfolio theory, 39–40
consumption and savings, 37–38
traditional perspectives on, 28–36
and traditional perspectives on portfolio construction, 36

practice problems, 45–46
and psychological profiling of individual investors, 166–167
solutions to problems, 47
traditional vs.
individual behavior, 8–14
market behavior, 28–36
portfolio construction, 36
behavioral finance macro (BFMA), 7–8, 49
behavioral finance micro (BFMI), 7–8, 49
behavioral investor types (BITs), 110. *see also* psychographic modeling of investors
behavioral life-cycle model, 37–38
behaviorally-modified asset allocation, 81–96
about, 82–83
amount to moderate or adapt, 84–86
case studies, 86–96
high wealth level investor with emotional biases, 88–92
low wealth level investor with cognitive errors, 92–96
guidelines, 83–84
and investment policy development, 81–82
behavioral portfolio theory (BPT), 39–40
example, 40
and mental accounting bias, 64
and portfolio construction, 124–125
Belarus, 304
Belgium
capital gains tax, 236
and EUSD, 311
in Hague Conference, 304
tax regime, 231, 347
wealth taxes, 238
belief perseverance biases, 52–63
confirmation bias, 55–56
conservatism bias, 52–55
hindsight bias, 62
illusion of control bias, 61
representativeness bias, 56–60
beliefs
and conservatism bias, 54
and representativeness bias, 58
beneficiaries, of trusts, 184–185
benefit period, of disability income insurance, 417–418
Bernanke, Ben, 6
BFMA. *see* behavioral finance macro
BFMI. *see* behavioral finance micro
biases. *see* behavioral biases
BITs. *see* behavioral investor types
blackout periods, 330
bonds, insurance company investments in, 515–516
bond yields, 426
Bosnia and Herzegovina, 304
bottom up approach to psychographic modeling, 110
bounded rationality, 15, 20, 22–24
BPT. *see* behavioral portfolio theory
Brazil
capital gains tax, 228
gift tax, 293
in Hague Conference, 304
tax rates, 179
tax regime, 231, 347
bubbles, market, 141–144
Bulgaria, 304
business assets, 389
business cycle risk, 324
business equity. *see* private business equity
businesses, concentrated positions held in, 357–358
business owners with concentrated positions
monetization decision-making process for, 336–337, 362–364
personal lines of credit for, 360–361
profile of, 358
buyers
financial, 358–359
strategic, 358

C

calendar anomalies, 35
Canada
capital gains taxes, 228, 240n.5
capital loss limits, 255
corporate estate tax freeze, 338
deemed disposition regimes, 298
defined-benefit pension plans, 473
exit taxes, 306–307
in Hague Conference, 304
insurance companies, 499, 507
interest income taxation, 233
ownership of private business enterprises, 322
tax-advantaged savings accounts, 246
tax rates, 179
tax regime, 231, 347
transfer of assets from DB plans, 464n.1
universal banking, 519
cancellation, in prospect theory, 25
capital. *see specific types, e.g.:* financial capital
capital asset pricing model (CAPM), 34, 38
capital gains, 179
accumulation using long- vs. short-term tax rate on, 258–260
and cost basis, 237–238
deferred, 234–237
and income, 181–182
and investment policy statements, 179
tax provisions for, 228
in tax regimes, 229–231, 347
capital losses, 255–258
capital market constraints, on concentrated positions, 330–331
CAPM. *see* capital asset pricing model
career development phase (financial stages of life), 393
case studies
Susan Fairfax, 188–194
high-wealth-level investor with emotional biases, 88–92
behaviorally-modified portfolio decision, 92
diagnostic tests, 89–91
effect of biases, 91
moderate or adapt recommendation, 91–92
Inger family, 159–162, 164–165, 170–171, 173–175, 177, 178, 184–187, 194–196
low-wealth-level investor with cognitive biases, 92–96
behaviorally-modified portfolio decision, 96
diagnostic tests, 93–94
effect of biases, 95
moderate or adapt recommendation, 95
Perrier family, 433–440
cash balance plans, 463, 483
cash flow
of non-insurance companies, 512
volatility of, 502
cashless collars, 349–350
cash management, 526–527
cash-value life insurance, 389
cash values
inside buildup of, 506
and policy reserves, of life insurance, 412–413
casualty insurance companies. *see* non-life insurance companies
categorization, availability bias and, 68
Cautious investors, 169
Cayman Islands, 276
Celebrity (BB&K classification), 110
certainty equivalents, 13
certainty overconfidence, 74–75
CFCs. *see* controlled foreign corporations
chairs, committee, 137
charitable gratuitous transfers, 298–299
charitable remainder trusts (CRT), 287–288
charitable trusts, 368
children
forced heirship rules, 274–276
gifting to, 182, 184
Chile
in Hague Conference, 304
tax-advantaged savings accounts, 246
tax rates, 179
China
in Hague Conference, 304
home ownership, 388
interest income taxation, 233
investment real estate, 324
tax rates, 179
tax regime, 231, 347
Citibank, 520
Citicorp, 520
civil law systems, 274, 300, 302
clawback provisions, 275
client-adviser relations. *see* adviser-client relations
closing out of transactions prior to expiration, 342
CNA Financial Corporation, 515, 516
codification, in prospect theory, 25
cognitive cost, 58
cognitive dissonance, 52, 125–126
cognitive errors, 52–69
of analysts, 125
anchoring and adjustment bias, 63–64
availability bias, 67–69
in behavioral finance, 166

cognitive errors (*continued*)
belief perseverance biases, 52–63
confirmation bias, 55–56
conservatism bias, 52–55
hindsight bias, 62
illusion of control bias, 61
representativeness bias, 56–60
in BFMI, 7–8
confirmation bias, 55–56
conservatism bias, 52–55
defined, 50
emotional biases vs., 51–52
framing bias, 65–67
hindsight bias, 62
illusion of control bias, 61
information-processing biases, 63–69
anchoring and adjustment bias, 63–64
availability bias, 67–69
framing bias, 65–67
mental accounting bias, 64–65
of investors with concentrated positions, 332
investors with emotional biases and, 117
low-wealth-level investor case study, 92–96
behaviorally-modified portfolio decision, 96
diagnostic tests, 93–94
effect of biases, 95
moderate or adapt recommendation, 95
mental accounting bias, 64–65
representativeness bias, 56–60
coinsurance (health insurance), 403n.3, 421
collars, 330n.1
cashless, 349–350
debit, 350
collectibles, 389
collision coverage, for automobile insurance, 420
Colombia
deemed disposition regimes, 298
gift tax, 293
interest income taxation, 233
tax regime, 231, 347
wealth taxes, 238, 306
combination, in prospect theory, 25
combined ratio, 514
committee decision making, 136–138
investment committee dynamics, 137
techniques for structuring and operating committees, 137–138
commodity pools, 526
common law systems, 274, 300
Common Progressive Tax Regime, 229–231, 347
common stock to surplus ratio, 512–513
community foundations, 484–485
community property regimes, 275–276
companies, as estate planning tools, 303
company-specific risk, with concentrated positions, 325–326
company-sponsored foundations, 484–485
company stock, 122–123
and confirmation bias, 56
in defined-contribution pension plans, 478
in 401(k) plans, 484n.9
personal lines of credit secured by, 360–361
comparable data, in forecasting, 128–129
competition, perfect, 12
Completeness axiom (utility theory), 9
completeness portfolios, 355
complex models, forecasting with, 127
compounded returns, 287
compounding
and cash flow volatility, 502
and tax deferrals, 235
comprehensive coverage, for automobile insurance, 420
comprehensive major medical insurance, 421
concentrated single-asset positions, 321–379
asset classes involved in, 323–324
defined, 323
global perspective on management, 322–323
investment real estate, 366–369
about, 366
monetization strategies, 367–369
investment risks, 324–327
management principles, 327–340
asset location and wealth transfers, 337–340
capital market constraints, 330–331
decision-making process, 332–337, 340, 362–364
goal-based planning, 334–337
institutional constraints, 329–330
investor constraints, 328–329
objectives, 327–328
psychological considerations, 331–334
monetizing, 322
practice problems, 372–375
private business equity, 356–366
about, 356–357
business owner profile, 358
business profile, 357–358
monetization strategies, 358–366
single-stock positions, 340–356
about, 340–341
management strategies, 343–356
non-tax considerations, 342–343
tax considerations, 341–342
solutions to problems, 376–379
concurrent returns, expected value of, 198
conditional 1/n diversification, 122
conditional probability. *see* Bayes' formula
confidence intervals
for forecasts, 126
and prediction overconfidence, 74
confirmation bias, 55–56, 332
of analysts, 133
consequences of, 55–56
detection and methods of overcoming, 56
diagnostic questions, 88
and market bubbles, 143
conjunction fallacy, 133, 135
conservatism bias, 52–55, 87, 332
consistency, of investment approach, 118
constraints of individual investors, 176–187
asset allocation based on, 193, 194
and asset location, 253–254
case study, 186–187
with concentrated positions, 328–329
legal and regulatory environment, 182–185
family foundation, 184–185
jurisdiction, 185
personal trust, 183–184
liquidity, 176–178
in sample IPSs, 186–187, 190–191
taxes, 179–182
early transfers, 182
tax avoidance, 181
tax deferral, 181
tax reduction, 181–182
transfer at death, 182
wealth transfer taxes, 182
time horizon, 178
unique circumstances, 185
consumer comparisons, of life insurance costs, 413–415
consumption
behavioral approach to, 37–38
and self-control bias, 76–77
taxes on, 226
Continuity axiom (utility theory), 9
contractual restrictions, on concentrated positions, 330
control. *see also* illusion of control bias; self-control bias
of emotions, 51
of family limited partnerships, 297–298
of trusts, 300
voting, 328
controlled foreign corporations (CFCs), 303
copayments (health insurance), 403n.3, 421
core capital, 278–288
defined, 279
Monte Carlo estimation, 285–288
mortality table estimation, 280–284
corporate risk management, 476–477
corporate share of income, 506
correlation analysis, personality typing of investors and, 170
cost basis, 235, 237–238, 329
cost of living rider, for disability income insurance, 418
costs
consumer comparisons of life insurance, 413–415
replacement, in homeowner's insurance, 418–419
counterparty credit risk, 342
Cowles, Alfred, 31–32
CPI. *see* US Consumer Price Index
crashes, market, 141–144
credited rates, 500
credit method, 307
credit risk, 517n.28
counterparty, 342
for insurance companies, 502
and investments for banks, 522
Croatia, 304

cross-border estate planning, 303–311
Hague Conference, 304–305
taxes, 305–310
double taxation, 307–310
exit taxes, 306–307
foreign tax credit provisions, 307–308
income taxes, 305–306
wealth and wealth transfer taxes, 306
transparency and offshore banking, 310–311
cross hedging, 355–356
crowds, committees vs., 137–138
CRT. *see* charitable remainder trusts
current assets, 386
Cyprus, 293, 304
Czech Republic
capital gains tax, 236
gift tax, 293
in Hague Conference, 304
interest income taxation, 233
tax regime, 231, 347

D
DALBAR, 59, 75
DB pension plans. *see* defined-benefit pension plans
DC pension plans. *see* defined-contribution pension plans
death, transfer of taxes at, 182
death benefits, of deferred variable annuities, 424
death tax, 182
debit collars, 350
decapitalizations, 495
decision making
about concentrated single-asset positions, 332–337, 340, 362–364
behavioral factors in, 107–108
in behavioral finance, 20–28
bounded rationality, 22–24
decision theory, 20–22
prospect theory, 24–28
committee, 136–138
investment committee dynamics, 137
techniques for structuring and operating committees, 137–138
in traditional finance, 8–11
decision-making style questionnaire, 168
decision theory, 20–22
deductible
health insurance, 403n.3, 421
homeowner's insurance, 419
deduction method, 308
deemed dispositions, 298, 307
deemed distributions, 303
default options, 120–121
deferred annuities, 423
deferred capital gains, 234–237
deferred fixed annuities, 424
deferred variable annuities, 423–424
defined-benefit (DB) pension plans
defined, 463
defined-contribution vs., 463–464
discounting liabilities for, 283
portfolio management for, 464–477
corporate risk management, 476–477
legal and regulatory factors, 472–473
liquidity requirement, 470–471
return objectives, 468–470
risk objectives, 465–468
tax concerns, 472
time horizon, 471–472
unique circumstances, 473–476
defined-contribution (DC) pension plans
behavioral factors in portfolio construction for, 120–125
defined, 463
defined-benefit vs., 463–464
portfolio management for, 477–484
middle-aged participant, 478
objectives and constraints framework, 478–479
participant in early career, 479
Deloitte Touche Tohmatsu International Business Guides, 227
demand deposit, 520n.30
demutualization, 499
Denmark
capital gains taxes, 240n.5
in Hague Conference, 304
tax regime, 231, 347
deposits, time and demand, 520n.30
derivatives
foundation investments in, 488
over-the-counter, 342–343
detection of dominance, in prospect theory, 25
deterministic retirement analysis, 197
direct loss, of property, 402
direct real estate, 388
disability income insurance, 417–418, 434, 438
discounting
hyperbolic, 76
of liabilities for DB pension plans, 283
of spending needs, 282–283
valuation discounts, 297–298
discount rate
for human capital, 383–384
in life insurance pricing, 411
discretionary trusts, 300, 301
discretionary wealth, 279n.11, 335n.4
disequilibrium behavior, temporary, 139
disintermediation, 499, 505
disposition effect, 70, 71, 141, 143–144
distribution phase of life, 164
diversification
and asset allocation, 193, 194
and availability bias, 68
and confirmation bias, 55–56
in defined-contribution pension plans, 477–478
with human capital, 483–484
and illusion of control bias, 61
and mental accounting bias, 124–125
naïve, 122
divestiture, of private business equity, 360
divide-and-conquer procedure, 23
dividends
accrual taxes on, 233–234
heavy dividend tax regime, 229–231
tax provisions for, 228
in tax regimes, 229–231, 235, 347
documentation, research, 136
donor-advised funds, 367–368
dopamine, 19–20
double inflection utility function, 17
double taxation, 307–310
double taxation treaties (DTT), 308–310
Dow Jones Industrial Average, 74–75
Dow Jones Industrial Index, 34
downside risks, aversion to, 145
DTT. *see* double taxation treaties
due diligence, for DB plans, 473
duration, 521

E
early career phase (financial stages of life), 392–393
early retirement phase (financial stages of life), 393
early transfers of taxes, 182
earnings risk, 400–401
earn outs, 362
economic (holistic) balance sheet
assets on, 382
human capital considered on, 442
used in individual risk management, 396–397
economic state, bias about, 63
Ecuador, 304
education phase (financial stages of life), 392
efficient frontier, retirement income, 430–431
efficient market hypothesis (EMH), 28–36
and AMH, 41
and calendar anomalies, 35
and fundamental anomalies, 33–34
and limited arbitrage, 35–36
review of, 28–30
semi-strong-form, 29–32
studies challenging, 32–36
studies in support of, 30–32
and technical anomalies, 34
weak-form, 29–31
Egypt, 179, 304
eligible investments, 507
elimination, asset allocation by, 188–196
elimination period, of disability income insurance, 418
emergency reserves, 176
EMH. *see* efficient market hypothesis
emotional biases, 70–81
of analysts, 125
in BFMI, 7–8
cognitive errors vs., 51–52
in conducting research, 133–136
defined, 50
endowment bias, 78–79
high-wealth-level investor case study, 88–92
behaviorally-modified portfolio decision, 92
diagnostic tests, 89–91
effect of biases, 91
moderate or adapt recommendation, 91–92
investors with cognitive errors and, 117
of investors with concentrated positions, 331–332
loss-aversion bias, 70–73
consequences of, 72
detection and methods of overcoming, 73
effect of, 71
myopic loss aversion, 72–73

emotional biases (*continued*)
overconfidence bias, 73–76
consequences of, 75
detection and methods of overcoming, 75–76
prediction and certainty overconfidence, 74–75
regret-aversion bias, 79–80
self-control bias, 76–77
status quo bias, 77–78
emotional intelligence, 79
emotions, control of, 51
Employee Retirement Income Security Act (ERISA), 468, 472–473, 477–478
employee share ownership plans, 483–484
employee stock ownership plans
as hybrid pension plans, 483–484
and private business equity, 361–362
employer mandates, 330
employer pension plans (vested), 389–390
endowment bias, 78–79, 331
of analysts, 134
consequences of, 79
detection and methods of overcoming, 79
diagnostic questions, 87
and status quo bias, 77
endowments
foundations vs., 485
investment policy statements, 496–499
portfolio management for, 489–499
legal and regulatory factors, 495
liquidity requirements, 494
return objectives, 492–494
risk objectives, 491–492
tax concerns, 495
time horizon, 494–495
unique circumstances, 495–496
Enron Corporation, 122, 325
equity forward sale contracts, 345
equity market valuation, of insurance company investments, 507
equity monetization, 343–347
equity premium puzzle, 72
equity swaps, total return, 344–345
ERISA. *see* Employee Retirement Income Security Act
errors of commission, 79
errors of omission, 79
estate planning, 271–318
core capital, 278–288
Monte Carlo estimation, 285–288
mortality table estimation, 280–284
cross-border, 303–311
Hague Conference, 304–305
taxes, 305–310
transparency and offshore banking, 310–311
defined, 273
estates, wills, and probate, 273–274
and legal systems, 274–276
practice problems, 313–314
solutions to problems, 315–318
taxes, 276–278
tools for, 299–303
companies and controlled foreign corporations, 303
foundations, 302
life insurance, 302–303
trusts, 299–301
transferring excess capital, 288–299
charitable gratuitous transfers, 298–299
deemed dispositions, 298
generation skipping, 296
gifts and bequests, 288–296
spousal exemptions, 297
valuation discounts, 297–298
and wealth management, 272–273
estates, 273–274
estate tax, 182, 277n.8, 288, 338–340
estimates
biases for, 63–64
of human capital, 383–386
Estonia, 304
ethical investment considerations, for DB plans, 473
EU. *see* European Union
Europe. *see also specific countries*
defined-benefit pension plans, 464
family foundations, 184
insurance companies, 499
ownership of private business enterprises, 322
trusts, 302
European Community, 304
European Union (EU), 307, 507
European Union Savings Directive (EUSD), 311
evaluation phase (prospect theory), 26–28
evidence, 135
excess benefit transactions, 495
excess capital, 288–299
charitable gratuitous transfers, 298–299
deemed dispositions, 298
defined, 279
generation skipping, 296
gifts and bequests, 288–296
location of gift tax liability, 293–296
taxable gifts, 291–293
tax-free gifts, 289–291
spousal exemptions, 297
valuation discounts, 297–298
excessive risk
and hindsight bias, 62
and loss-aversion bias, 72
and mental accounting bias, 64
and self-control bias, 77
excessive trading, 61, 123–124
and framing bias, 67
and loss-aversion bias, 72
and market bubbles, 143
exchange funds, 356
exchange-traded instruments, 342–343
exempt investors, 254
exemption method, 307–308
exit strategies, staged, 359, 361
exit taxes, 306–307
expectations, investor
and adviser-client relations, 118
in behavioral finance, 166
in traditional finance, 165
expected future cash flows, 280–284
expected risk-adjusted performance, 193, 194
expected value of concurrent returns, 198
expenses, liquidity and, 176
expiration, closing out prior to, 342
Extraordinary Popular Decisions and the Madness of Crowds (Mackay), 141

F
Fairfax, Susan (case study), 188–194
Fama and French three-factor asset pricing model, 144
Fama–French multi-risk-factor framework, 38
familiarity effect, 123
family foundation, 184–185
family foundations, 487
family limited partnerships (FLPs), 297–298, 339
family members, sale of private business equity to, 360
FAS 115. *see* Financial Accounting Standard 115
Federal Deposit Insurance Corporation, 520
feedback
and committee decision making, 137
and hindsight bias, 128
and overconfidence bias, 128
and research, 135
fees
associated with annuities, 428
with exchange-traded instruments, 342
fiduciary, 473
Financial Accounting Standard (FAS) 115, 502n.22
financial advice
for Active Accumulators, 116
on asset allocation, 84–86
for Friendly Followers, 115
for Independent Individualists, 115–116
for Passive Preservers, 114–115
financial buyers, 358–359
financial capital, 386–390
account types, 390
core (*see* core capital)
defined, 382–383
excess (*see* excess capital)
human vs., 387
investment assets, 388
non-marketable assets, 389–390
employer pension plans, 389–390
government pensions, 390
non-publicly traded marketable assets, 388–389
annuities, 389
business assets, 389
cash-value life insurance, 389
collectibles, 389
real estate, 388
personal assets, 387
publicly traded marketable assets, 388
financial market participants (FMPs), 52
financial market risk. *see* market risk
Financial Modernization Act, 506–507
Financial Services Authority, 507
financial stages of life, 392–394
career development phase, 393
early career phase, 392–393
early retirement phase, 393

education phase, 392
late retirement phase, 394
peak accumulation phase, 393
pre-retirement phase, 393
financial wealth. *see* wealth
financing, mortgage, 367
Finland, 231, 233, 304, 347
Fitch Ratings, 503
fixed annuities
advantages and disadvantages of variable and, 426–428
deferred, 424
immediate, 424–426
fixed trusts, 300
Flat and Heavy Tax Regime, 230–232, 347
Flat and Light Tax Regime, 230–232, 347
flat tax structures, 227, 230–232
flexibility
of annuities, 427
with exchange-traded instruments, 343
flexible-premium variable life insurance, 500n.20
FLPs. *see* family limited partnerships
FMPs. *see* financial market participants
forced heirship rules, 274–276
Ford Foundation, 490
Ford Motor Company, 137
forecasts, 125–136
biases in research for, 133–136
and conservatism bias, 54
evaluating previous, 135
management's influence on analysis, 131–133
and overconfidence in forecasting skills, 126–131
case studies, 128, 130–131
remedial actions, 128–131
and representativeness bias, 58
foreign tax credit provisions for estate planning, 307–308
Fortune, 145
forward conversions with options, 345
foundation phase of life, 163
foundations, 184–185, 302
endowments vs., 485
investment policy statements for, 488–489
portfolio management for, 484–489
legal and regulatory factors, 488
liquidity requirements, 486–487
return objectives, 486
risk objectives, 486
tax concerns, 487–488
time horizon, 487
unique circumstances, 488
401(k) plans, 120n.4
company stock in, 122–123, 484n.9
excessive trading in, 124
framing bias, 37–38, 65–67
consequences of, 67
detection and methods of overcoming, 67
diagnostic questions, 87
effect of, 65–66
and forecasting, 132–133
and loss-aversion bias, 72
and management's influence on forecasts, 132–133
and overinvestment in company stock, 123
framing stage (prospect theory), 24–26
France
defined-benefit pension plan, 473
domestic tax relief, 308
estate tax, 299
gift tax, 293, 295–296
in Hague Conference, 304
long-term after-tax asset allocation, 293
ownership of private business enterprises, 322
recognition of trusts, 274
tax-free gifts, 289
tax rates, 179
tax regime, 231, 347
wealth taxes, 306
franking, 228
Free Commission (UK), 473
Friendly Followers, 115
fully funded pension plans, 465
fundamental anomalies, 33–34
funded status, 465
funds functioning as endowments, 490
future long term accumulation, 242–243
future market expectations, and annuities, 427
future pension contributions, 469
future value interest factor (FVIF), 233

G

GAAP. *see* US Generally Accepted Accounting Principles
gains taxes. *see* capital gains
gamblers' fallacy, 133–134, 141
GDP. *see* gross domestic product
GDP deflator. *see* gross domestic product deflator
GE, 35
generation skipping, 182, 296
geometric average return, 287
geometric smoothing rule, 491
Georgia, 304
Germany
defined-benefit pension plans, 466n.3
exit taxes, 306–307
gift tax, 293
in Hague Conference, 304
home ownership, 388
interest income taxation, 228, 233
long-term after-tax asset allocation, 293
ownership of private business enterprises, 322
recognition of trusts, 274
tax-advantaged savings accounts, 246
tax-free gifts, 289
tax rates, 179
tax regime, 231, 347
wealth taxes, 238
gifts, 184–185, 288–296
and forced heirship rules, 275
location of gift tax liability, 293–296
taxable gifts, 291–293
taxes on, 277, 288
tax-free gifts, 289–291
and wealth transfer taxes, 182
Gilovich, Thomas, 55
glide path, asset allocation, 121
global income tax structures, 226–232
common elements, 227–229
dimensions in tax planning, 232
general regimes, 229–232
international comparisons of income taxes, 227
goal-based planning, 334–337
goals, financial
and ability to take risk, 174–175
and adviser-client relations, 118
goals-based investing, 81–82
goodwill, 386n.2
government pensions, 390
government retirement benefits, 387
Gramm-Leach-Bliley Act (1999), 520
grandchildren, gifting to, 182, 184, 296
grantors, 183–184, 299–300
gratuitous transfers, 277
charitable, 298–299
of excess wealth, 288
Greece, 231, 233, 304, 347
gross domestic product (GDP) deflator, 492–493
Grossman-Stiglitz paradox, 29
gross premiums, of life insurance, 411–412
growth approach, 172
growth investing, fundamental anomalies and, 33–34
growth stocks, performance of, 144
guaranteed investment contracts, 504
guaranteed minimum withdrawal benefit for life rider, 424
Guardian (BB&K classification), 110

H

Hague Conference on Private International Law, 304–305
Hague Convention of the Law Applicable to Trusts and Their Recognition, 304–305
halo effect, 144
Hayward, Paul, 346n.7
health maintenance organization (HMO), 421
health/medical insurance, 420–421
in case study, 434
direct costs of, 403n.3
recommendations for, in case study, 438
health risk, 403–404
Heavy Capital Gain Tax Regime, 229–231, 347
Heavy Dividend Tax Regime, 229–231, 235, 347
Heavy Interest Tax Regime, 229–231, 347
hedge funds, 526
hedging strategies
cross hedging, 355–356
of single-stock positions, 341, 348–354
cashless collars, 349–350
prepaid variable forwards, 350
purchasing of puts, 348–349
selecting best strategy, 352–354
heirs, forced heirship rules, 274–276
HEPI. *see* Higher Education Price Index
herding behavior, 80, 140
heuristics, 22n.13, 23, 67
Higher Education Price Index (HEPI), 492–493
highest-in, first-out (HIFO) tax lot accounting, 258

high-net-worth investors (HNWI), 272–273. *see also* portfolio management, for individual investors
high-wealth-level investor with emotional biases (case study), 88–92
  behaviorally-modified portfolio decision, 92
  diagnostic tests, 89–91
  effect of biases, 91
  moderate or adapt recommendation, 91–92
hindsight bias, 62
  of analysts, 127
  consequences of, 62
  detection and methods of overcoming, 62–63
  diagnostic questions, 87
  and market bubbles, 143
  overcoming, 128
  and regret, 141
historical data, in Monte Carlo simulations, 199
HMO. *see* health maintenance organization
HNWI. *see* high-net-worth investors
holding period
  and asset location, 253
  and capital gains tax rate, 236
holding period management, 258–260
holistic balance sheet. *see* economic (holistic) balance sheet
home bias, 124, 144–145
home equity, 177–178
homeowner's insurance, 418–420
homestead, 177
Hong Kong
  offshore banking centers, 310–311
  RNDs' assets in, 306
  tax regime, 231, 347
  territorial tax system, 305
Horan, Stephen M., 337n.5
house money effect, 71
human capital
  defined, 382
  diversification of investments in, 483–484
  in economic balance sheets, 396–397
  effect of, on asset allocation policy, 440–443
  financial vs., 387
  as implied asset, 279
  in net wealth, 399–400
  in risk management for individual investors, 383–386
human capital risk, 442–443
human life value method
  of calculating life insurance needs, 412
  in case study, 435–438
Hungary, 231, 304, 306, 347
hybrid pension plans, 463, 483–484
hyperbolic discounting, 76

I

IAS. *see* International Accounting Standards
Iceland, 304
idiosyncratic risks, 443
illiquidity
  of family limited partnerships, 297–298
  illiquid holdings of individual investors, 177–178
illusion of control bias, 61, 332
  of analysts, 127
  consequences of, 61
  detection and methods of overcoming, 61
  diagnostic questions, 88
  of management, 132
illusion of knowledge, 74, 126, 143, 331
immediate annuities, 422–423
immediate fixed annuities, 424–426
immediate variable annuities, 424
implicit advice, 123
incentives
  for analysts, 128
  for overinvestment in company stock, 123
income
  for banks, 522
  corporate share of, 506
  from dividends, 228
  endowment spending based on, 490
  interest (*see* interest income)
  net investment, 487–488
  and objectives for concentrated positions, 328
  pension, 469
  policyholder's share of, 506
  unrelated business, 487, 495
income approach, 172
income beneficiaries, of trusts, 184–185
income taxes, 347
  and cross-border estate planning, 305–306
  in estate planning, 276
  and gains taxes, 181–182
  global structures, 226–232
    common elements, 227–229
    dimensions in tax planning, 232
    general regimes, 229–232
    international comparisons of income taxes, 227
  and investment policy statements, 179
income yield, for immediate fixed annuities, 424–425
indemnity plan, as health/medical insurance, 421
Independence axiom (utility theory), 9
independent events, emotional biases about, 133
independent foundations, 484–485
Independent Individualists, 115–116
index-tracking strategies, 355
India
  capital gains tax, 228
  in Hague Conference, 304
  tax rates, 179
  tax regime, 231, 347
  wealth taxes, 306
indifference curve analysis, 15–17
indirect loss, of property, 402–403
individual balance sheet, 394–400
  changes in net wealth, 397–400
  economic (holistic) balance sheet, 396–397
  traditional balance sheet, 395–396
individual behavior, 7–20
  in behavioral finance, 14–19
    attitudes toward risk, 17–19
    challenges to rational economic man, 15
    utility maximization, 15–17
  BFMA and BFMI, 7–8
  and neuro-economics, 19–20
  in traditional finance, 8–14
    perfect rationality, self-interest, and information, 12
    rational economic man, 11–12
    risk aversion, 13–14
    utility theory and Bayes' formula, 8–11
individual investors. *see* portfolio management, for individual investors; risk management, for individual investors
Individualist (BB&K classification), 110
Individualist investors, 169
Individual Retirement Accounts (IRAs), 246
individual risk exposures, 400–405
  earnings risk, 400–401
  health risk, 403–404
  liability risk, 403
  longevity risk, 402
  premature death risk, 401
  property risk, 402–403
Indonesia, 231, 347
inertia, 77, 120–121
inflation
  impact of, on annuity income, 428
  and returns for endowments, 492–494
inflation risk, 324
information, perfect, 12, 15
information-processing biases, 63–69
  anchoring and adjustment bias, 63–64
  availability bias, 67–69
  framing bias, 65–67
  mental accounting bias, 64–65
Inger family (case study), 159–162, 164–165, 170–171, 173–175, 177, 178, 184–187, 194–196
inheritance, 277
inheritance tax, 277n.8, 288
inherited securities, endowment bias and, 78, 79
initial public offerings, 361
inside buildup of cash values, 506
insider status, 190
institutional constraints, on concentrated positions, 329–330
institutional investors
  defined, 462
  portfolio management for, 461–544
    about, 462
    banks, 519–526
    endowments, 489–499
    foundations, 484–489
    insurance industry, 499–519
    investment intermediaries, 526–527
    pension funds, 463–484
    practice problems, 530–536
    solutions to problems, 537–544
insurable interest, for life insurance, 408
insurance industry
  life insurance companies, 499–511
  non-life insurance companies, 511–519
  portfolio management for, 499–519

insurance program analysis, 433–440
  current insurance plan in, 434
  program review in, 434–438
  recommendations from, 438–440
insurances
  disability income insurance, 417–418
  health/medical insurance, 420–421
  liability insurance, 421–422
  life insurance, 405–416
    elements of, 407–409
    pricing of, 409–415
    types of, 406–407
    uses of, 406
  other types of, 422
  property insurance, 418–420
    automobile insurance, 420
    homeowner's insurance, 418–420
interest
  retained, 184–185
  in tax regimes, 229–232, 347
interest income
  accrual taxes on, 233–234
  and asset location, 253
  heavy interest tax regime, 229–231
  tax provisions for, 227–228
interest rate risk, 427, 501–502, 521
interest spread, 521
intergenerational equity, 486
Internal Revenue Code, 488, 495
Internal Revenue Service (IRS), 487
International Accounting Standards (IAS)
  investments by insurance companies, 507
  pension expense, 469
intestate (term), 273
investment accounts, 245–250
  after-tax asset allocation, 247–248
  selecting, 248–250
  tax-deferred accounts, 246
  tax-exempt accounts, 246–247
investment assets, 388
investment banking, 519–520
investment committees, dynamics of, 137
Investment Company Act (1940), 496
investment instruments, asset allocation and, 196
investment intermediaries, 526–527
investment opportunity set, availability bias and, 68
investment policy statements (IPSs)
  and asset allocation, 189–191
  behaviorally-modified asset allocation for, 81–82
  for individual investors, 171–187
    constraints, 176–187
    return objectives, 172–174
    risk objectives, 174–175
  for institutional investors
    banks, 524–526
    defined-contribution pension plans, 478–482
    endowments, 496–499
    foundations, 488–489
    life insurance companies, 508–511
    non-life insurance companies, 518–519
investment processes, behavioral factors in. *see* behavioral factors in investment processes
investment real estate
  about, 366
  client objectives with, 328
  concentrated positions in, 324, 366–369
  monetization strategies, 367–369
    donor-advised funds, 367–368
    mortgage financing, 367
    sale and leaseback, 368–369
investment risk
  with concentrated single-asset positions, 324–327
  and taxes, 250–251
investors. *see also under* portfolio management
  behavioral types, 108–117
    Barnewall two-way model, 108–109
    BB&K model, 109–110
    limitations of classification, 116–117
    psychographic modeling, 111–116
  characteristics of individual investors, 162–171
    psychological profiling, 165–171
    situational profiling, 162–165
IPO puzzle, 139
IPSs. *see* investment policy statements
IRAs. *see* Individual Retirement Accounts
Ireland, 231, 304, 347
irrational behavior, predicting, 117
irrevocable trusts, 183–184, 300, 301
IRS. *see* Internal Revenue Service
Islamic law, 274
isolation effect, 26
Israel
  exit taxes, 306–307
  in Hague Conference, 304
  tax rates, 179
  tax regime, 231, 347
Italy
  gift tax, 293
  in Hague Conference, 304
  interest income taxation, 227
  tax-advantaged savings accounts, 246
  tax rates, 179
  tax regime, 231, 347

J

January effect, 35, 139
Japan
  asset price bubble of 1980s, 142
  banking, 519–520
  defined-benefit pension plans, 464
  economic state of, 63
  gift tax, 293, 296
  in Hague Conference, 304
  insurance companies, 507
  interest income taxation, 233
  investment real estate, 324
  life insurance industry, 503
  taxable gifts, 292, 294
  tax on stock purchases, 323
  tax rates, 179
  tax regime, 231, 347
joint life annuities, 423, 428–429
joint ownership with right to survivorship, 274
Jordan, 179, 304
junk bonds, 64
jurisdiction
  of individual investors, 185
  residence, 305
  source, 305
  tax, 305

K

Kahneman, Daniel, 70, 166
Kazakhstan, 231, 232n.4, 347
Kenya, 231, 347
key employees, sale of private business equity to, 359–360
Keynes, John Maynard, 80
Knight, Frank, 21
knock-out options, 348–349
Korea, 179, 304

L

lack of marketability discount, 339
large-capitalization stocks, performance of, 144
late retirement phase (financial stages of life), 394
Latin America, 322. *see also specific countries*
Latvia, 231, 304, 347
LawInContext, 274
law of small numbers, 57
leaseback, 368–369
legacy goals, 416
legal constraints of individual investors, 182–185
  family foundation, 184–185
  jurisdiction for taxation, 185
  personal trust, 183–184
  in sample IPSs, 187
legal factors for institutional investors
  banks, 523
  defined-benefit plans, 472–473
  endowments, 495
  foundations, 488
  life insurance companies, 506–508
  non-life insurance companies, 517
legal issues, with estate planning, 274–276
leverage-adjusted duration gap, 521
leveraged recapitalization, 359
liabilities. *see also* pension liabilities
  on economic balance sheets, 396
  on traditional balance sheets, 395
liability insurance, 421–422
liability risk, 403
life annuities, 428
life annuities with refund, 428
life balance sheets, 279–280
life-cycle finance, 382
life-cycle models, traditional vs. behavioral, 37–38
life expectancy, core capital based on, 280–281
life insurance, 405–416. *see also specific types, e.g.:* whole life insurance
  in case study, 434–438
  elements of, 407–409
  as estate planning tool, 302–303

life insurance (*continued*)
participating vs. non-participating policies, 406–407
pricing of, 409–415
appropriateness of, 416
calculation of net and gross premiums, 411–412
cash values and policy reserves, 412–413
consumer comparisons of life insurance costs, 413–415
mortality expectations, 409–410
riders on, 407
types of, 406–407
uses of, 406
life insurance companies
investment policy statements for, 508–511
portfolio management for, 499–511
legal and regulatory factors, 506–508
liquidity requirements, 505–506
return objectives, 503–505
risk objectives, 501–503
tax concerns, 506
time horizon, 506
unique circumstances, 508
life insurance underwriting, 409
life-only annuities, 425
lifetime gratuitous transfers, 277
life with period certain annuities, 425, 428
LIFO tax lot accounting. *see* lowest in, first-out tax lot accounting
Light Capital Gain Tax Regime, 229–231, 347
limited arbitrage, 35–36
Lincoln National Corporation, 504, 516
liquidation value, 354
liquidity
for banks, 521
and concentrated positions, 327, 329, 331
of individual investors, 176–178
in sample IPSs, 186–187, 190
and tax-sheltered savings accounts, 181
liquidity constraints of investors
and asset location, 253
and gift tax, 294
and life insurance, 303
liquidity requirements for institutional investors
banks, 523
defined-benefit plans, 470–471
endowments, 494
foundations, 487
life insurance companies, 505–506
non-life insurance companies, 515
Lithuania, 304
loading, in life insurance pricing, 411
loans, non-recourse, 367
London, England, 310–311
London Business School, 140
longevity insurance, 440
longevity risk, in risk management, 402
long tail, of non-life insurance, 511
long-term capital gains tax rate, accumulation using, 258–260
Long Term Capital Management (LTCM), 41
long-term health care, 404
long-term health care insurance, 439
long-term investments, identifying, 59
loss, direct vs. indirect, 402–403
loss aversion
in behavioral finance, 166
myopic, 72–73
and prospect theory, 26
loss-aversion bias, 70–73, 94–95
consequences of, 72
detection and methods of overcoming, 73
diagnostic questions, 87, 94
effect of, 71
myopic loss aversion, 72–73
and prospect theory, 166
loss control, 432
loss harvesting, 181–182
loss prevention, 432
loss reduction, 432
lowest in, first-out (LIFO) tax lot accounting, 258
low-wealth-level investor with cognitive biases (case study), 92–96
behaviorally-modified portfolio decision, 96
diagnostic tests, 93–94
effect of biases, 95
moderate or adapt recommendation, 95
loyalty effects, overinvestment in company stock and, 123
LTCM. *see* Long Term Capital Management
Luxembourg
and EUSD, 311
in Hague Conference, 304
offshore banking centers, 310–311
tax regime, 231, 347

M

Macedonia, former Yugoslav Republic of, 304
Mackay, Charles, 141
macro securities, 178
maintenance phase of life, 164
Malaysia, 231, 304, 347
Malta, 304
managed care facilities, 177
management, influence on analysts' forecasts of, 131–133
management buyout, 359–360
margin, net interest, 521
marginal tax rate, 227
margin-lending rule, 330
market anomalies
behavioral factors in, 138–139
calendar anomalies, 35
defined, 138–139
and EMH, 32–36
fundamental anomalies, 33–34
technical anomalies, 34
market behavior, 28–41
behavioral factors in, 138–145
bubbles and crashes, 141–144
market anomalies, 138–139
momentum, 140–141
value and growth stocks, 144–145
in behavioral finance, 37–38, 41
adaptive markets hypothesis, 41
behavioral approach to asset pricing, 38–39
behavioral approach to consumption and savings, 37–38
and behavioral portfolio theory, 39–40
in traditional finance, 28–36
market bubbles, 141–144
market crashes, 141–144
market growth, 144
market momentum, 140–141
market risk, diversifying, 334–335
market risk bucket, 334, 335
Markowitz, Harry, 39, 122
Markowitz framework for diversifying market risk, 334
matching contributions, in company stock, 123
maximum out-of-pocket expenses, for health insurance, 421
maximum yearly benefits, for health insurance, 421
means-end analysis, 23
mean–variance models
behavioral models vs., 125
for portfolio construction, 36
mean–variance optimization (MVO), 260
measure of wealth classifications, 163
medical insurance. *see* health/medical insurance
memory, hindsight bias and, 62
mental accounting bias, 37–38, 64–65, 94–95
consequences, 64
detection and methods of overcoming, 64–65
diagnostic questions, 87, 93–94
and diversification, 124–125
Methodical investors, 169
Mexico
in Hague Conference, 304
tax rates, 180
tax regime, 231, 347
wealth taxes, 306
Microsoft, 35
middle-market businesses, 357
minimum size constraints, 343
Ministry of Finance, 507
minority interests, valuation discounts for, 297
mismatch in character, 352–354
mixed assets, 387
moderate or adapt recommendations
in behaviorally-modified asset allocation, 84–86
for high-wealth-level investors, 91–92
for low-wealth-level investors, 95
moderating, of cognitive biases, 51–52
momentum, market, 140–141
Monaco, 304
monetization, 322
monetization strategies
for business equity, 358–366
evaluating, 362–366
types of, 358–362

for investment real estate, 367–369
donor-advised funds, 367–368
mortgage financing, 367
for single-stock position, 341
monetizing tax-free exchanges, 369
money markets, 526–527
Monte Carlo simulation
for asset allocation, 196–199
estimating core capital with, 285–288
of returns for endowments, 493–494
Montenegro, 304
Montier, James, 53–54
Moody's Investor Service, 503
Morningstar, 58
Morocco, 304
mortality credits, 427, 429–430
mortality expectations, 409–410
mortality risk, 401
mortality tables, estimating core capital with, 280–284
mortgage financing, 367
mortgage loans, 388
moving averages, technical anomalies in, 34
multistage time horizons, 178
municipal bonds, taxation of interest on, 253
mutual benefit, adviser-client relations and, 119
mutual funds, 526
alphas of, 32
skilled and unskilled, 58–59
zero-alpha, 58–59
mutual life insurance companies, 411
mutuals, 499
MVO. *see* mean–variance optimization
Myner Commission (UK), 473
myopic loss aversion, 72–73

N

naïve diversification, 122
named-risks homeowner's insurance policy, 418
National Association of Insurance Commissioners (NAIC), 501, 506–507
needs, financial
and ability to take risk, 174–175
estimating, 280–284
needs analysis method, 412
negative liquidity events, 176
net employment capital, 279
Netherlands
exit taxes, 306–307
gift tax, 293
in Hague Conference, 304
taxable gifts, 291
tax-advantaged savings accounts, 246
tax regime, 231, 347
wealth taxes, 306
net interest margin, 521
net interest spread, 503
net investment income, 487–488
net-of-tax principal, 257–258
net payment cost index, for life insurance, 414–415
net premiums, of life insurance, 411–412
net wealth, 390, 397–400
net wealth tax, 276–277
net worth, 390
net worth tax, 276–277
neuro-economics, 19–20
New York, New York, 310–311
New York State, 507, 517
New Zealand
in Hague Conference, 304
marginal tax rates, 180
tax regime, 231, 347
Nigeria, 231, 347
no free lunch (assumption), 29
non-cancelable and guaranteed renewable policy, for disability income insurance, 418
non-cancelable policy, for disability income insurance, 418
non-controlling interest, discount for, 339
non-core assets, 360
non-current assets, 386
non-insurance risk transfers, 432
non-life insurance companies, 511–519
legal and regulatory factors, 517
liquidity requirements, 515
portfolio policy determination, 517
return objectives, 513–515
risk objectives, 512–513
tax concerns, 516–517
time horizon, 515–516
non-marketable assets, 389–390
employer pension plans, 389–390
government pensions, 390
non-participating life insurance policy, 407
non-publicly traded marketable assets, 388–389
annuities, 389
business assets, 389
cash-value life insurance, 389
collectibles, 389
real estate, 388
non-recourse loans, 367
non-recourse mortgages, 388
non-taxable accounts, 390
Norway, 231, 304, 347

O

objectives
management of concentrated single-asset positions, 327–328
return objectives
asset allocation based on, 192–195
for banks, 523
for defined-benefit plans, 468–470
for endowments, 492–494
for foundations, 486
for individual investors, 172–174
for life insurance companies, 503–505
for non-life insurance companies, 513–515
in sample IPSs, 186, 189
of risk management strategies, 391
risk objectives
asset allocation based on, 193–195
for banks, 522
for defined-benefit plans, 465–468
for endowments, 491–492
for foundations, 486
for individual investors, 174–175
for life insurance companies, 501–503
for non-life insurance companies, 512–513
objectives and constraints framework, 478–479
OECD Commentary, 309
OECD Model Treaty. *see* Organisation for Economic Co-operation and Development Model Treaty
off-balance-sheet debt, 330
offshore banking, 310–311
offshore investments, 185
oil price shock (1970s), 142
1/n naïve diversification, 122
ongoing expenses, liquidity and, 176
Ontario Pension Commission, 473
operating foundations, 484–485
operating investments, 476–477
optimism, 132
options
default, 120–121
forward conversions with, 345
knock-out, 348–349
put, 348–349
option to purchase additional insurance rider, 418
ordinary life insurance, 499n.19
Organisation for Economic Co-operation and Development (OECD) Model Treaty, 308–309
OTC derivatives. *see* over-the-counter derivatives
Other Than Temporary Impairment (OTTI), 502n.22
outright sale
of concentrated position, 328–329
of single-stock position, 341
overconfidence
certainty, 74–75
and halo effect, 144
and market bubbles, 143
prediction, 74–75
overconfidence bias, 73–76, 91
of analysts, 126–131
case studies, 128, 130–131
remedial actions for, 128–131
and committee decision making, 137
consequences of, 75
detection and methods of overcoming, 75–76
diagnostic questions, 88–90
of management, 132
and overinvestment in company stock, 123
prediction and certainty overconfidence, 74–75
overfunded pension plans, 466
over-the-counter (OTC) derivatives, 342–343
ownership
in civil law, 274
joint ownership with right to survivorship, 274
sole, 274

P
Pacific Rim, 322. *see also specific countries*
Pakistan, 180, 231, 347
Panama, 304
Paraguay, 304
Paris, France, 310–311
partial disability benefit, 417
participant-directed DC pension plans, 464
participating life insurance policy, 406–407
parties, to annuities, 423
partnerships
  FLPs, 297–298
  tax avoidance with, 181
Pascal, Blaise, 20–21
passive investors, 108–109
  in behavioral alpha process, 111–112
  trading behavior of, 254
Passive Preservers, 113–115
path dependency, 197n.8
payout methods, of annuities, 428–429
PBGC. *see* Pension Benefit Guaranty Corporation
PBO. *see* projected benefit obligation
PBO pension plan. *see* projected benefit obligation pension plan
peak accumulation phase (financial stages of life), 393
Pension Benefit Guaranty Corporation (PBGC), 468
pension funds, 463–484
  arbitrage argument for, 251–254
  defined, 463
  portfolio management for, 463–484
    defined-benefit plans, 464–477
    defined-contribution plans, 478–483
    hybrid plans, 483–484
pension income, 469
pension liabilities
  active-lives portion of, 465, 469, 471–472
  defined, 463
  managing investments for, 469
  pension investments and, 476–477
  retired-lives portion of, 465, 469, 471
pension participants, objectives and constraints of, 478–479
pension plans
  considered in asset allocation, 444–445
  defined-benefit, 464–477
    corporate risk management with, 476–477
    discounting liabilities for, 283
    legal and regulatory factors with, 472–473
    liquidity requirements for, 470–471
    return objectives for, 468–470
    risk objectives for, 465–468
    tax concerns with, 472
    time horizon for, 471–472
    unique circumstances of, 473–476
  defined-contribution, 477–484
    behavioral factors in portfolio construction for, 120–125
    middle-aged participant, 478
    objectives and constraints framework, 478–479
    for participants in early career, 479
  employer pension plans, 389–390
  government pensions, 390
  in net wealth, 399
Pension Protection Fund (PPF), 390
pension surplus, 465, 467
perfect competition, 12
perfect information, 12, 15
perfect rationality, 12
perfect self-interest, 12
performance assessment
  and hindsight bias, 62
  with Monte Carlo simulations, 198–199
period-certain annuities, 425, 428
periodic table of investment returns, 59–60
permanent life insurance, 406–407
Perrier family (case study), 433–440
personal assets, 387
personality types of individual investors, 167–171
  cautious investors, 169
  individualist investors, 169
  methodical investors, 169
  spontaneous investors, 169
personal lines of credit, 360–361
personal risk bucket, 334, 335
personal trusts, 183–184
personal umbrella liability insurance policy, 421–422
Peru, 304
Philippines, 180, 231, 347
plan sponsors, pension fund, 463
pledging requirement, 522
Poland, 231, 304, 347
policyholder reserves, 503n.23
policyholder's share of income, 506
policy pricing, insurance, 513
policy reserves, of life insurance, 412–413
portable assets, 464
portfolio construction
  behavioral factors in, 120–125
    and behavioral portfolio theory, 124–125
    company stock, 122–123
    excessive trading, 123–124
    home bias, 124
    inertia and default options, 120–121
    naïve diversification, 122
    target date funds, 121
  in behavioral finance, 167
  in traditional finance, 36, 166
portfolio management
  for individual investors, 157–223
    about, 158
    asset allocation, 188–199
    case study, 158–162
    investment policy statements, 171–187
    investor characteristics, 162–171
    practice problems, 202–211
    solutions to problems, 212–223
  for institutional investors, 461–544
    about, 462
    banks, 519–526
    endowments, 489–499
    foundations, 484–489
    insurance industry, 499–519
    investment intermediaries, 526–527
    pension funds, 463–484
    practice problems, 530–536
    solutions to problems, 537–544
portfolio performance, taxes and, 180–181
portfolio policy, non-life insurance company, 517
portfolio theory, 226. *see also* behavioral portfolio theory (BPT)
portfolio tilts, 181
portfolio turnover, 116
portfolio volatility, taxes and, 251
portfolio yields, 503, 515
Portugal, 231, 304, 347
PPF. *see* Pension Protection Fund
PPO. *see* preferred provider organization
preadmission certification, 421
prediction overconfidence, 74–75
preexisting conditions, 421
preferred provider organization (PPO), 421
premature death risk, 401
premiums
  life insurance, 302
  net and gross, 411–412
  with puts, 348
prepaid variable forwards, 330, 350
pre-retirement phase (financial stages of life), 393
present value, of human capital, 385–386
price discovery, 342
price is right (assumption), 28–29
price volatility, liquidity and, 176
pricing, asset. *see* asset pricing
primary capital, 335
primary residence, as illiquid holding, 177–178
private business equity, 324, 356–366
  about, 356–357
  business owner profile, 358
  business profile, 357–358
  client objectives with, 328
  monetization strategies, 358–366
    evaluating, 362–366
    types of, 358–362
private clients, portfolio management for. *see* portfolio management, for individual investors
private foundations, 302, 486–488
private wealth management, 251–260. *see also* portfolio management, for individual investors
  after-tax mean–variance optimization, 260
  and after-tax wealth, 225–226
  asset location, 251–254
  and estate planning, 272–273
  holding period management, 258–260
  tax loss harvesting, 255–258
    adding net-of-tax principal, 257–258
    current tax savings, 255–256
    tax deferral, 256–257
  trading behavior, 254–255
probabilistic retirement analysis, 196–199

probabilities
assigning, in research, 135
conditional (*see* Bayes' formula)
from Monte Carlo simulations, 196–199
probate, 273, 302
processing errors, 52
profiling of individual investors. *see* psychological profiling; situational profiling
profitability, of non-insurance companies, 513–514
profitability cycle. *see* underwriting cycle
profit-sharing plans, 463
progressive tax rate structures, 227, 229–231
estate tax in, 278
and tax reduction with trusts, 301
projected benefit obligation (PBO) pension plan, 465
property insurance, 418–420
automobile insurance, 420
in case study, 434
homeowner's insurance, 418–420
recommendations for, in case study, 439–440
property risk, 402–403
property-specific risk, 327
property taxes, 179
prospect theory, 24–28
defined, 18
and loss-aversion bias, 70, 166–167
and utility theory, 20, 22
Prudential, 504, 516
prudent investor rule, 507
Prudent Person Rule, 190
psychographic modeling of investors, 111–116
behavioral alpha process, 111–116
Active Accumulators, 116
classifying as behavioral investor type, 113–116
Friendly Followers, 115
Independent Individualists, 115–116
Passive Preservers, 114–115
plotting on risk tolerance and active/passive scale, 112
testing for behavioral biases, 112–113
testing for risk tolerance and active/passive traits, 111–112
bottom up approach, 110
psychological considerations, with concentrated positions, 331–334
psychological profiling of individual investors, 165–171
behavioral finance, 166–167
personality typing, 167–171
traditional finance, 165–166
put options, hedging with, 348–349
put spread, 348, 350

Q
Qualified Intermediaries (QIs), 311
Quantitative Analysis of Investor Behavior (DALBAR), 59
quasi-endowments, 490

R
range of experience, availability bias and, 68
rational economic man (REM), 11–12, 15
rationality
bounded, 15, 20, 22–24
perfect, 12
in utility theory, 9
rational portfolios, 36
RBC requirements. *see* risk-based capital requirements
real estate
concentrated single-asset positions in, 366–369
as non-publicly traded marketable asset, 388
wealth taxes on, 238
recapitalization, leveraged, 359
recency effect, 140
recourse mortgages, 388
recourse with respect to a debt, 341n.a
reference dependence, 27
refinancing, 369
Registered Retirement Savings Plans (RRSPs), 246
regret, hindsight bias and, 141
regret-aversion bias, 79–80, 91
consequences of, 80
detection and methods of overcoming, 80
diagnostic questions, 87, 89
and status quo bias, 77
regulations, concentrated positions and, 330
regulatory constraints of individual investors, 182–185
family foundation, 184–185
jurisdiction for taxation, 185
personal trust, 183–184
in sample IPSs, 187
regulatory factors for institutional investors
banks, 523
defined-benefit plans, 472–473
endowments, 495
foundations, 488
life insurance companies, 506–508
non-life insurance companies, 517
rehabilitation clause, of disability income insurance, 418
reinvestment risk, 502
relative after-tax value
of taxable gifts, 291, 294
of tax-free gift, 290–291
REM. *see* rational economic man
remaindermen beneficiaries, of trusts, 184–185
replacement costs, in homeowner's insurance, 418–419
representativeness bias, 56–60
of analysts, 126, 128, 134
consequences of, 58
detection and methods of overcoming, 58–60
diagnostic questions, 87
and halo effect, 144
of investment managers, 134
research, forecasting, 133–136
residence, as illiquid holding, 177–178
residence jurisdiction, 305
residence–residence conflicts, 307
residence–source conflicts, 307–310
and double taxation treaties, 308–310
relief from, 307–308
resident, non-domiciliaries (RNDs), 306
residential property boom (2005-2007), 142
residents, taxation of, 305–306
residual disability benefit, 417
resonance, availability bias and, 68
retired-lives portion of pension liability, 465, 469, 471
retirement accounts, tax-deferred, 232
retirement income efficient frontier, 430–431
retirement planning
longevity risk in, 402
Monte Carlo simulation in, 196–199
primary residence in, 178
Retirement Savings Accounts (RSAs), 159, 181
retrievability, availability bias and, 67–68
return(s)
accrual equivalent, 243–245
after tax, 241
of company stock, 123
return objectives
asset allocation based on, 192–195
for individual investors, 172–174
for institutional investors
banks, 523
defined-benefit plans, 468–470
endowments, 492–494
foundations, 486
life insurance companies, 503–505
non-life insurance companies, 513–515
in sample IPSs, 186, 189
return requirement, 469
returns-based taxes, 232–237
reverse mortgages, 178
review processes, overconfidence bias and, 75–76
revocable trusts, 183, 300
rider(s)
cost of living rider, 418
guaranteed minimum withdrawal benefit for life rider, 424
on insurance policies, 407
option to purchase additional insurance rider, 418
risk. *see also specific types, e.g.:* earnings risk
ability to take risk, 174–175
attitudes toward, 17–19
avoiding, 80
evaluation of, in risk management strategies, 391–392
excessive
and hindsight bias, 62
and loss-aversion bias, 72
and mental accounting bias, 64
and self-control bias, 77
identification of, in risk management strategies, 391
willingness to take risk, 175

risk aversion
  for downside risk, 145
  and source of wealth, 162
  in traditional finance, 13–14, 165
risk avoidance, 391, 432
risk-based capital (RBC) requirements, 501, 517, 523
risk-based margin regimes, 330
risk exposures, 400–405
  earnings risk, 400–401
  health risk, 403–404
  liability risk, 403
  longevity risk, 402
  monitoring, in risk management strategies, 392
  premature death risk, 401
  property risk, 402–403
risk management
  for individual investors, 381–458
    annuities, 422–431
    determining optimal strategy, 431–433
    financial capital, 386–390
    framework for, 391–405
    human capital, 383–386
    implementation of, 431–446
    insurances, 405–422
    life-cycle finance, 382
    net wealth, 390
    practice problems, 449–454
    solutions to problems, 455–458
    strategy for, 391–392
  portfolio management for defined-benefit plans, 477
risk neutrality, 13
risk objectives
  asset allocation based on, 193–195
  for individual investors, 174–175
  for institutional investors
    banks, 522
    defined-benefit plans, 465–468
    endowments, 491–492
    foundations, 486
    life insurance companies, 501–503
    non-life insurance companies, 512–513
risk reduction
  and asset allocation, 443–446
  in risk management strategies, 391
risk retention, 392, 432
risk-seeking, 13
risk tolerance
  of defined-benefit pension plans, 466
  of endowments, 491–492
  and goals-based investing, 81–82
  misidentification of, 67
  plotting, in behavioral alpha process, 112
  and return requirements, 172–173
  in sample IPSs, 186, 189–190
  testing for, in behavioral alpha process, 111–112
  and willingness to take risk, 175
risk tolerance questionnaires, 119–120, 168
risk transfer, 391–392, 432
RNDs. *see* resident, non-domiciliaries
Robinson, Thomas R., 337n.5
rolling three-year average spending rule, 491
Romania, 304
Roman law, 274
Roth IRAs, 246
RRSPs. *see* Registered Retirement Savings Plans
RSAs. *see* Retirement Savings Accounts
ruin probabilities, 285, 286
rule-based margin regimes, 330
Russia
  flat tax rate, 227
  gift tax, 293
  in Hague Conference, 304
  tax rates, 180
  tax regime, 231, 232n.4, 347

S

safety-first rules, 191
safety reserve, for core capital, 283, 285
sale(s)
  of concentrated position, 328–329
  of private business equity, 358–360
  short sales against the box, 344, 365–366
  of single-stock position, 341
sale and leaseback transactions, 368–369
sale price, private business equity, 362
sales taxes, 226
Salomon Smith Barney, 520
sample-size neglect, 57
Samuelson, Paul, 72–73
satisfice (term), 22
Saudi Arabia, 231, 232n.4, 347
savings
  behavioral approach to, 37–38
  tax-advantaged, 245–246
  tax-sheltered, 181
screening criteria, investment, 55
search process, for information, 135
securities
  inherited, 78, 79
  macro, 178
  regulations on sale of, 330
  tax-exempt, 181
Security Valuation Book (NAIC), 507
segmentation, of insurance companies, 505
segregation, in prospect theory, 25
self-attribution bias
  of analysts, 126, 127
  of management, 132
  and market bubbles, 143
  and overconfidence bias, 73–74
self-control bias, 37, 76–77
  consequences of, 77
  detection and methods of overcoming, 77
  diagnostic questions, 88, 90–91
self-enhancing bias, 74
self-insured, 392
self-interest, perfect, 12
self-made investors, 162
self-protecting bias, 74
semi-strong-form EMH, 29–32
senior management, sale of private business to, 359–360
separate property regimes, 275
Serbia, 304
serotonin, 19–20
service contracts, as insurance, 422
settlor, 299–300
SEU. *see* subjected expected utility
shadow period, 307
Shari'a, 274
Shiller, Robert, 166, 178
shortfall risk, 467
short sales against the box, 344, 365–366
short-term capital gains tax rate, accumulation using, 258–259
short-term income distributions, 199
simple spending rule, 491
simplification, in prospect theory, 25
Singapore
  offshore banking centers, 310–311
  residence–source conflicts, 307
  RNDs' assets in, 306
  tax regime, 231, 347
  territorial tax system, 305
  wealth taxes, 238
single-asset positions. *see* concentrated single-asset positions
single-premium immediate annuities (SPIAs), 423
single-stock positions, 323, 340–356
  about, 340–341
  non-tax considerations, 342–343
  risk reduction strategies, 343–356
    cross hedging, 355–356
    equity monetization, 343–347
    exchange funds, 356
    hedging, 348–354
    tax-optimized equity strategies, 354–355
    yield enhancement, 354
  tax considerations, 341–342
situational profiling of individual investors, 162–165
  by measure of wealth, 163
  by source of wealth, 162
  by stage of life, 163–165
skewed forecasts, 127
skilled mutual funds, 58–59
skills, overconfidence in, 126–131
Slovakia, 304
Slovenia, 304
SLR. *see* standard of living risk
small-capitalization stocks, performance of, 144
small numbers, law of, 57
smoothing rule, 487, 491–492, 494
social proof, 137
sole ownership, 274
source jurisdiction, 305
source of wealth classifications, 162
source–source conflicts, 307
South Africa
  gift tax, 293
  in Hague Conference, 304
  spousal exemptions for estate tax, 297
  tax-free gifts, 289
  tax rates, 180
  tax regime, 231, 347
South America, trusts in, 302
Spain
  domestic tax relief, 308
  gift tax, 293
  in Hague Conference, 304

tax regime, 231, 347
wealth taxes, 306
S&P Corporation. *see* Standard and Poor's Corporation
spending down, 487
spending policies
endowments, 489–491, 493–494
foundations, 485–487
spending rates, sustainable, 285–287
S&P 500 Index. *see* Standard and Poor's 500 Index
SPIAs. *see* single-premium immediate annuities
sponsor-directed DC pension plans, 464
Spontaneous investors, 169
spousal exemptions, for excess capital, 297
spouses, inheritance rights of, 275
spread
interest, 521
net interest, 503
put, 348, 350
spread order, 349n.8
Sri Lanka, 304
staged exit strategies, 359, 361
stage of life classifications, 163–165, 178
Standard and Poor's (S&P) Corporation, 503
Standard and Poor's (S&P) 500 Index
calendar anomalies in, 35
equity fund investors' performance vs., 59
Monte Carlo simulations of, 198, 199
in studies of EMH, 32
standard of living risk (SLR), 84
State Farm, 515, 516
statements of strategic asset allocation, 192–193
Statman, Meir, 5, 8, 64, 166
status quo bias, 77–78, 120n.5, 331
consequences of, 78
detection and methods of overcoming, 78
diagnostic questions, 87
and overinvestment in company stock, 123
stereotypes, 57
stock
investments of insurance companies in, 516
single-stock positions, 323, 340–356
about, 340–341
non-tax considerations, 342–343
risk reduction strategies, 343–356
tax considerations, 341–342
stock companies, 499
stock life insurance companies, 411, 508n.25
stock prices, stock splits and, 31
stock splits, prices and, 31
stories, research conclusions presented as, 133
Straight Arrow (BB&K classification), 110
strategic buyers, 358
strong-form EMH, 29–30
subjected expected utility (SEU), 21–22
Super Bowl indicator, 139
Suriname, 304
surplus
of insurance companies, 501n.21, 512–513
of non-insurance companies, 514
pension, 465, 467
surplus capital, 335
surrender cost index, for life insurance, 414, 415
survival probability, core capital based on, 280–284
survivorship, joint ownership with right to, 274
swaps, total return equity, 344–345
Sweden
exit taxation, 306–307
in Hague Conference, 304
tax regime, 231, 347
Switzerland
gift tax, 293
in Hague Conference, 304
ownership of private business enterprises, 322
tax regime, 231, 347
wealth taxes, 306
systematic approach to research, 135
systematic risk, 324, 443

T

Taft-Hartley Labor Act, 473
Taiwan
tax rates, 180
tax regime, 231, 347
territorial tax system, 305
target date funds, 121
taxable accounts, 390
taxable investment accounts, 246
tax-advantaged savings accounts, 245–246
tax alpha, 251
tax avoidance, 181, 310
tax benefits, of annuities, 429
tax cost basis, 329
tax deferral
for capital gains, 234–237
by individual investors, 181
with tax loss harvesting, 256–257
tax-deferred accounts (TDAs), 246
and after-tax asset allocation, 247–248
asset location for, 251–254
financial capital in, 390
and investment risk, 250
retirement, 232
selecting tax exempt accounts vs., 248–250
tax drag, 233, 235
and accrual equivalent tax rate, 244
and trading behavior, 254, 258
tax efficiency, 327
taxes, 225–269. *see also specific types, e.g.:* income taxes
after-tax accumulations and returns, 232–245
accrual equivalent returns, 243–245
accrual equivalent tax rates, 244–245
blended tax environments, 239–243
simple tax environments, 232–239
and after-tax wealth, 225–226
and asset allocation, 196
and concentrated positions
equity monetization strategies, 345–347
hedging strategies, 352–354
leveraged recapitalization, 359
managing single-stock positions, 341–342
monetization of private business equity, 362
outright sale of positions, 328–329
and cross-border estate planning, 305–310
double taxation, 307–310
double taxation treaties, 308–310
exit taxes, 306–307
foreign tax credit provisions, 307–308
income taxes, 305–306
wealth and wealth transfer taxes, 306
and disability income insurance, 438
and estate planning, 276–278
global income tax structures, 226–232
common elements, 227–229
dimensions in tax planning, 232
general regimes, 229–232
international comparisons of income taxes, 227
for individual investors, 179–182
early transfers, 182
jurisdiction for taxation, 185
tax avoidance, 181
tax deferral, 181
tax reduction, 181–182
transfer at death, 182
wealth transfer taxes, 182
for institutional investors
banks, 523
defined-benefit plans, 472
endowments, 495
foundations, 487–488
life insurance companies, 506
non-life insurance companies, 514, 516–517
and investment account types, 245–250
after-tax asset allocation, 247–248
selecting account type, 248–250
tax-deferred accounts, 246
tax-exempt accounts, 246–247
and investment risk, 250–251
for irrevocable trusts, 183
and life insurance, 302–303
in Monte Carlo simulations, 199
practice problems, 262–266
in sample IPSs, 187, 190
solutions to problems, 267–269
and trusts, 301
and wealth management, 251–260
after-tax mean–variance optimization, 260
asset location, 251–254
holding period management, 258–260
tax loss harvesting, 255–258
trading behavior, 254–255
tax evasion, 310
tax-exempt accounts, 246–247
and after-tax asset allocation, 247–248
asset location for, 251–254
selecting TDAs vs., 248–250
tax-exempt securities, 181

tax loss harvesting, 255–258
adding net-of-tax principal, 257–258
current tax savings, 255–256
tax deferral, 256–257
tax-optimized equity strategies, 354–355
tax rates
accrual equivalent, 244–245
in other countries, 179–180, 227–229
Tax Reform Act (1969), 486
tax-sheltered savings accounts, 181
TDAs. *see* tax-deferred accounts
technical anomalies, 34
technology bubble (1990s), 69, 142
temporary disequilibrium behavior, 139
temporary life insurance, 406
term life insurance, 406, 499n.19
territorial tax systems, 305
testamentary gratuitous transfers, 277
testator, 274
Thailand, 231, 347
Thaler, Richard, 64, 72, 166
"The Theory of Speculation" (Bachelier), 30
TIAA-CREF plans, 120n.6, 122
time deposit, 520n.30
time horizon
and accumulation for deferred capital gains, 236
and expected value of returns, 198, 199
for individual investors, 178
for institutional investors
banks, 523
defined-benefit plans, 471–472
endowments, 494–495
foundations, 487
life insurance companies, 506
non-life insurance companies, 515–516
in sample IPSs, 187, 190
and taxes/capital growth, 233–234
and wealth tax/investment growth, 238–239
timing, of taxation, 259–260
TIPS. *see* Treasury Inflation-Protected Securities
title insurance, 422
top down approach to psychographic modeling. *see* behavioral alpha process
total future liability, pension plan, 465
total return equity swaps, 344–345
total returns
endowment spending based on, 489–491
for insurance companies, 504
investor requirements based on, 172–173
for non-life insurance companies, 514
traders, 254–255
trading
excessive (*see* excessive trading)
and wealth management, 254–255
trading range breaks, technical anomalies in, 34
traditional balance sheet, 395–397
traditional finance
behavioral vs., 5–6
individual behavior in, 8–14
perfect rationality, self-interest, and information, 12
rational economic man, 11–12
risk aversion, 13–14
utility theory and Bayes' formula, 8–11
market behavior in, 28–36
portfolio construction in, 36
and psychological profiling of individual investors, 165–166
transaction costs, liquidity and, 176
Transitivity axiom (utility theory), 9
transparency, in cross-border estate planning, 310–311
Travelers Group, 520
Travelers Insurance, 515, 516, 520
Treasury Inflation-Protected Securities (TIPS), 390
trend-chasing effect, 141
trending effects. *see* momentum, market
T Rowe Price, 121
trust companies, 183
trust departments, 183
trustees, 158, 183–184, 473
trusts, 183–184, 299–301
asset protection, 301
beneficiaries of, 184–185
charitable, 368
charitable remainder, 287–288
in common law, 274
control, 300
and Hague Conference, 305
tax avoidance with, 181
tax reduction, 301
Turkey, 231, 304, 347
Tversky, Amos, 70, 166

U

Ukraine
in Hague Conference, 304
tax regime, 231, 232n.4, 347
UMIFA. *see* Uniform Management of Institutional Funds Act
undeclared funds, 310
underfunded pension plans, 465, 466
underwriting, of life insurance, 409
underwriting cycle, of non-life insurance companies, 512, 516
Uniform Management of Institutional Funds Act (UMIFA), 488, 490, 495
unique circumstances
for banks, 524
for defined-benefit plans, 473–476
for endowments, 495–496
for foundations, 488
of individual investors, 185, 187
for life insurance companies, 508
United Arab Emirates, 276
United Kingdom
defined-benefit pension plans, 464, 466n.3, 473
gift tax, 294
in Hague Conference, 304
house price average multiple of family income, 142
inheritance tax, 277–278
insurance companies, 499, 507
interest income taxation, 233
legal system, 274
market bubbles, 142
momentum effect in, 140
ownership of private business enterprises, 322
pensions, 390
spousal exemptions for estate tax, 297
stock purchases, 323
taxable gifts, 291
tax-advantaged savings accounts, 246
taxation of residents, 306
taxation on pension funds, 472
tax-free gifts, 289
tax rates, 180
tax regime, 231, 347
wealth taxes, 238
weekend effect, 139
United States
banks, 519–520, 522
corporate estate tax freeze, 338
defined-benefit pension plans, 464, 472–473
disintermediation, 499, 505
domestic tax relief, 308
donor-advised funds, 367–368
employee stock ownership plans, 361
endowments, 495
exit taxes, 306–307
foundations, 484, 486–488
generation-skipping transfer tax, 296
government pensions, 390
in Hague Conference, 304
health/medical insurance, 421
insurance industry, 499
interest income taxation, 233
laws on transparency in banking, 311
legal system and wills in, 274
life insurance companies, 500–501, 503–508
managed care facilities, 177
market bubbles, 142
mismatch in character, 353–354
monetizing tax-free exchanges, 369
non-life insurance companies, 511, 513–515, 517
normal distribution of common stocks, 191–192
ownership of private business enterprises, 322
prepaid variable forwards, 330
residence–source conflicts, 307
spousal exemptions for estate tax, 297
taxable gifts, 291
tax-advantaged savings accounts, 246
taxation of citizens and residents, 305
tax-free gifts, 289
tax on stock purchases, 323
tax rates, 180
tax regime, 231, 347
tax treatment of irrevocable trusts, 183
value stock in, 144
wealth taxes, 306
weekend effect, 139
yield curves, 515–516
US Consumer Price Index (CPI), 492–493
US Generally Accepted Accounting Principles (GAAP)
capital gains for non-life insurance companies, 514
insurance companies, 501
pension expense, 469

unit-linked life insurance, 500n.20
universal banking, 519–520
universal life insurance, 407, 500n.20
unrelated business income, 487, 495
unskilled mutual funds, 58–59
Uruguay, 304
utility, 8–9, 11–12
utility function, of wealth, 13–14
utility maximization, 15–17
utility theory
  and indifference curve analysis, 16–17
  prospect theory vs., 27
  risk aversion in, 13
  in traditional finance, 8–9
  utility function of wealth, 13–14

V
valuation
  and endowment bias, 78–79
  of insurance company investments, 508
  and interest rate risk, 501
valuation discounts, 297–298
valuation reserve, 501n.21
value-added taxes, 226
Value at Risk (VaR), 521
value investing, fundamental anomalies and, 33–34
value stocks, performance of, 144
Vanguard Investments Australia, 58
VaR. *see* Value at Risk
variable annuities
  advantages and disadvantages of fixed and, 426–428
  deferred, 423–424
  immediate, 424
variable life insurance, 500n.20
variable universal life insurance, 500n.20
Venezuela, 231, 304, 347
vested (term), 383n.1, 464n.1
Vienna Convention on the Law Treaties, 309
Vietnam, 231, 347
volatility
  of benefits, for annuities, 427
  cash flow, 502
  and expected value of returns, 198, 199
  human capital, 441
  and measure of wealth, 163
  portfolio, 251
  price, 176
  and sustainability of spending rates, 285, 287
voting control, 328

W
waiting period, of disability income insurance, 418
waiver of premium clause, of disability income insurance, 418
weak-form EMH, 29–31
wealth
  after-tax, 225–226
  and behaviorally modified asset allocation, 84–86
  measure of wealth classifications, 163
  net, 390, 397–400
  source of wealth classifications, 162
  utility function of, 13–14
wealth concentration, 327
wealth management. *see* private wealth management
wealth taxes, 238–239
  and cross-border estate planning, 306
  and estate planning, 276–277
  in global tax structures, 226
  and tax planning, 232
wealth transfers, managing concentrated positions with, 337–340
wealth transfer taxes, 182
  and concentrated positions, 339–340
  and cross-border estate planning, 306
  and estate planning, 276–277
  and investment policy statements, 179
weekend effect, 139
Western Europe. *see also specific countries*
  managed care facilities, 177
  universal banking, 519
whole life insurance, 406–407, 499n.19
Wilcox, Jarrod, 335n.4
wills
  defined, 273
  and legal system, 274–276
  and trusts, 183
workforce age, 471–472
WorldCom, Inc., 122

Y
yield curve, 515–516
yield enhancement, 354
yields
  bond, and annuity pricing, 426
  income, for immediate fixed annuities, 424–425
  portfolio, 504, 515

Z
zakat, 231, 347
zero-alpha mutual funds, 58–59
zero-premium collars, 349–350
Zurich, Switzerland, 310–311

CFA Institute®
CFA Program

APPLICATIONS OF ECONOMIC ANALYSIS AND ASSET ALLOCATION

CFA® Program Curriculum
2018 • LEVEL III • VOLUME 3

WILEY

CONTENTS

How to Use the CFA Program Curriculum vii
Curriculum Development Process vii
Organization of the Curriculum viii
Features of the Curriculum viii
Designing Your Personal Study Program x
Feedback xi

Portfolio Management

Study Session 7 **Applications of Economic Analysis to Portfolio Management** 3

Reading 14 **Capital Market Expectations** 5
Introduction 6
Organizing the Task: Framework and Challenges 7
A Framework for Developing Capital Market Expectations 7
Challenges in Forecasting 13
Tools for Formulating Capital Market Expectations 23
Formal Tools 23
Survey and Panel Methods 48
Judgment 50
Economic Analysis 50
Business Cycle Analysis 51
Economic Growth Trends 68
Exogenous Shocks 74
International Interactions 75
Economic Forecasting 80
Using Economic Information in Forecasting Asset Class Returns 89
Information Sources for Economic Data and Forecasts 104
Summary 106
Practice Problems 108
Solutions 116

Reading 15 **Equity Market Valuation** 125
Introduction 125
Estimating a Justified P/E Ratio 126
Neoclassical Approach to Growth Accounting 126
The China Economic Experience 128
Quantifying China's Future Economic Growth 130
Equity Market Valuation 131
Top-Down and Bottom-Up Forecasting 140
Portfolio Suitability of Each Forecasting Type 142
Using Both Forecasting Types 143
Top-Down and Bottom-Up Forecasting of Market Earnings per Share 144
Relative Value Models 147
Earnings-Based Models 147

◘ indicates an optional segment

	Asset-Based Models	157
	Summary	162
	Practice Problems	165
	Solutions	172
Study Session 8	**Asset Allocation and Related Decisions in Portfolio Management (1)**	175
Reading 16	**Introduction to Asset Allocation**	177
	Introduction	177
	Asset Allocation: Importance in Investment Management	178
	The Investment Governance Background to Asset Allocation	180
	Governance Structures	180
	Articulating Investment Objectives	181
	Allocation of Rights and Responsibilities	182
	Investment Policy Statement	184
	Asset Allocation and Rebalancing Policy	185
	Reporting Framework	185
	The Governance Audit	185
	The Economic Balance Sheet and Asset Allocation	188
	Approaches to Asset Allocation	191
	Relevant Objectives	194
	Relevant Risk Concepts	194
	Modeling Asset Class Risk	195
	Strategic Asset Allocation	201
	Asset Only	203
	Liability Relative	208
	Goals Based	211
	Implementation Choices	216
	Passive/Active Management of Asset Class Weights	216
	Passive/Active Management of Allocations to Asset Classes	217
	Risk Budgeting Perspectives in Asset Allocation and Implementation	221
	Rebalancing: Strategic Considerations	222
	A Framework for Rebalancing	223
	Strategic Considerations in Rebalancing	225
	Summary	227
	Practice Problems	230
	Solutions	233
Reading 17	**Principles of Asset Allocation**	235
	Introduction	236
	Developing Asset-Only Asset Allocations	237
	Mean–Variance Optimization: Overview	237
	Monte Carlo Simulation	249
	Criticisms of Mean–Variance Optimization	252
	Addressing the Criticisms of Mean–Variance Optimization	254
	Allocating to Less Liquid Asset Classes	265
	Risk Budgeting	267
	Factor-Based Asset Allocation	269

	Developing Liability-Relative Asset Allocations	**273**
	Characterizing the Liabilities	**273**
	Approaches to Liability-Relative Asset Allocation	**276**
	Examining the Robustness of Asset Allocation Alternatives	**287**
	Factor Modeling in Liability-Relative Approaches	**289**
	Developing Goals-Based Asset Allocations	**289**
	The Goals-Based Asset Allocation Process	**291**
	Describing Client Goals	**293**
	Constructing Sub-Portfolios	**295**
	The Overall Portfolio	**298**
	Revisiting the Module Process in Detail	**300**
	Periodically Revisiting the Overall Asset Allocation	**304**
	Issues Related to Goals-Based Asset Allocation	**304**
	Heuristics and Other Approaches to Asset Allocation	**306**
	Portfolio Rebalancing in Practice	**311**
	Conclusions	**315**
Study Session 9	**Asset Allocation and Related Decisions in Portfolio Management (2)**	**319**
Reading 18	**Asset Allocation with Real-World Constraints**	**321**
	Introduction	**321**
	Constraints in Asset Allocation	**322**
	Asset Size	**322**
	Liquidity	**327**
	Time Horizon	**330**
	Regulatory and Other External Constraints	**334**
	Asset Allocation for the Taxable Investor	**340**
	After-Tax Portfolio Optimization	**341**
	Taxes and Portfolio Rebalancing	**344**
	Revising the Strategic Asset Allocation	**350**
	Short-Term Shifts in Asset Allocation	**356**
	Discretionary TAA	**357**
	Systematic TAA	**358**
	Dealing with Behavioral Biases in Asset Allocation	**361**
	Loss Aversion	**362**
	Illusion of Control	**362**
	Mental Accounting	**363**
	Representative Bias	**364**
	Framing Bias	**365**
	Availability Bias	**366**
	Summary	**369**
Reading 19	**Currency Management: An Introduction**	**373**
	Introduction	**373**
	Review of Foreign Exchange Concepts	**374**
	Spot Markets	**375**
	Forward Markets	**377**
	FX Swap Markets	**380**
	Currency Options	**381**

Currency Risk and Portfolio Return and Risk 381
Return Decomposition 381
Volatility Decomposition 384
Currency Management: Strategic Decisions 387
The Investment Policy Statement 387
The Portfolio Optimization Problem 388
Choice of Currency Exposures 389
Locating the Portfolio Along the Currency Risk Spectrum 392
Formulating a Client-Appropriate Currency Management Program 396
Currency Management: Tactical Decisions 399
Active Currency Management Based on Economic Fundamentals 399
Active Currency Management Based on Technical Analysis 401
Active Currency Management Based on the Carry Trade 402
Active Currency Management Based on Volatility Trading 404
Tools of Currency Management 409
Forward Contracts 410
Currency Options 417
Strategies to Reduce Hedging Costs and Modify a Portfolio's Risk Profile 420
Hedging Multiple Foreign Currencies 428
Basic Intuitions for Using Currency Management Tools 434
Currency Management for Emerging Market Currencies 438
Special Considerations in Managing Emerging Market Currency Exposures 438
Non-Deliverable Forwards 440
Summary 441
Practice Problems 445
Solutions 454

Reading 20 **Market Indexes and Benchmarks** 463
Introduction 463
Distinguishing between a Benchmark and a Market Index 465
Benchmark Uses and Types 466
Benchmarks: Investment Uses 466
Types of Benchmarks 468
Market Indexes Uses and Construction 471
Use of Market Indexes 471
Index Construction 473
Index Construction Tradeoffs 475
Index Weighting Schemes: Advantages and Disadvantages 477
Capitalization-Weighted Indexes 477
Price-Weighted Indexes 478
Equal-Weighted Indexes 478
Fundamental-Weighted Indexes 478
Choosing an Equity Index Weighting Scheme When an Index Is Used as a Benchmark 479
Market Indexes as Benchmarks 480
Benchmark Selection: An Example 481

Summary **483**
Practice Problems **485**
Solutions **486**

Glossary **G-1**
Index **I-1**

CUSTOMER SERVICE

68

How to Use the CFA Program Curriculum

Congratulations on reaching Level III of the Chartered Financial Analyst® (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities it develops. Your commitment to the CFA Program should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. The CFA Program represents the first step toward a career-long commitment to professional education.

The CFA examination measures your mastery of the core skills required to succeed as an investment professional. These core skills are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major topic areas covered in the CFA Program (www.cfainstitute.org/cbok);
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/level_III);
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- The CFA Program curriculum, which contains the readings and end-of-reading questions, that candidates receive upon exam registration.

Therefore, the key to your success on the CFA examinations is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, and tips for developing an effective study program.

CURRICULUM DEVELOPMENT PROCESS

The CFA Program is grounded in the practice of the investment profession. Beginning with the Global Body of Investment Knowledge (GBIK), CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the knowledge, skills, and abilities (competencies) that are relevant to the profession. Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback from the GBIK collaborative website. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

© 2017 CFA Institute. All rights reserved.

The Education Advisory Committee, consisting of practicing charterholders, in conjunction with CFA Institute staff, designs the CFA Program curriculum in order to deliver the CBOK to candidates. The examinations, also written by charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit www.cfainstitute.org.

ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into 10 topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected.

Each topic area is then divided into one or more study sessions. These study sessions—18 sessions in the Level III curriculum—should form the basic structure of your reading and preparation.

Each study session includes a statement of its structure and objective and is further divided into specific reading assignments. An outline illustrating the organization of these 18 study sessions can be found at the front of each volume of the curriculum.

The readings and end-of-reading questions are the basis for all examination questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK. These readings are drawn from content commissioned by CFA Institute, textbook chapters, professional journal articles, research analyst reports, and cases. All readings include problems and solutions to help you understand and master the topic areas.

Reading-specific Learning Outcome Statements (LOS) are listed at the beginning of each reading. These LOS indicate what you should be able to accomplish after studying the reading. The LOS, the reading, and the end-of-reading questions are dependent on each other, with the reading and questions providing context for understanding the scope of the LOS.

You should use the LOS to guide and focus your study because each examination question is based on the assigned readings and one or more LOS. The readings provide context for the LOS and enable you to apply a principle or concept in a variety of scenarios. The candidate is responsible for the entirety of the required material in a study session, which includes the assigned readings as well as the end-of-reading questions and problems.

We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfaprogram/courseofstudy/Pages/study_sessions.aspx), including the descriptions of LOS "command words" (www.cfainstitute.org/programs/Documents/cfa_and_cipm_los_command_words.pdf).

FEATURES OF THE CURRICULUM

OPTIONAL SEGMENT

Required vs. Optional Segments You should read all of an assigned reading. In some cases, though, we have reprinted an entire chapter or article and marked certain parts of the reading as "optional." The CFA examination is based only on the required segments, and the optional segments are included only when it is determined that they might help you to better understand the required segments (by seeing the required material in its full context). When an optional segment begins, you will see an icon and a dashed

vertical bar in the outside margin that will continue until the optional segment ends, accompanied by another icon. *Unless the material is specifically marked as optional, you should assume it is required.* You should rely on the required segments and the reading-specific LOS in preparing for the examination.

END OPTIONAL SEGMENT

End-of-Reading Problems/Solutions *All problems in the readings as well as their solutions (which are provided directly following the problems) are part of the curriculum and are required material for the exam.* When appropriate, we have included problems within and after the readings to demonstrate practical application and reinforce your understanding of the concepts presented. The problems are designed to help you learn these concepts and may serve as a basis for exam questions. Many of these questions are adapted from past CFA examinations.

Glossary and Index For your convenience, we have printed a comprehensive glossary in each volume. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the glossary. The curriculum eBook is searchable, but we also publish an index that can be found on the CFA Institute website with the Level III study sessions.

LOS Self-Check We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

Source Material The authorship, publisher, and copyright owners are given for each reading for your reference. We recommend that you use the CFA Institute curriculum rather than the original source materials because the curriculum may include only selected pages from outside readings, updated sections within the readings, and problems and solutions tailored to the CFA Program. Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*®, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and 11 Nobel laureates have contributed a total of 45 articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this practice-oriented publication. Candidates have full online access to the *Financial Analysts Journal* and associated resources. All you need is to log in on www.cfapubs.org using your candidate credentials.

DESIGNING YOUR PERSONAL STUDY PROGRAM

Create a Schedule An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all reading assignments and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skill, or ability described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

As you prepare for your exam, we will e-mail you important exam updates, testing policies, and study tips. Be sure to read these carefully. Curriculum errata are periodically updated and posted on the study session page at www.cfainstitute.org.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience. For each level of the curriculum, there are 18 study sessions. So, a good plan is to devote 15–20 hours per week for 18 weeks to studying the material. Use the final four to six weeks before the exam to review what you have learned and practice with topic tests and mock exams. This recommendation, however, may underestimate the hours needed for appropriate examination preparation depending on your individual circumstances, relevant experience, and academic background. You will undoubtedly adjust your study time to conform to your own strengths and weaknesses and to your educational and professional background.

You will probably spend more time on some study sessions than on others, but on average you should plan on devoting 15–20 hours per study session. You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

An interactive study planner is available in the candidate resources area of our website to help you plan your study time. The interactive study planner recommends completion dates for each topic of the curriculum. Dates are determined based on study time available, exam topic weights, and curriculum weights. As you progress through the curriculum, the interactive study planner dynamically adjusts your study plan when you are running off schedule to help you stay on track for completion prior to the examination.

CFA Institute Topic Tests The CFA Institute topic tests are intended to assess your mastery of individual topic areas as you progress through your studies. After each test, you will receive immediate feedback noting the correct responses and indicating the relevant assigned reading so you can identify areas of weakness for further study. For more information on the topic tests, please visit www.cfainstitute.org.

CFA Institute Mock Exams The three-hour mock exams simulate the morning and afternoon sessions of the actual CFA examination, and are intended to be taken after you complete your study of the full curriculum so you can test your understanding of the curriculum and your readiness for the exam. You will receive feedback at the end of the mock exam, noting the correct responses and indicating the relevant assigned readings so you can assess areas of weakness for further study during your review period. We recommend that you take mock exams during the final stages of your preparation for the actual CFA examination. For more information on the mock examinations, please visit www.cfainstitute.org.

Preparatory Providers After you enroll in the CFA Program, you may receive numerous solicitations for preparatory courses and review materials. When considering a prep course, make sure the provider is in compliance with the CFA Institute Approved

Prep Provider Program (www.cfainstitute.org/utility/examprep/Pages/index.aspx). Just remember, there are no shortcuts to success on the CFA examinations; reading and studying the CFA curriculum is the key to success on the examination. The CFA examinations reference only the CFA Institute assigned curriculum—no preparatory course or review course materials are consulted or referenced.

SUMMARY

Every question on the CFA examination is based on the content contained in the required readings and on one or more LOS. Frequently, an examination question is based on a specific example highlighted within a reading or on a specific end-of-reading question and/or problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the examination except for occasional sections marked as optional. You may read optional pages as background, but you will not be tested on them.
2. All questions, problems, and their solutions—found at the end of readings—are part of the curriculum and are required study material for the examination.
3. You should make appropriate use of the topic tests and mock examinations and other resources available at www.cfainstitute.org.
4. Use the interactive study planner to create a schedule and commit sufficient study time to cover the 18 study sessions, review the materials, and take topic tests and mock examinations.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and member feedback as we work to incorporate content, design, and packaging improvements. You can be assured that we will continue to listen to your suggestions. Please send any comments or feedback to info@cfainstitute.org. Ongoing improvements in the curriculum will help you prepare for success on the upcoming examinations and for a lifetime of learning as a serious investment professional.

CUSTOMER SERVICE

68

Portfolio Management

STUDY SESSIONS

Study Session 3	Behavioral Finance
Study Session 4	Private Wealth Management (1)
Study Session 5	Private Wealth Management (2)
Study Session 6	Portfolio Management for Institutional Investors
Study Session 7	Applications of Economic Analysis to Portfolio Management
Study Session 8	Asset Allocation and Related Decisions in Portfolio Management (1)
Study Session 9	Asset Allocation and Related Decisions in Portfolio Management (2)
Study Session 10	Fixed-Income Portfolio Management (1)
Study Session 11	Fixed-Income Portfolio Management (2)
Study Session 12	Equity Portfolio Management
Study Session 13	Alternative Investments for Portfolio Management
Study Session 14	Risk Management
Study Session 15	Risk Management Applications of Derivatives
Study Session 16	Trading, Monitoring, and Rebalancing
Study Session 17	Performance Evaluation
Study Session 18	Global Investment Performance Standards

This volume includes Study Sessions 7–9.

© 2017 CFA Institute. All rights reserved.

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; evaluate portfolio performance; and analyze a presentation of investment returns for consistency with Global Investment Performance Standards (GIPS®).

PORTFOLIO MANAGEMENT

STUDY SESSION

7

Applications of Economic Analysis to Portfolio Management

A necessary task in the investment management process is to formulate capital market expectations. These forecasts of risk and return for various asset classes form the basis for constructing portfolios that maximize expected return for given levels of risk.

This study session examines the process of setting capital market expectations and covers major tools of economic analysis. The application of neo-classical growth theory to develop economic forecasts is presented. The discussion includes how economic forecasts can be integrated with equity valuation techniques to value an equity market.

READING ASSIGNMENT

Reading 14	Capital Market Expectations by John P. Calverley, Alan M. Meder, CPA, CFA, Brian D. Singer, CFA, and Renato Staub, PhD
Reading 15	Equity Market Valuation by Peter C. Stimes, CFA, and Stephen E. Wilcox, PhD, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

14

Capital Market Expectations

by John P. Calverley, Alan M. Meder, CPA, CFA, Brian D. Singer, CFA, and Renato Staub, PhD

John P. Calverley (Canada). Alan M. Meder, CPA, CFA, is at Duff & Phelps Investment Management Co. (USA). Brian D. Singer, CFA, is at William Blair (USA). Renato Staub, PhD, is at William Blair Investment Management (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss the role of, and a framework for, capital market expectations in the portfolio management process;
☐	**b.** discuss challenges in developing capital market forecasts;
☐	**c.** demonstrate the application of formal tools for setting capital market expectations, including statistical tools, discounted cash flow models, the risk premium approach, and financial equilibrium models;
☐	**d.** explain the use of survey and panel methods and judgment in setting capital market expectations;
☐	**e.** discuss the inventory and business cycles and the effects that consumer and business spending and monetary and fiscal policy have on the business cycle;
☐	**f.** discuss the effects that the phases of the business cycle have on short-term/long-term capital market returns;
☐	**g.** explain the relationship of inflation to the business cycle and the implications of inflation for cash, bonds, equity, and real estate returns;
☐	**h.** demonstrate the use of the Taylor rule to predict central bank behavior;
☐	**i.** interpret the shape of the yield curve as an economic predictor and discuss the relationship between the yield curve and fiscal and monetary policy;
☐	**j.** identify and interpret the components of economic growth trends and demonstrate the application of economic growth trend analysis to the formulation of capital market expectations;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved. Revision © 2017 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**k.** explain how exogenous shocks may affect economic growth trends;
☐	**l.** identify and interpret macroeconomic, interest rate, and exchange rate linkages between economies;
☐	**m.** discuss the risks faced by investors in emerging-market securities and the country risk analysis techniques used to evaluate emerging market economies;
☐	**n.** compare the major approaches to economic forecasting;
☐	**o.** demonstrate the use of economic information in forecasting asset class returns;
☐	**p.** explain how economic and competitive factors can affect investment markets, sectors, and specific securities;
☐	**q.** discuss the relative advantages and limitations of the major approaches to forecasting exchange rates;
☐	**r.** recommend and justify changes in the component weights of a global investment portfolio based on trends and expected changes in macroeconomic factors.

1 INTRODUCTION

A noted investment authority has written that the "fundamental law of investing is the uncertainty of the future."[1] Yet investors have no choice but to forecast at least elements of the future because nearly all investment decisions look toward it. Specifically, investment decisions incorporate the decision maker's expectations concerning factors and events believed to affect investment values. The decision maker finally integrates these views into expectations about the risk and return prospects of individual assets and groups of assets.

The particular concern of this reading is **capital market expectations** (CME): the investor's expectations concerning the risk and return prospects of asset classes, however broadly or narrowly the investor defines those asset classes. Capital market expectations are an essential input to formulating a strategic asset allocation. For example, if an investor's investment policy statement specifies and defines eight permissible asset classes, the investor will need to have formulated long-term expectations concerning those asset classes to develop a strategic asset allocation. The investor may also act on short-term expectations. Capital market expectations are expectations about classes of assets, or **macro expectations**. By contrast, **micro expectations** are expectations concerning individual assets. Micro expectations are key ingredients in security selection and valuation. Insights into capital markets gleaned during CME setting should help in formulating accurate micro expectations in security selection and valuation.

One theme of this reading is that a disciplined approach to expectations setting will be rewarded. Therefore, much of the reading is devoted to explaining a widely applicable expectations-setting process. A second theme of this reading is that skillful

1 Peter L. Bernstein in the foreword to Rapaport and Mauboussin (2001), p. xiii.

economic analysis can contribute to expectations setting. That theme is supported by the observation that securities markets trade claims on the cash flows of the business sector and that other markets reflect the macro economy too.

The reading is organized as follows: Section 2 presents a general framework for developing capital market expectations and alerts the reader to the range of problems and pitfalls that await the investor or analyst in this arena. Section 3 then turns to describing the range of tools, both formal and judgmental, that an analyst may use in expectations setting. Section 4 covers economic analysis as applied to formulating capital market expectations, and we then summarize the reading.

ORGANIZING THE TASK: FRAMEWORK AND CHALLENGES

2

In this section, we provide a guide to collecting, organizing, combining, and interpreting information. After illustrating the process, we turn to a discussion of typical problems and challenges to formulating the most informed judgments possible.

2.1 A Framework for Developing Capital Market Expectations

The following is a framework for a disciplined approach to setting CME.

1. *Specify the final set of expectations that are needed, including the time horizon to which they apply.* The analyst needs to understand the specific objectives of the analysis in order to work efficiently toward them. To make this step even more concrete, the analyst should write the questions that need to be answered. Accomplishing this step requires the analyst to formulate his or her specific needs in terms of a relevant set of asset classes that are of concern, giving appropriate regard to the constraints of the client. In many cases, the investor's investment policy statement may provide guidance in this task. For example, for a taxable investor with a 10-year time horizon, the portfolio manager would develop long-term after-tax expectations for use in developing a strategic asset allocation.
2. *Research the historical record.* Most forecasts have some connection to the past. For many markets, the historical record contains useful information on the investment characteristics of the asset, suggesting at least some possible ranges for future results. Beyond the raw historical facts, the analyst should seek to identify the factors that affect asset class returns and to understand the what, when, where, why, and how of these return drivers. The analyst will then have a better sense of the information mosaic that he or she will need to piece together to arrive at well-informed conclusions.
3. *Specify the method(s) and/or model(s) that will be used and their information requirements.* The investor, capital market analyst, or unit responsible for developing capital market expectations (as the case may be) should be explicit about the method(s) and/or model(s) that will be used and should be able to justify the selection. Information requirements (economic and financial market data needs, for example) depend on the decision about method(s).
4. *Determine the best sources for information needs.*
5. *Interpret the current investment environment using the selected data and methods, applying experience and judgment.* The analyst should be sure that he or she is working from a common set of assumptions in interpreting different

elements of the investment and economic scene so that the analyst's conclusions are mutually consistent. The analyst often needs to apply judgment and experience to interpret apparently conflicting signals within the data.

6 *Provide the set of expectations that are needed, documenting conclusions.* These are the analyst's answers to the questions set out in Step 1. The answers should be accompanied by the reasoning and assumptions behind them.

7 *Monitor actual outcomes and compare them to expectations, providing feedback to improve the expectations-setting process.*

Disciplined capital market expectations setting requires experience and expertise in investments and economics. Large asset managers may have a research unit—for example, an economics unit—with responsibility for developing capital market expectations. Through superior forecasts, such asset managers seek to better control risk and improve the results of actively managed accounts in particular. The development of capital market expectations is **beta research** (research related to systematic risk and returns to systematic risk). As such, it is usually centralized so that the CME inputs used across all equity and fixed-income products are consistent. On the other hand, **alpha research** (research related to capturing excess risk-adjusted returns by a particular strategy) is typically conducted within particular product groups with the requisite investment-specific expertise. For institutional investors, professional consultants are a resource for systematically developed capital market expectations. Consultants' assistance may be given in the course of asset allocation reviews or asset–liability planning studies. Institutional investors may develop capital market expectations in-house, although they will usually be aware of the perspectives of professional consultants and peers. Most individual investors rely on their investment adviser or other external source for guidance in setting capital market expectations, as they often do not have expertise in this area. Yet an adviser may incorporate the client's perspectives on capital markets prospects, as the portfolio is run on the client's behalf and the client must be comfortable with the inputs to constructing the portfolio.

The first step in the framework for developing CME requires that analysts set boundaries to focus their attention on the expectations most relevant for their investment situation. Otherwise, effort is wasted. Even pared down to the minimum needs, the scope of the expectations-setting process can be quite challenging. As Example 1 illustrates, there is a direct relationship between the number and variety of permissible asset class alternatives and the scope of the expectations-setting task facing the manager.

EXAMPLE 1

Capital Market Expectations Setting: Information Requirements (1)

Consider the tasks facing two investment managers, John Pearson and Michael Wu.

Pearson runs US balanced separately managed accounts (SMAs) for high-net-worth individuals within a bank trust department. The mandates of these accounts restrict investments to US equities, US investment-grade fixed-income instruments, and prime US money market instruments. These balanced accounts have an investment objective of long-term capital growth and income. In contrast, Wu is the chief investment officer of a large Hong Kong–based, internationally focused asset manager that uses the following types of assets within its investment process:

Equities	Fixed Income	Alternative Investments
Hong Kong equities	Eurozone sovereign debt	Eastern Europe venture capital
Eurozone equities*	US government debt	New Zealand timber assets
US large-cap equities		US apartment properties
US small-cap equities		
Canadian large-cap equities		

*The **Eurozone** is the region of countries using the euro as a currency. As of the end of 2011, the Eurozone consisted of Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain.
Note: Venture capital is equity investment in private companies.

Wu runs SMAs with generally long-term time horizons and global tactical asset allocation (GTAA) programs. Compare and contrast the information and knowledge requirements of Pearson and Wu.

Solution:

Pearson's in-depth information requirements relate to US equity and fixed-income markets. By contrast, Wu's information requirements relate not only to US and non-US equity and fixed-income markets, but also to three alternative investment types with nonpublic markets, located on three different continents. Wu's need to be current on political, social, economic, and even trading-oriented operational details worldwide is more urgent than Pearson's. Given their respective investment time horizons, Pearson's focus is on the long term while Wu needs to focus not only on the long term but also on near-term disequilibria among markets (as he runs GTAA programs). One challenge that Pearson has in US fixed-income markets that Wu does not face is the need to cover corporate as well as government debt securities. Nevertheless, Wu's overall information and knowledge requirements are clearly more demanding than Pearson's.

In the next example, the balanced fund manager from Example 1 specifies the final set of expectations needed and the time frame for those expectations.

EXAMPLE 2

Capital Market Expectations Setting: Information Requirements (2)

Following the practice of his employer, Pearson uses the results of constrained mean–variance optimization (MVO) and information from clients' investment policy statements to develop strategic asset allocations for the balanced accounts.

Pearson is now addressing the first step in the framework given in the text for a client whose investment time horizon is five years. What set of final expectational data does Pearson need?

Solution:

Pearson needs the following final set of expectations:

- the expected US broad market annual equity total return over a five-year horizon;

- the expected US investment-grade bond annual total return over a five-year horizon;
- the standard deviation of annual returns of US broad market equities;
- the standard deviation of annual returns of US investment-grade bonds; and
- the correlation of annual US stock and US bond returns.

In total, Pearson needs two expected returns, two standard deviations, and one correlation for the MVO.

Steps 2 and 3 in the expectations-setting process involve understanding the historical performance of the asset classes and researching their return drivers. The analyst can approach these tasks by collecting macroeconomic and market information (e.g., asset returns) by:

- geographic area (e.g., domestic, nondomestic, or some subset—for example, a single international area), or
- broad asset class (e.g., equity, fixed-income, or real estate).

The finer classifications depend on the characteristics of the task and the orientation of the investor. For equities, one approach would be to further classify by economic sector, possibly making style-related (e.g., market-capitalization) distinctions. A fixed-income investor might distinguish between governmental and corporate sectors and make further credit distinctions. For example, an industry rotation equity strategist might formulate expectations on domestic equities as follows:

Economic Sector (e.g., technology manufacturers)

Industry (e.g., computer equipment manufacturers)

Subindustry (e.g., microchip component manufacturers)

EXAMPLE 3

Historical Analysis

As Peter L. Bernstein (2004) has written, forecasters who make predictions without regard to past experience have no benchmarks to distinguish between what is new about their expectations and what may be a continuation of past experience. Dimson, Marsh, and Staunton (2011), in a rigorous study covering the 111-year period from 1900 to 2010, found that equities achieved higher annualized geometric mean real returns than did bonds or bills in seventeen major national markets. It would be appropriate for an analyst forecasting that bonds would outperform equities over some (probably shorter-term) horizon to supply supporting analysis that recognizes the tension between the forecast and past long-term experience.

In Step 3, the analyst also needs to be sensitive to the fact that the effectiveness of forecasting approaches and relationships among variables may be related to the investor's time horizon. As an example, a discounted cash flow approach to developing equity market expectations is usually considered to be most appropriate to long-range forecasting.

The fourth step involves determining the best sources for information needs. Executing this step well requires that the analyst research the quality of alternative data sources. Factors such as data collection principles and definitions, error rates in collection, calculation formulas, and for asset class indexes, qualities such as investability, correction for free float, turnover in index constituents, and biases in the data are relevant. The cost of data may also be relevant. In short, analysts must understand everything they can about the data they will use for analysis. Using flawed or misunderstood data is a recipe for faulty analysis. Furthermore, analysts should constantly be alert to new, superior sources for their data needs.

Besides taking care with data sources, the analyst must select the appropriate data frequency. For instance, long-term data series should not be used for setting short-term trading expectations or evaluating short-term volatility. Daily series are of more use for setting shorter-term capital market expectations. Quarterly or annual data series are useful for setting long-term capital market expectations.

The fifth step involves interpreting the current investment environment using the selected data and methods, applying experience and judgment. In the sixth step, we take all of our analyses of the economic and market environment into forward-looking views on capital markets, developing any required quantitative forecasts. In other words, the questions formulated in Step 1 are answered in Step 6. Economic analysis may work itself into quantitative forecasts in a variety of ways depending on the investor's selection of methodology. Top-down investment approaches often use economic analysis more intensively than bottom-up approaches. Example 4 illustrates several ways an analyst's relative optimism or pessimism concerning a market might be reflected in quantitative forecasts.

EXAMPLE 4

Incorporating Economic Analysis into Expected Return Estimates

Michael Wu has gathered information on consensus expectations in equity and fixed-income markets. On the basis of his economic analysis, Wu is optimistic relative to the consensus on the prospects for Hong Kong equities. On the other hand, Wu is pessimistic relative to the consensus on the prospects for US large-cap equities. Depending on the model chosen, Wu's views might be reflected in his quantitative expectations in several ways, including the following:

- **Historical mean return with adjustments**. If Wu takes a historical mean return as his baseline for each asset class, he may make an upward adjustment to that mean for Hong Kong equities and a downward adjustment for US large-cap equities.
- **Risk premium approach**. Wu may frame his analysis in terms of the equity risk premium (the expected return on equities in excess of the long bond expected return). After translating his views into equity risk premium estimates for Hong Kong and US large-cap equities, his return expectation for each asset class is the expected equity risk premium in each market plus the long bond expected return in each market (which he can estimate directly from the term structure of interest rates).

- **Discounted cash flow (DCF) model estimates**. Wu may use his economic analysis to forecast the growth rates of corporate profits for the United States and Hong Kong and input those forecasts into a DCF model solved for the required return on equities in each country.
- **Implied market estimates of expected return with adjustment**. Making use of a world market benchmark and a methodology known as the Black–Litterman model, Wu may infer the equilibrium expected returns on asset classes as reflected by their values in the allocated world market benchmark. Wu can then incorporate his own views on Hong Kong and US large-cap equities using a procedure specified by Black–Litterman.[2]

For a Hong Kong–based client, Hong Kong dollar returns are relevant, so Wu will also need to make exchange rate forecasts to arrive at his conclusions.

Finally, we want to use experience to improve the expectations-setting process. We measure our previously formed expectations against actual results to assess the level of accuracy that the expectations-setting process is delivering. Generally, good forecasts are:

- unbiased, objective, and well researched;
- efficient, in the sense of reducing the magnitude of forecast errors to a minimum; and
- internally consistent.

Internal inconsistency can take a number of forms. For example, domestic bond and domestic equity expectations developed by different analysts using different inflation projections would not be internally consistent. A restructuring of a portfolio based on those expectations would, at least in part, merely reflect an unresolved difference in assumptions. In some cases, inconsistent forecasts may result in conclusions that are implausible or impossible. Example 5 illustrates inconsistent statistical forecasts.

EXAMPLE 5

Inconsistency of Correlation Estimates: An Illustration

Frequently, the expected correlations between asset classes form part of the final expectational data that an analyst needs. If the number of asset classes is n, the analyst will need to estimate $(n^2 - n)/2$ distinct correlations (or the same number of distinct covariances). In doing so, the analyst must be sure that his or her estimates are consistent. For example, consider the correlation matrix for three assets shown in Exhibit 1.

Exhibit 1 Inconsistent Correlations

	Market 1	Market 2	Market 3
Market 1	1	–1	–1
Market 2	–1	1	–1
Market 3	–1	–1	1

2 The Black–Litterman model is discussed further in the reading on asset allocation.

According to Exhibit 1, the estimated correlation between each asset and each other asset is −1. These estimates are internally inconsistent and, in fact, not possible. If Markets 1 and 2 are perfectly negatively correlated and Markets 2 and 3 are as well, then Markets 1 and 3 should be perfectly positively correlated rather than perfectly negatively correlated.

Other cases of an inconsistent correlation matrix are not so obvious.[3]

As a result of the final feedback step, we may be able to identify and correct weaknesses in our expectations-setting process or methods.

2.2 Challenges in Forecasting

A range of problems can frustrate analysts' expectations-setting efforts. Expectations reflecting faulty analysis or assumptions may cause a portfolio manager to construct a portfolio that is inappropriate for the client. At the least, the portfolio manager may incur the costs of changing portfolio composition without any offsetting benefits. On the principle that forewarned is forearmed, the following sections provide guidance on the points where special caution is warranted. The discussion focuses on problems in the use of data and on analyst mistakes and biases.

2.2.1 *Limitations of Economic Data*

The analyst needs to understand the definition, construction, timeliness, and accuracy of any data used, including any biases. The time lag with which economic data are collected, processed, and disseminated can be an impediment to their use. Although in some highly developed markets some economic data may be reported with a lag as short as one week, other important data may be reported with a lag of more than a quarter. The International Monetary Fund sometimes reports macroeconomic data for developing economies with a lag of two years or more. Older data for a variable increase the uncertainty concerning the current state of the economy with respect to that variable.

Furthermore, one or more official revisions to the initial values are common. In effect, measurements are made with error, but the direction and magnitude of the error are not known at the time the data are initially publicized.

Definitions and calculation methods change too. For example, the sampling procedures and calculation methods for the US Consumer Price Index for All Urban Consumers (CPI-U) used by the Bureau of Labor Statistics (BLS) have changed in significant ways since the series was first published. In 1983, for example, the BLS shifted to a flow-of-services model for pricing owner-occupied housing, based on the costs that would be associated with renting such housing. In 1991, the BLS began the introduction of hedonic or regression-based quality adjustments to prices to reflect any increases in quality and features of various consumption items.

3 What may look like a viable correlation matrix at first inspection is not necessarily feasible. In a three-asset case, it is feasible for all pairwise correlations to be −0.50; however, it can be shown that correlations that are all equal to −0.51 are not feasible (i.e., are inconsistent). Correlations must be consistent for variances to be nonnegative.

EXAMPLE 6

A Change in Focus from GNP to GDP

In the late 1980s, expanding international trade caused economists to favor the use of Gross Domestic Product (GDP) over Gross National Product (GNP). Basically, GDP measures production within national borders regardless of whether the labor and property inputs are domestically or foreign owned. In contrast, GNP makes an adjustment to GDP equal to the receipts of factor income from the rest of the world to the country, less the payments of factor income from a country to the rest of the world. This change in preference reflected the fact that product subcomponents, such as automobile parts, were being created in various regions of the world. Thus, measuring economic activity according to what nation was responsible for activities in various regions of the world was becoming more difficult and less useful than being able to measure what was being made within a nation or particular region. Consistent with this observation, the United Nations System of National Accounts (known as UNSNA, or SNA for short) emphasizes GDP.

An analyst must realize that suppliers of indexes of economic and financial data periodically **re-base** these indexes, meaning that the specific time period used as the base of the index is changed. A re-basing is not a substantive change in the composition of an index. It is more of a mathematical change. Analysts constructing a data series should take care that data relating to different bases are not inadvertently mixed together.

2.2.2 *Data Measurement Errors and Biases*

Analysts need to be aware of possible biases in data measurement of series such as asset class returns. Errors in data series include the following:

- **Transcription errors**. These are errors in gathering and recording data. Such errors are most serious if they reflect a bias.
- **Survivorship bias**. Survivorship bias arises when a data series reflects only entities that have survived to the end of the period. For example, a share index may be based on companies that trade on an exchange. Such companies are often delisted (removed from trading on the exchange) after events such as bankruptcy filings and mergers. Shares of bankrupt companies may trade elsewhere after delisting. Do reported returns on a share index reflect post-delisting returns? If not, the return series will probably convey an overly optimistic picture of the real-time investment returns from owning all listed shares. Without correction, statistics derived from series subject to survivorship bias can be misleading in the forward-looking context of expectations setting.[4]
- **Appraisal (smoothed) data**. For certain assets without liquid public markets, appraisal data are used in lieu of market price transaction data. Appraised values tend to be less volatile than market-determined values for the identical asset would be. The consequences are 1) the calculated correlations with other assets tend to be smaller in absolute value than the true correlations, and 2) the true standard deviation of the asset is biased downward. This concern has been raised particularly with respect to alternative investments such as real estate.

4 See Brown, Goetzmann, and Ross (1995).

EXAMPLE 7

Smoothed Data: The Case of Alternative Investments (1)

The perception of alternative investments is that they yield high returns with low risk and that they barely correlate with traditional asset classes. At least in some cases, this perception results from the uncritical use of flawed historical statistics because alternative assets are not traded on exchanges with continuously observable markets. First, risk is underestimated. Consider the following analogy: A bat is flying through a dark tunnel. While it is in the tunnel, you cannot see it. The bat may exit from the tunnel at about the same height it entered the tunnel, as shown.

Source: UBS Asset Management White Paper Series – "Global Investment Solutions – Capital Market Assumptions," February 2005 © UBS 2005. All rights reserved. Reproduced with permission.

However, the bat's flight within the tunnel, if it could be viewed, would be seen to go up and down:

Source: UBS Asset Management White Paper Series – "Global Investment Solutions – Capital Market Assumptions," February 2005 © UBS 2005. All rights reserved. Reproduced with permission.

In this analogy, the time in the tunnel corresponds to the time between trades (or fund valuations) and the bat's height of flight corresponds to the true price of the asset. In measuring the bat's height only at the points of entry and exit from the tunnel, we would underestimate the real volatility of price. Asset liquidity corresponds to the end of the tunnel, when the true price is first clearly visible. In the context of venture capital, for instance, the end of the tunnel is analogous to the initial public offering date.

Data for alternative investments tend to overly smooth return variation because they are often appraisal-based rather than transaction-based. Many indexes, such as those for real estate, private equity, and natural resources, were created with a focus on measuring return rather than risk. Unfortunately, these indexes have been used to derive risk and correlation estimates that are biased downward. For alternative investments, the issue is not only whether the past is a good indicator of the future, but also whether the past is even correctly recorded.

As an illustration, consider the quarterly returns on the S&P 500 between 1981 and 1999, which include the crash of 1987. The period contains 18 negative quarters and has an annual standard deviation of returns of 16.1 percent. Venture capital also represents equity claims, but on less seasoned and riskier companies. Nevertheless, based on venture economics data, the index-based quarterly venture capital returns over the same period are considerably smoother. Venture capital also seems unaffected by the crash, with a reported 5.2 percent

return in the fourth quarter of 1987. Only six negative quarters are reported. The reported annual standard deviation of returns is 9.1 percent, and correlation with the S&P 500 is 0.28.

The analyst can attempt to correct for the biases in datasets (when a bias-free dataset is not available). For example, one heuristic approach to correcting for smoothed data is to rescale the data in such a way that their dispersion is increased but the mean of the data is unchanged. Example 8 illustrates this idea.

EXAMPLE 8

Smoothed Data: The Case of Alternative Investments (2)

How might an analyst address the biases resulting from smoothed data? To continue with the case of venture capital return data, one approach would be to rescale the reported data so that dispersion is increased but the mean is unchanged. The point is that the larger the rescaling, the larger the number of negative quarterly returns, because the frequency distribution is centered in the same place but there is more probability in the tails as dispersion is larger. For example:

- The venture returns rescaled by a factor of 1.4 provide 18 negative quarters—that is, as many as the S&P 500. The estimated standard deviation of the rescaled data is 13 percent.
- The venture returns rescaled by a factor of 4.1 provide 36 negative quarters, which is twice as many as the S&P 500. The estimated standard deviation of the rescaled data is 37 percent.
- The venture returns rescaled by a factor of 4.4 provide 38 negative quarters, 2.1 times as many as the S&P 500. The estimated standard deviation of the rescaled data is 40 percent.

Using these data in conjunction with other analyses, one might propose risks of 43 percent for early-stage venture capital, 34 percent for late-stage venture capital, 29 percent for leveraged buyouts (largely debt-financed purchases of established companies), and 20 percent for distressed debt (the debt of companies that are under financial distress or in or near bankruptcy).[5]

The key is to model the risks of alternative investments as if they were frequently traded, focusing not on statistical observations but on the underlying fundamental and economic drivers of returns.

2.2.3 *The Limitations of Historical Estimates*

With justification, analysts frequently look to history for information in developing capital market forecasts. But although history is usually a guide to what we may expect in the future, the past cannot be simply extrapolated to produce future results uncritically. A historical estimate should be considered a starting point for analysis. The analysis should include a discussion of what may be different from past average results going forward. If we do not see any such differences, we may want to project the historical estimates into the future (perhaps after making certain technical adjustments). However, making such projections without raising the question of differences is questionable.

5 See the reading on alternative investments portfolio management for a discussion of these alternative investments.

Changes in the technological, political, legal, and regulatory environments, as well as disruptions such as wars and other calamities, can alter risk–return relationships. Such shifts are known as changes in **regime** (the governing set of relationships) and give rise to the statistical problem of **nonstationarity** (meaning, informally, that different parts of a data series reflect different underlying statistical properties). For example, the shifts in US central bank policy in 1980 began a period of declining and subsequently stable inflation that is widely recognized as representing a break with the past. Also, disruptive events in a particular time period may boost volatilities in a manner that is simply not relevant for the future. However, extending a dataset to the distant past increases the chance of including irrelevant data. The well-informed analyst tracks the range of events that can indicate an important change in a time series. Statistical tools are available to help identify such changes or turning points.[6]

When many variables are considered, a long data series may be a statistical necessity. (For example, to calculate a historical covariance matrix, the number of observations must exceed the number of variables.) If we could be assured of stationarity, going back farther in time to capture a larger sample should increase the precision with which population parameters of a return distribution are estimated.[7] Related to that point, using larger samples may reduce the sensitivity of parameter estimates to the starting and ending dates of the sample. In practice, using a long data series may involve a variety of problems. For instance:

- The risk that the data cover multiple regimes increases.
- Time series of the required length may not be available.
- In order to get data series of the required length, the temptation is to use high-frequency data (weekly or even daily). Data of high frequency are more sensitive to asynchronism across variables.[8] As a result, high-frequency data tend to produce lower correlation estimates.

Researchers have concluded that the underlying mean returns on volatile asset classes such as equities are particularly difficult to estimate from historical data.[9] Using high-frequency data is of no help in increasing the accuracy of mean return estimates.

A practical approach to deciding whether one should use the whole of a long data series is to answer two questions. The first question is: Is there any fundamental reason to believe that the entirety of the series' time period is no longer relevant? If there is, the next question to answer is: Do the data support that hypothesis? Texts on time-series and regression analysis offer a variety of means to assess objectively whether there is a break in a time series. If the answers to both questions are yes, one should use only that part of the time series that appears to be relevant to the present.

EXAMPLE 9

Using Regression Analysis to Identify a Change in Regime

The effects of specific events on a time series (e.g., the announcement by a central bank of a new monetary policy) can be most simply modeled in a regression framework using a dummy explanatory variable $z(t)$, where $z(t) = 0$ for t before

6 See Hamilton (1994).

7 According to sampling theory, the precision of the estimate of the population mean is proportional to $1/\sqrt{(\text{number of observations})}$.

8 **Asynchronism** is a discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

9 See Luenberger (1998).

the intervention (change) date and $z(t) = 1$ for t at and subsequent to the intervention date. This dummy variable approach models a simple shift in the mean of the dependent variable.

2.2.4 Ex Post *Risk Can Be a Biased Measure of* Ex Ante *Risk*

In interpreting historical prices and returns over a given sample period for their relevance to current decision making, we need to evaluate whether asset prices in the period reflected the possibility of a very negative event that did not materialize during the period. Looking backward, we are likely to underestimate *ex ante* risk and overestimate *ex ante* anticipated returns.[10] For example, suppose that bond prices reflect an anticipation of a small chance of a central bank policy change that would be very negative for inflation and bond returns. When investors become aware that the risk has passed, bond prices should show strong gains. *Ex post* realized bond returns are high although *ex ante* they were lower. Because the bank policy change did not occur, it may be overlooked as a risk that was faced by bond investors at the time. An analyst reviewing the record might conclude that bonds earn high returns in excess of the short-term interest rate.[11] Similarly, a high *ex post* US equity risk premium may reflect fears of adverse events that did not materialize and may be a poor estimate of the *ex ante* risk premium.[12] Only the *ex ante* risk premium is important in decision making.

2.2.5 *Biases in Analysts' Methods*

Analysts naturally search for relationships that will help in developing better capital market expectations. Among the preventable biases that the analyst may introduce in such work are the following:

- **Data-mining bias**. Data-mining bias is introduced by repeatedly "drilling" or searching a dataset until the analyst finds some statistically significant pattern. Such patterns cannot be expected to be of predictive value. It is almost inevitable that the analyst will find some statistically significant relationship by mining the data: Using a given sample, if we examine 50 different variables as predictors of the equity risk premium and set a 10 percent significance level in our tests, we would expect 5 variables to appear significant by random chance alone. The absence of an explicit economic rationale for a variable's usefulness is one warning sign of a data-mining problem: no story, no future.[13]
- **Time-period bias**. Time-period bias relates to results that are time period specific. Research findings are often found to be sensitive to the selection of starting and/or ending dates. As one example, the small-cap stock effect in US stock returns has been found to be largely concentrated in the nine-year period 1975 to 1983, when as a group, small-cap stocks outperformed large-cap equities by 19.6 percent per year. Excluding the 1975–1983 period, a given investment in large-cap equities in 1926 would have grown by the end of 2001 to an amount that was 20 percent greater than the amount resulting from an equal initial investment in small-cap equities.[14]

10 That situation of biased measurement has been called the "generalized peso problem" or the "peso problem." The name comes from an explanation for the fact that forward markets for the Mexican peso in the mid-1970s consistently underpredicted the US dollar/peso exchange rate. The explanation is that traders feared that the Mexican government would devalue the peso from its peg.

11 This explanation has been offered by Bekaert, Hodrick, and Marshall (2001) along with time-varying term premiums for anomalies in the term structure of interest rates noted by Campbell and Shiller (1991).

12 See Goetzmann and Jorion (1999) and references therein.

13 See McQueen and Thorley (1999).

14 See Siegel (2002), pp. 134–135.

How might the analyst avoid the mistake of using a variable in a forecasting mode that historical analysis has suggested as useful but which is actually irrelevant? The analyst should scrutinize the variable selection process for data-mining bias and be able to provide an economic rationale for the variable's usefulness in a forecasting mode. A further practical check is to examine the forecasting relationship out of sample (i.e., on data other than those used to estimate the relationship). For example, the available data period could be split into two subperiods. If the forecasting relationship estimated from the first period does not hold similarly when tested using data from the second subperiod, the variable may not be useful as a forecaster.

2.2.6 *The Failure to Account for Conditioning Information*

We observed above that the analyst should ask whether there are relevant new facts in the present when forecasting the future. Where such information exists, the analyst should condition his or her expectations on it.

We can take the case of estimating mean returns. Long-run mean returns and risk involve an averaging over many different economic and market conditions. Prospective returns and risk for an asset as of today are conditional on the specific characteristics of the current marketplace and prospects looking forward. That fact explains the role of economic analysis in expectations setting: We should not ignore any relevant information or analysis in formulating expectations. Indeed, the use of unconditional expectations can lead to misperceptions of risk, return, and risk-adjusted return.

Consider an asset class that has a beta of 0.80 in economic expansions and 1.2 in recessions (with respect to a world market portfolio). If we make the assumptions in Exhibit 2 on the market return and the risk-free rate, the asset class's expected return is 10 percent in an expansion versus 4.4 percent in a recession and its true unconditional expected return is 0.5(10%) + 0.5(4.4%) = 7.2%. The asset class fairly rewards risk in both expansions and recessions [alpha = 0.5(0%) + 0.5(0%) = 0%]. The asset class would appear to have a beta of 0.5(0.8) + 0.5(1.2) = 1.0 in a regression. Given this unconditional beta, the expected return according to the CAPM would be 8 percent.

Exhibit 2 Misvaluation from Using an Unconditional Benchmark

	Expansion	Recession	Unconditional Expectation
Risk-free rate	2%	2%	2%
Exp. return on market	12%	4%	8%
β_i	0.80	1.20	1.0
$E(R_i)$	2% + 0.8 (12% − 2%) = 10%	2% + 1.2 (4% − 2%) = 4.4%	True: 7.2% Using β_i = 1.0: 2% + 1.0 (8% − 2%) = 8%
α_i	0%	0%	7.2% − 8% = −0.8%

Note: An expansion and a recession are assumed to be equally likely.

Comparing the unconditional expected return using the unconditional beta of 1.0, the asset class appears to inadequately reward risk (alpha = −0.8 percent) although we know from the analysis presented that the asset class fairly rewards risk.[15] How would an analyst avoid drawing the wrong conclusion? The analyst would need to uncover

15 Note that Ferson and Schadt (1996) developed a method to estimate conditional alpha.

through research that the asset class's systematic risk varies with the business cycle. The analyst would then condition his or her forecasts on the state of the economy to formulate the most accurate expectations.

2.2.7 *Misinterpretation of Correlations*

In financial and economic research, the analyst should take care in interpreting correlations. When a variable A is found to be significantly correlated with a variable B, there are at least three possible explanations:

- A predicts B;
- B predicts A;
- a third variable C predicts A and B.

Without the investigation and modeling of underlying linkages, relationships of correlation cannot be used in a predictive model. For example, suppose A relates to natural disasters in quarter t and B represents property insurer claims in quarter $t + 1$. One can discern on the basis of simple economic reasoning a cause-and-effect link from A to B. Supporting that conclusion, no plausible feedback linkage exists from B to A: A is truly an exogenous variable (an **exogenous variable** is determined outside the system, in contrast to an **endogenous variable**, which is determined within the system). One might consider using A as one predictor of B, but the reverse—using claims in $t + 1$ to predict natural disasters in $t + 2$—would not be fruitful (although the observed correlation by itself would not tell you that).

As the third bullet point represents, there may be no predictive relationship between A and B; the relationship between A and B is conditional on the presence of the variable C, and the correlation between A and B is spurious.

Another surprise that might be in store: A and B could have a strong but *nonlinear* relationship but have a low or zero correlation.[16]

Suppose that one has a plausible model of an underlying causal link to support the use of a variable as a predictor. Are there any more powerful tools to apply to establish the variable's usefulness than simple correlation? Multiple-regression analysis may be one such tool. For example, suppose we have a model that suggests B predicts A but we need to eliminate C as mediating the relationship between A and B (as in the third bullet point above). We can estimate the following regression:

$$A = \beta_0 + \beta_1 B + \beta_2 C + \varepsilon$$

The variable C in this regression is a control variable. The coefficient β_1 represents the effect of B on A after accounting for the effect of the control variable C on A. The coefficient β_1 reflects the **partial correlation** between A and B. If the estimated value of β_1 is significantly different from 0 but β_2 is not significantly different from 0 (based on t-tests), we have a piece of evidence in support of the proposition that B predicts A. The multiple-regression framework supports the introduction of multiple control variables. The analyst may also use time-series analysis. For example, with sufficiently long time series, we can regress A on lagged values of itself, lagged values of B, and lagged values of control variables, and test the null hypothesis that all the coefficients on the lagged values of B jointly equal 0. If we can reject the null hypothesis, the variable B may be useful in predicting A.[17]

---

16 For example, consider $B = A^2$ (A raised to the second power indicates a nonlinear association). The variable B increases with increasing values of A when A is above 0. But consider negative values of A. As A increases from −100 to 0, B decreases. The correlation between A and B is zero, although the relationship between them is so precise that it can be expressed in a mathematical equation.

17 This would be a test of "predictive causality," known as Granger causation. See Granger (1969) and Diebold (2004).

EXAMPLE 10

Causality Relationships

That one event follows another is not sufficient to show that the first event caused the second. For example, a decrease in the number of new accountants following an increase in tax rates would be association without cause-and-effect relationship. But seasonal incoming tax receipts probably bear a direct cause-and-effect relationship to the needs of governments to borrow funds in some months versus others. If an increase in income tax rates causes individuals to be more concerned with minimizing taxes, one might discern an indirect cause-and-effect relationship between the tax rate increase and a subsequent jump in sales of tax preparation software.

2.2.8 *Psychological Traps*

Hammond, Keeney, and Raiffa (1998) formulated several psychological traps that are relevant to our discussion because they can undermine the analyst's ability to make accurate and unbiased forecasts.

The **anchoring trap** is the tendency of the mind to give disproportionate weight to the first information it receives on a topic. In other words, initial impressions, estimates, or data anchor subsequent thoughts and judgments. For instance, in an investment committee in which several different perspectives on capital market returns are presented, the first presentation may tend to function as an anchor for discussion and its lead-off position might give it an edge in being adopted. The analyst can try to address this trap by consciously attempting to avoid premature conclusions.

The **status quo trap** is the tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past. If inflation has been rising at a double-digit rate for several recent periods, it is a natural tendency to forecast a similar increase in the next period. In a decision-making context, because doing something other than maintaining the status quo (risking an error of commission) may lead to increased work and regret if the decision is wrong, doing nothing (risking an error of omission) becomes the easy and oft-preferred alternative. The status quo trap may be overcome with rational analysis used within a decision-making process.

The **confirming evidence trap** is the bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it. The tendency to seek out information that supports an existing point of view also reflects this bias. Several steps may be taken to help ensure objectivity:

- Examine all evidence with equal rigor.
- Enlist an independent-minded person to argue against your preferred conclusion or decision.
- Be honest about your motives.

The **overconfidence trap** is the tendency of individuals to overestimate the accuracy of their forecasts. Many people do not admit or attempt to measure the possibility of failure in predicting uncertain events. In similar fashion, we tend to believe that most people share our particular views. The overconfidence trap would be reflected in admitting too narrow a range of possibilities or scenarios in forecasting. A good practice to prevent this trap from undermining the forecasting endeavor is to widen the range of possibilities around the primary target forecast.

The **prudence trap** is the tendency to temper forecasts so that they do not appear extreme, or the tendency to be overly cautious in forecasting. In a decision-making context, it is the tendency to be cautious when making decisions that could be potentially

expensive or damaging to the decision maker's career. To avoid the prudence trap, an analyst is again wise to widen the range of possibilities around the target forecast. In addition, the most sensitive estimates affecting a forecast should be carefully reviewed in light of the supporting analysis.

The **recallability trap** is the tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory. Often, forecasts are overly influenced by the memory of catastrophic or dramatic past events. For example, investors' memory of the stock market crash of 1929 has sometimes been cited as a depressing influence on equity valuation levels for as long as three decades following the crash. To minimize the distortions of the recallability trap, analysts should ground their conclusions on objective data and procedures rather than on personal emotions and memories.

EXAMPLE 11

Traps in Forecasting

Cynthia Casey is a Canada-based investment adviser with a clientele of ultra-high-net-worth individuals. The Canadian equity allocation of client Philip Lasky's portfolio had favorable risk-adjusted performance from 2006 to 2008 but nevertheless lost 20 percent of its year-end 2007 value by the end of 2008. In a phone call prior to a quarterly portfolio review at the end of 2008, Lasky expressed the thought that the pain of the recent and continuing bear market had made him very cautious about investing in the stock market. Although his equity allocation results with Casey showed healthy appreciation over the entire period he had invested with her, his conversation dwelled mostly on the experience of the past year. Lasky told Casey that he had read a variety of financial reports containing predictions by investment notables on the equity risk premium ranging from near zero to 6 percent. During the call, he repeated to Casey, sometimes inaccurately, the arguments of the most bearish prognosticator. At the time of the call, Casey was preparing to share with clients relatively optimistic forecasts for Canadian equities, developed with an assistant who was well grounded in capital market analysis. Perceiving that Lasky and many of her other clients held more pessimistic viewpoints and that she might lose their trust if her own viewpoint turned out to be wrong, after the phone call, Casey decided to revise downward some of the economic growth assumptions she had previously made.

Critique the forecasts of A) Lasky and B) Casey with respect to psychological traps in forecasting.

Solution to A:

In focusing on the most recent period only and predicting a continuation of the most recent trend, Lasky may have fallen into the status quo trap. The pain of the bear market may have overly influenced his thinking about the present (recallability trap). Furthermore, in sharing the viewpoint of the most bearish prognosticator, Lasky may be falling into the confirming evidence trap.

Solution to B:

By trimming her assumptions to be more conservative without real supporting analysis, Casey may have fallen into the prudence trap.

2.2.9 *Model Uncertainty*

The analyst usually encounters at least two kinds of uncertainty in conducting an analysis: **model uncertainty** (uncertainty concerning whether a selected model is correct) and **input uncertainty** (uncertainty concerning whether the inputs are correct). For example, suppose an analyst takes the equity risk premium of UK equities to be the realized value of the return of UK equities over UK bonds over the past 50 years. The analyst's model might be described as follows: "The *ex ante* UK equity risk premium was, is, and will be equal to some constant number μ." If the model is far off the true state of affairs, the analyst's forecast will also be off. (The sampling error in the estimate of μ using 50 years of data would constitute the input error in this approach.) To take another example, if the analyst uses a monetarist model for forecasting future inflation, the analyst faces uncertainty concerning whether that model is correct. In some cases, the analyst may gauge model uncertainty by observing the variation in results that comes from shifting between the several most promising models.

Input uncertainty and model uncertainty in particular often make it hard to confirm the existence of capital market anomalies (inefficiencies); some valuation model usually underlies the identification of an inefficiency. **Behavioral finance** (the theory that psychological variables affect and often distort individuals' investment decision making) has offered explanations for many perceived capital market anomalies. Kurz, Jin, and Motolese (2005) argue that many of these apparent anomalies could represent equilibria resulting from the actions of investors who use competing models but process and act on information rationally.[18]

TOOLS FOR FORMULATING CAPITAL MARKET EXPECTATIONS

3

The following sections introduce a range of tools that have been used in professional forecasting of capital market returns. Although an analyst may have distinct preferences among these approaches, familiarity with all these major tools will be helpful in addressing the widest variety of forecasting problems according to their particular characteristics.

3.1 Formal Tools

Formal tools are established research methods amenable to precise definition and independent replication of results. The information provided by well-chosen formal tools applied to sound data can help the analyst produce accurate forecasts.

3.1.1 *Statistical Methods*

Statistical methods relevant to expectations setting include **descriptive statistics** (methods for effectively summarizing data to describe important aspects of a dataset) and **inferential statistics** (methods for making estimates or forecasts about a larger group from a smaller group actually observed).

The simplest approach to forecasting is to use past data to directly forecast future outcomes of a variable of interest.

18 That is, apparent anomalies could represent a *rational belief equilibrium* in the sense of Kurz (1994).

3.1.1.1 Historical Statistical Approach: Sample Estimators[19] Suppose an investor uses the FTSE 100 as his benchmark for UK large-cap equity allocations. The investor could use the mean return on the FTSE 100 over some selected sample period as his forecast of the long-run expected return on UK large-cap equities. If future returns over the selected time horizon reflect the same probability distribution as past returns (because the time series is **stationary**—that is, the parameters that describe the return-generating process are unchanged), the resulting estimate will be useful. For example, in a mean–variance framework, the analyst might use:

- the sample arithmetic mean total return or sample geometric mean total return as an estimate of the expected return;
- the sample variance as an estimate of the variance; and
- sample correlations as estimates of correlations.

One decision point relates to the choice between an arithmetic mean and a geometric mean. The arithmetic mean return (which is always used in the calculation of the sample standard deviation) best represents the mean return in a single period. The geometric mean return of a sample represents the compound rate of growth that equates the beginning value to the ending value of a data series. The geometric mean return represents multiperiod growth more accurately than the arithmetic mean return. The geometric mean return is always lower than the arithmetic mean return for a risky variable. The differences between the arithmetic mean and the geometric mean in historical estimates of the equity risk premium can be substantial.[20] Both approaches are used in current practice.

Dimson, Marsh, and Staunton (2011) presented authoritative evidence on asset returns in 17 countries for the 111 years 1900–2010. Exhibit 3 excerpts their findings.

An analyst using a historical statistical approach would use historical data such as those given in Exhibit 3 as the basis for forecasts. Alternatively, using a historical statistical approach for the equity risk premium and a current term-structure estimate for the expected return on bonds (e.g., a yield to maturity on a zero-coupon government bond), the expected return on equities could be estimated as their sum.

Exhibit 3 Real (Inflation-Adjusted) Equity and Bond Returns: Seventeen Major Markets, 1900–2010

	Equities		Bonds	
Country	Arithmetic Mean Equity Return	Standard Deviation of Return	Arithmetic Mean Bond Return	Standard Deviation
Australia	9.1%	18.2%	2.3%	13.2%
Belgium	5.1	23.61	1.1	12.0
Canada	7.3	17.2	2.6	10.4
Denmark	6.9	20.9	3.7	11.7
France	5.7	23.5	0.8	13.0

19 A **sample estimator** is a formula for assigning a unique value (a **point estimate**) to a population parameter.

20 Looking forward to later discussion, the arithmetic historical equity risk premium would be calculated as the difference between the arithmetic mean return on the proxy for equities and the arithmetic mean return on long-term bonds. The geometric mean can be approximated as the difference between the geometric mean return on the proxy on equities ($R_{G,e}$) and the geometric mean return on long-term bonds ($R_{G,b}$), or more precisely, as $(1 + R_{G,e})/(1 + R_{G,b})$. In practice, the geometric mean calculation produces a lower estimate for the equity risk premium than does the arithmetic mean calculation.

Exhibit 3 (Continued)

	Equities		Bonds	
Country	Arithmetic Mean Equity Return	Standard Deviation of Return	Arithmetic Mean Bond Return	Standard Deviation
Germany	8.1	32.2	0.8	15.7
Ireland	6.4	23.21	1.9	14.9
Italy	6.1	29.0	–0.4	14.1
Japan	8.5	29.8	1.6	20.1
Netherlands	7.1	21.8	1.8	9.4
Norway	7.2	27.4	2.4	12.2
South Africa	9.5	22.6	2.3	10.4
Spain	5.8	22.3	1.9	12.4
Sweden	8.7	22.9	3.2	11.8
Switzerland	6.1	19.8	2.5	9.3
United Kingdom	7.2	20.0	2.2	13.7
United States	8.3	20.3	2.3	10.2

Source: Dimson, Marsh, and Staunton (2011), Tables 2 and 5. German data exclude 1922–1923.

3.1.1.2 Shrinkage Estimators **Shrinkage estimation** involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates. This "two-estimates-are-better-than-one" approach has desirable statistical properties that have given it a place in professional investment practice. The term "shrinkage" refers to the approach's ability to reduce the impact of extreme values in historical estimates. The procedure has been applied to covariances and mean returns.

A **shrinkage estimator** of the covariance matrix is a weighted average of the historical covariance matrix and another, alternative estimator of the covariance matrix, where the analyst places the larger weight on the covariance matrix he or she believes more strongly in.[21] Why are analysts often not satisfied with using the historical sample covariance matrix? Basically, because investment data series are relatively short and samples often reflect the nonrecurring peculiarities of a historical period. The sample covariance matrix is perfectly well suited for *summarizing* an observed dataset and has the desirable (large-sample) property of unbiasedness. Nevertheless, a shrinkage estimator is a superior approach for estimating the population covariance matrix for the medium- and smaller-size datasets that are typical in finance.

A shrinkage estimator approach involves selecting an alternative estimator of the covariance matrix, called a **target covariance matrix**. For example, an analyst might believe that a particular model relating asset class returns to a particular set of return drivers or systematic risk factors has some validity. The asset classes' estimated betas or factor sensitivities in such a model can be used to estimate the asset classes' covariances. To consider one number in the covariance matrix, suppose that the estimated covariance between domestic shares and bonds is 48 using the factor model and 80 using a historical estimate, and assume further that the optimal weights on the model and historical estimates are 0.75 and 0.25, respectively. The shrinkage

21 This method is usually presented in terms of covariances rather than correlations for technical reasons. Either covariance or correlation can be used in MVO. Stein (1956) introduced shrinkage estimates.

estimate of the covariance would be 0.75(48) + 0.25(80) = 56. There is a systematic way to determine the optimal weights on the two estimates that the analyst can obtain from the investment literature on this topic.[22]

A surprising fact concerning the shrinkage estimator approach is that any choice for the target covariance matrix will lead to an increase (or at least not a decrease) in the efficiency of the covariance estimates versus the historical estimate. The improvement will be greater if a plausible target covariance matrix is selected. If the target covariance matrix is useless in improving the accuracy of the estimate of covariance, the optimal weight on the historical estimate would be calculated as 1. One reasonable choice for the target covariance matrix would be a factor-model-based estimate of the covariance matrix, following the lead of Ledoit and Wolf (2003). Another choice for the target covariance matrix would be a covariance matrix based on assuming each pairwise covariance is equal to the overall average covariance.[23]

EXAMPLE 12

Adjusting a Historical Covariance

Cynthia Casey has estimated the covariance between Canadian equities and US equities as 230 using historical data. Using a factor model approach based on a proxy for the world market portfolio, she estimates the covariance as 190. Casey takes a shrinkage estimator approach to estimating covariances and determines that the optimal weight on the historical estimate is 0.30.

1. Calculate the shrinkage estimate of the covariance between US and Canadian equities.
2. Describe the theoretical advantage of a shrinkage estimate of covariance compared to a raw historical estimate.

Solution to 1:

0.30(230) + 0.70(190) = 202.

Solution to 2:

The shrinkage estimate should be more accurate, given that the weights are chosen appropriately.

A shrinkage estimator of mean returns involves taking a weighted average of each historical mean return and some other target constant—such as the overall (grand) mean historical return across assets. For example, five assets have historical mean returns of 4 percent, 6 percent, 7 percent, 8 percent, and 10 percent, respectively. The overall mean return is 7 percent. Given a weight of 80 percent on an asset's historical mean, we would calculate the shrinkage estimate of the first asset's return as 0.8(4%) + 0.2(7%) = 4.6%.

3.1.1.3 Time-Series Estimators **Time-series estimators** involve forecasting a variable on the basis of lagged values of the variable being forecast and often lagged values of other selected variables.

22 Ledoit and Wolf (2003) give a simple formula for the optimal weights. The criterion their formula satisfies is that the weights minimize the mean square error in the resulting estimate.

23 An identity matrix or a scalar multiple of it is considered a serviceable choice when the researcher has no insight into an intuitive target for the covariance matrix.

Time-series methods have been found useful in developing particularly short-term forecasts for financial and economic variables. Time-series methods have been notably applied to estimating near-term volatility, given persuasive evidence of variance clustering (particularly at high frequencies, such as daily and weekly) in a number of different markets, including equity, currency, and futures markets.[24] **Volatility clustering** is the tendency for large (small) swings in prices to be followed by large (small) swings of random direction. Volatility clustering captures the idea that some markets represent periods of notably high or low volatility. Robert F. Engle shared the 2003 Nobel Prize in Economics in part for the development of time-series models that can accurately capture the property of volatility clustering.[25]

One of the simplest specifications in this broad class of models was developed within a division at JPMorgan that was later established as the RiskMetrics Group. This model specifies that the volatility in period t, σ_t^2, is a weighted average of the volatility in the previous period, σ_{t-1}^2, and the squared value of a random "noise" term, ε_t^2. The expression is

$$\sigma_t^2 = \beta\sigma_{t-1}^2 + (1-\beta)\varepsilon_t^2 \tag{1}$$

with $0 < \beta < 1$. The coefficient β measures the rate of decay of the influence of the value of volatility in one period on future volatility, and the rate of decay is exponential. The higher β is, the more volatility in one period "remembers" what happened in the past and the more it clusters.

To illustrate using $\beta = 0.94$, we will suppose that the standard deviation of returns in $t = 11$ is 10 percent, so $\sigma_{11}^2 = 0.10^2 = 0.01$. The noise term is $\varepsilon_{12} = 0.05$, so $\varepsilon_{12}^2 = 0.05^2 = 0.0025$. The prediction for $t = 12$ is therefore

$$\begin{aligned}\sigma_{12}^2 &= 0.94\sigma_{11}^2 + 0.06\varepsilon_{12}^2\\ &= 0.94(0.01) + 0.06(0.0025)\\ &= 0.00955\end{aligned}$$

implying that $\sigma_{12} = \sqrt{0.00955} = 0.0977$, or 9.77 percent. Intuitively, the high weight on σ_{11}^2 means that it had a strong effect on σ_{12}^2. However, on occasion, the noise term will take on an extreme value and cause volatility to shift quite a bit. In a similar vein to this approach to variance estimation, the correlation matrix has also been estimated with some success using exponentially weighted historical observations.[26]

3.1.1.4 Multifactor Models A **multifactor model** is a model that explains the returns to an asset in terms of the values of a set of return drivers or risk factors.

The structure of a multifactor model, if the analyst believes that K factors drive asset returns, is as follows:

$$R_i = a_i + b_{i1}F_1 + b_{i2}F_2 + \ldots + b_{iK}F_K + \varepsilon_i \tag{2}$$

24 See Drost and Nijman (1993) and references therein.

25 Such models are called autoregressive conditional heteroskedasticity (ARCH) time-series models. The Nobel Prize was shared with Clive W. J. Granger, who developed methods for analyzing cointegrated time series (informally, time series with common trends).

26 For more details on models of volatility clustering, see Bollerslev, Engle, and Nelson (1994).

where

R_i = the return to asset i
a_i = an intercept term in the equation for asset i
F_k = the return to factor k, $k = 1, 2, \ldots, K$
b_{ik} = the sensitivity of the return to asset i to the return to factor k, $k = 1, 2, \ldots, K$
ε_i = an error term with a zero mean that represents the portion of the return to asset i not explained by the factor model. The error term is assumed to be uncorrelated with each of the K factors and to be uncorrelated with the error terms in the equations for other assets.

This structure has been found useful for modeling asset returns and covariances among asset returns. Multifactor models are useful for estimating covariances for the following reasons:

- By relating the returns on all assets to a common set of return drivers, a multifactor model simplifies the task of estimating covariances: estimates of covariances between asset returns can be derived using the assets' factor sensitivities.
- When the factors are well chosen, a multifactor model approach may filter out noise (i.e., random variation in the data specific to the sample period).
- Such models make it relatively easy to verify the consistency of the covariance matrix, because if the smaller factor covariance matrix is consistent, so are any covariances computed on the basis of it.

In the balance of this section, we illustrate a top-down structured approach to using factor models in estimating the covariance matrix. In this approach, we model factors as portfolios of securities and start from a simple two-factor model at the most aggregated level.

Assume that two factors, a global equity factor and a global bonds factor, drive the returns of all assets in the investable universe. In this case, we start the modeling process with a covariance matrix for global equity and global bonds (we will refer to it in this discussion as the *equity–bonds covariance matrix*). A standard deviation of 14 percent for global equity and 4 percent for global bonds and a correlation between them of 0.30 imply the covariance matrix shown in Exhibit 4. In Exhibit 4, 0.0196 is the variance for global equity, 0.0016 is the variance for global bonds, and 0.0017 is the covariance between global equity and global bonds. The covariance between global equity and global bonds is the product of their standard deviations times the correlation between them, or (0.14)(0.04)(0.30) = 0.0017 to four decimal places; for global equity variance, $0.0196 = (0.14)^2$; for global bonds variance, $0.0016 = (0.04)^2$.

Exhibit 4 Factor Covariance Matrix

	Global Equity	Global Bonds
Global Equity	0.0196	0.0017
Global Bonds	0.0017	0.0016

This is a **factor covariance matrix**, as it contains the covariances for the factors assumed to drive returns. In order to derive the **asset covariance matrix** (the covariance matrix for the asset classes or markets under consideration), we need to know how each of the markets responds to factor movements. We measure the responsiveness of markets to factor movements by the markets' **factor sensitivities** (also known

as factor betas or factor loadings), represented by the quantities b_{ik} in Equation 2. If Market 1 moves by 110 basis points in response to a 100 basis point move of global equities, the corresponding factor sensitivity is 1.10. In addition, every market has some risk that is not explained by the factors. This is called the market's idiosyncratic or residual risk and is represented by the residual variance, $\mathrm{Var}(\varepsilon_i)$ for market i. It is assumed that the residuals are uncorrelated.

Exhibit 5 shows hypothetical statistics for five securities markets.

Exhibit 5 Hypothetical Statistics for Five Markets

	Sensitivities		
	Global Equity	**Global Bonds**	**Residual Risk (%)**
Market A	1.10	0	10.0
Market B	1.05	0	8.0
Market C	0.90	0	7.0
Market D	0	1.03	1.2
Market E	0	0.99	0.9

Source: Staub (2006).

Judged by its factor sensitivities, Market A is an equity market, with zero sensitivity to global bonds and a positive sensitivity to global equity. The zero sensitivity to global bonds does not mean that Market A is uncorrelated with global bonds, although it does mean that its partial correlation with bonds (the correlation after removing the influence of the other markets) is zero and that global bonds are not one of Market A's return drivers.[27]

In the case we are examining, we are assuming that the return of market i, M_i, is as follows:

$$M_i = a_i + b_{i1}F_1 + b_{i2}F_2 + \varepsilon_i,\ i = 1 \text{ to } 5$$

We compute the markets' variances and covariance using Equations 3a and 3b, respectively:

$$M_{ii} = b_{i1}^2\mathrm{Var}(F_1) + b_{i2}^2\mathrm{Var}(F_2) + 2b_{i1}b_{i2}\mathrm{Cov}(F_1,F_2) + \mathrm{Var}(\varepsilon_i), \quad \text{for } i = 1 \text{ to } 5 \tag{3a}$$

where M_{ii} is the variance of market i;

$$M_{ij} = b_{i1}b_{j1}\mathrm{Var}(F_1) + b_{i2}b_{j2}\mathrm{Var}(F_2) + (b_{i1}b_{j2} + b_{i2}b_{j1})\mathrm{Cov}(F_1,F_2) \quad \text{for } i = 1 \text{ to } 5, j = 1 \text{ to } 5, \text{ and } i \neq j \tag{3b}$$

where M_{ij} is the covariance of market i with market j.

For example, suppose we want to compute the covariance between Markets A and B. Using Equation 3b (with $i = 1$ for Market A and $j = 2$ for Market B), we calculate that

$$M_{12} = (1.1)(1.05)(0.0196) + (0)(0)(0.0016) + [(1.10)(0) + (0)(1.05)](0.0017) = 0.0226$$

27 Through the positive covariance (and correlation) between global equity and global bonds, Market A is still positively correlated with global bonds, although moderately.

Because both Market A and Market B have zero sensitivity to the global bonds factor, their correlation is explained only through their sensitivities to the global equity factor. Equations 3a and 3b are basic formulas for using multifactor models to estimate asset class covariance.

Note that establishing the consistency of the equity–bonds covariance matrix would not be a challenge, because it has only four entries. If the equity–bonds covariance matrix is consistent, then the covariance matrix for the markets calculated using Equations 3a and 3b will be consistent, even if many markets are involved so that consistency might be hard to check directly. The ability to establish consistency efficiently is a significant advantage of a multifactor model approach.

Exhibit 6 A Two-Layer Factor Approach

Source: Staub (2006). © 2006 UBS Global Asset Management (Americas) Inc. All rights reserved.

The above example, illustrated in Exhibit 6, is a two-layer structure with the factors on the first layer and the markets to be modeled on the second and final layer.[28]

In practice, a two-layer approach is not sufficient to accurately model interrelationships with the level of detail needed. Consider expanding the set of markets from securities markets to real estate markets, including US real estate sectors—apartment, industry, office, and retail. These are mutually fairly highly correlated but have moderate or weak correlations with most other markets.

In the case of these real estate sectors, we would require new factor layers to model co-movements that are unrelated to the movement of factors in the prior layer. To meet our needs, the two-layer approach must be replaced by a multilayer approach, as illustrated in Exhibit 7.

In a layer immediately below the US real estate sectors, we would introduce US real estate as a whole as a factor. The total number of layers would depend on the final set of markets whose covariance structure we wanted to model.[29]

28 The two-layer concept goes back to Grinold and Kahn (1995), who employ it for stock modeling. For more details, see p. 58f.

29 See Staub (2006) for more details.

Exhibit 7 A Multilayer Factor Approach

Source: Staub (2006). © 2006 UBS Global Asset Management (Americas) Inc. All rights reserved.

3.1.2 *Discounted Cash Flow Models*

Discounted cash flow models (DCF models) express the idea that an asset's value is the present value of its (expected) cash flows. Formally, the value of an asset using a DCF approach is as follows:[30]

$$V_0 = \sum_{t=1}^{\infty} \frac{\mathrm{CF}_t}{(1+r)^t} \tag{4}$$

where

V_0 = the value of the asset at time $t = 0$ (today)
CF_t = the cash flow (or the expected cash flow, for risky cash flows) at time t
r = the discount rate or required rate of return

For simplicity, we represent the discount rate in Equation 4 as the same for all time periods—a flat term structure of discount rates.

Analysts use DCF models in expectations setting both for traditional securities markets and for alternative investment markets where the investment (e.g., private equity or real estate) generates cash flows.

DCF models are a basic tool for establishing the intrinsic value of an asset based on fundamentals (e.g., its projected cash flows) and its fair required rate of return. DCF models have the advantage of being forward-looking. They do not address short-run factors such as current supply-and-demand conditions, so practitioners view them as more appropriate for setting long-term rather than short-term expectations. That said, asset prices that are disconnected from fundamentals may reflect conditions of speculative excess that can reverse abruptly.[31]

3.1.2.1 Equity Markets Analysts have frequently used the **Gordon (constant) growth model** form of the dividend discount model, solved for the required rate of return, to formulate the long-term expected return of equity markets. The Gordon growth model

30 If the asset trades in an integrated market, the future cash flows of the asset are to be translated into the home currencies of investors.
31 See Calverley (2004) for a discussion of **bubbles** (episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value).

assumes that there is a long-term trend in dividends and corporate earnings, which is a reasonable approximation for many developed country economies.[32] The expression for the Gordon growth model solved for $E(R_e)$, the expected rate of return on equity, is

$$E(R_e) = \frac{D_0(1+g)}{P_0} + g = \frac{D_1}{P_0} + g \tag{5}$$

where

D_0 = the most recent annual dividend per share
g = the long-term growth rate in dividends, assumed equal to the long-term earnings growth rate
P_0 = the current share price

According to the Gordon growth model, share price should appreciate at a rate equal to the dividend growth rate. Therefore, in Equation 5, the expected rate of return is composed of two parts: the dividend yield (D_1/P_0) and the capital gains (or appreciation) yield (g).

The quantity g can be estimated most simply as the growth rate in **nominal gross domestic product** (nominal GDP), a money measure of the goods and services produced within a country's borders.[33] Nominal GDP growth can be estimated as the sum of the estimated real growth rate in GDP plus the expected long-run inflation rate. A more advanced analysis can take account of any perceived differences between the expected growth of the overall economy and that of the constituent companies of the particular equity index that the analyst has chosen to represent equities. The analyst can use

Earnings growth rate = GDP growth rate + Excess corporate growth (for the index companies)

where the term *excess corporate growth* may be positive or negative depending on whether the sectoral composition of the index companies is viewed as higher or lower growth than that of the overall economy.[34] If the analyst has chosen a broad-based equity index, the excess corporate growth adjustment, if any, should be small. Exhibit 8 presents the real GDP growth rates for selected countries.

Exhibit 8 Average Annual Real GDP Growth Rates: 1980–2009 (in Percent)

	Time Period		
Country	**1980–89**	**1990–99**	**2000–09**
Australia	3.4%	3.3%	3.2%
Canada	3.0	2.4	2.1
Denmark	2.2	2.3	0.8
France	2.1	1.8	1.3
Germany	1.9	1.3	0.8
Italy	2.4	1.5	0.5
Japan	3.9	1.7	0.6
Netherlands	2.0	3.0	1.6
Sweden	2.4	1.8	1.9

32 See Jagannathan, McGrattan, and Scherbina (2000).
33 See Diermeier (1990) and Singer and Terhaar (1997) for a theoretical analysis of this relationship.
34 See Grinold and Kroner (2002), p. 12.

Exhibit 8 (Continued)

	Time Period		
Country	**1980–89**	**1990–99**	**2000–09**
Switzerland	1.8	1.1	1.7
United Kingdom	2.4	2.1	1.7
United States	3.1	3.1	1.8

Source: OECD, Datastream, Bloomberg, World Bank.

In the United States and other major markets, share repurchases have become an important means for companies to distribute cash to shareholders. Grinold and Kroner (2002) provided a restatement of the Gordon growth model that takes explicit account of repurchases. Their model also provides a means for analysts to incorporate expectations of valuation levels through the familiar P/E ratio. The **Grinold–Kroner model**, which is based on elaborating the expression for the expected single-period return on a share, is[35]

$$E(R_e) \approx \frac{D}{P} - \Delta S + i + g + \Delta PE \tag{6}$$

where

$E(R_e)$ = the expected rate of return on equity
D/P = the expected dividend yield
ΔS = the expected percent change in number of shares outstanding
i = the expected inflation rate
g = the expected real total earnings growth rate (not identical to the EPS growth rate in general, with changes in shares outstanding)
ΔPE = the per period percent change in the P/E multiple

The term ΔS is negative in the case of net positive share repurchases, so $-\Delta S$ is a positive **repurchase yield** in such cases.

Equation 6 consists of three components: an expected income return, an expected nominal earnings growth return, and an expected repricing return (from expected P/E ratio expansion or contraction).

- Expected income return: $D/P - \Delta S$.
- Expected nominal earnings growth return: $i + g$.
- Expected repricing return: ΔPE.

The expected nominal earnings growth return and the expected repricing return constitute the expected capital gains.

The Grinold–Kroner model can be used not only in expectations setting, but also as a tool to analyze the sources of historical returns. For example, the S&P 500 achieved a compound growth rate of 10.7 percent per year over the 76-year period 1926–2001 (corresponding to an equity premium of 5.3 percent).[36] Following the Grinold–Kroner analysis, the sources of this return were as follows:

- 4.4 percent from income;

35 See Grinold and Kroner (2002) for a derivation. Ibbotson and Chen (2003) presented a broadly similar analysis of the sources of equity returns but did not model stock repurchases.
36 The equity risk premium was defined by the authors as the mean return on the S&P 500 less the mean 10-year US Treasury bond return over this period.

- 4.8 percent from nominal earnings growth (consisting of 1.7 percent real earnings growth and 3.1 percent annual inflation); and
- 1.5 percent from repricing.

As a check, 4.4% + 4.8% + 1.5% = 10.7%. Repricing return was a volatile contributor to total return. The growth of the P/E ratio from 10.2 in 1926 to 30.6 in 2001 represented a compound annual growth rate of 1.5 percent. However, the P/E of 10.2 in 1926 was actually somewhat above the P/E in 1981: Most of the repricing return was concentrated in the 20 years leading up to the ending date of 2001.

EXAMPLE 13

The Grinold–Kroner Forecast of the US Equity Risk Premium

The details of the Grinold–Kroner (GK) forecast of the US equity risk premium (as of early 2002) are instructive. Their forecast horizon was 10 years.

Expected Income Return

The forecast dividend yield was 1.75 percent (somewhat above the then-current yield of 1.4 percent but below the historical mean of over 4 percent for 1926–2001). The repurchase yield was forecast to be 0.5 percent, down from the 1–2 percent rate of the 1990s, which was viewed as an unusual period. The expected income return was therefore 1.75% + 0.5% = 2.25%.

Expected Nominal Earnings Growth Return

Economic theory suggests that the real GDP growth rate is the sum of labor productivity growth and labor supply growth. GK took the historical 2 percent per year US labor productivity growth rate as their forecast. Using a US population growth forecast of 0.8 percent and assuming a 0.2 percentage point increase in the labor force participation rate, the forecast of the labor supply growth rate was 1 percent per year. The overall real GDP growth estimate of 2% + 1% = 3% was within the 2.7 percent to 3.6 percent range of forecasts by economists. Viewing the S&P 500 companies as having a slightly higher growth profile than the overall economy, GK added a 0.5 percent excess corporate growth return for a 3.5 percent real earnings growth return estimate. GK expected an inflation rate of 2.5 percent, 0.3 percentage points above the contemporaneous consensus estimate of economists (viewed by GK as slightly optimistic). Thus, the expected nominal earnings growth return was 3.5% + 2.5% = 6%.

Expected Repricing Return

This component was perhaps the hardest to forecast. Viewing the contemporaneous P/E of 28 as a slight overreaction to the positive factors of decreased inflation, technological advances (positive productivity shocks), and an expected increase in growth rates from globalization, over a 10-year horizon, GK forecast downward repricing equal to –0.75 percent per year.

The GK forecast of the expected return on US equities was therefore 2.25% + 6% – 0.75% = 7.5%. Subtracting the 10-year government bond yield of 5 percent, the GK forecast of the US equity risk premium was 2.5 percent.

The 2.5 percent estimate put GK in a middle position between the predictions of the "risk premium is dead" and the "rational exuberance" camps.

EXAMPLE 14

Forecasting the Return on Equities Using the Grinold–Kroner Model

Cynthia Casey employs the Grinold–Kroner model in forecasting long-term developed market equity returns. Casey makes the following forecasts:

- a 2.25 percent dividend yield on Canadian equities, based on the S&P/TSE Composite Index;
- a repurchase yield of 1 percent for Canadian equities;
- a long-term inflation rate of 2 percent per year;
- long-term corporate real earnings growth at 4 percent per year, based on a 1 percentage point premium for corporate growth over her expected Canadian GDP growth rate of 3.0 percent; and
- an expansion rate for P/E multiples of 0.25 percent per year.

Based only on the information given, determine the expected rate of return on Canadian equities consistent with Casey's assumptions.

Solution:

Using Casey's assumptions and Equation 6, the expected rate of return on Canadian equities should be 9.5 percent, calculated as

$$E(R_e) \approx 2.25\% - (-1.0\%) + 2.0\% + 4.0\% + 0.25\% = 9.5\%$$

DCF model thinking has provided various methods for evaluating stock market levels. The best known of these is the Fed model, which asserts that the stock market is overvalued if the market's forward earnings yield (earnings divided by price) is less than the 10-year Treasury bond yield.[37] The earnings yield is the required rate of return for no-growth equities and is thus a conservative estimate of the expected return for equities. The intuition of the Fed model is that when the yield of T-bonds is greater than the earnings yield of stocks (a riskier investment than T-bonds), stocks are overvalued.

3.1.2.2 Fixed-Income Markets The DCF model is a standard tool in the pricing of fixed-income instruments. In many such markets, bonds are quoted in terms of the single discount rate (the yield to maturity, or YTM) that equates the present value of the instrument's promised cash flows to its market price. The yield to maturity of a bellwether (reference) instrument for a bond market segment is a readily available first approximation of the market expected return for the asset segment at a time horizon equal to the maturity of the instrument.[38] The YTM calculation makes the strong assumption that as interest payments are received, they can be reinvested at an interest rate that always equals the YTM. Therefore, the YTM of a bond with intermediate cash flows is an estimate of the expected rate of return on the bond that is more or less plausible depending on the level of the YTM. If a representative zero-coupon bond is available at the chosen time horizon, its YTM would be a superior estimate.

37 This model was developed by the US Federal Reserve System (the Fed), the central bank of the United States.

38 If the bond is callable, a downward adjustment would generally need to be made. **Yield to worst** (the yield assuming the bond is called at the earliest opportunity) is sometimes used as a conservative estimate in such cases.

3.1.3 *The Risk Premium Approach*

The **risk premium approach** expresses the expected return on a risky asset as the sum of the risk-free rate of interest and one or more risk premiums that compensate investors for the risky asset's exposure to sources of **priced risk** (risk for which investors demand compensation). Investors would avoid purchasing assets offering inadequate expected compensation for priced risk; the lower demand should lead to lower asset prices until the point is reached at which the compensation for risk is adequate. The risk premium approach (sometimes called the **build-up approach**) is most often applied to estimating the required return in equity and bond markets.[39] In the following discussion, we assume that assets are fairly priced so that an asset's required return is also an investor's expected return.[40]

3.1.3.1 A General Expression Following our verbal definition of the risk premium approach, a formal expression for the expected return on a risky asset is

$$E(R_i) = R_F + (\text{Risk premium})_1 + (\text{Risk premium})_2 + \ldots + (\text{Risk premium})_K \tag{7}$$

where $E(R_i)$ is the asset's expected return and R_F denotes the risk-free rate of interest.

3.1.3.2 Fixed-Income Premiums The expected bond return, $E(R_b)$, can be built up as the real rate of interest plus a set of premiums:

$$E(R_b) = \text{Real risk-free interest rate} + \text{Inflation premium} + \text{Default risk premium} + \text{Illiquidity premium} + \text{Maturity premium} + \text{Tax premium}$$

- The **real risk-free interest rate** is the single-period interest rate for a completely risk-free security if no inflation were expected. In economic theory, the real risk-free rate reflects the time preferences of individuals for current versus future real consumption.
- The **inflation premium** compensates investors for expected inflation and reflects the average inflation rate expected over the maturity of the debt plus a premium (or discount) for the probability attached to higher inflation than expected (or greater disinflation). The sum of the real risk-free interest rate and the inflation premium is the **nominal risk-free interest rate**, often represented by a governmental Treasury bill YTM.[41]
- The **default risk premium** compensates investors for the possibility that the borrower will fail to make a promised payment at the contracted time and in the contracted amount. This itself may be analyzed as the sum of the expected default loss in yield terms plus a premium for the nondiversifiable risk of default.[42]
- The **illiquidity premium** compensates investors for the risk of loss relative to an investment's fair value if the investment needs to be converted to cash quickly.[43]

---

39 For more discussion on equity risk premiums, see Arnott and Bernstein (2002), Grinold and Kroner (2002), and Ilmanen (2003).

40 If there is a mispricing, then the expected return would differ from the required return by a capital appreciation or depreciation component reflecting the convergence to fair value over some time frame.

41 Technically, 1 plus the nominal rate equals the product of 1 plus the real rate and 1 plus the inflation rate. As a quick approximation, however, the nominal rate is equal to the real rate plus an inflation premium. In this discussion, we focus on approximate additive relationships to highlight the underlying concepts.

42 See Elton, Gruber, Agrawal, and Mann (2001) for empirical support for such an analysis.

43 Some writers refer to the "illiquidity premium" as the "liquidity" premium (where "lack of liquidity" is understood).

- The **maturity premium** compensates investors for the increased sensitivity, in general, of the market value of debt to a change in market interest rates as maturity is extended, holding all else equal. The difference between the interest rate on longer-maturity, liquid Treasury debt and that on short-term Treasury debt reflects a positive maturity premium for the longer-term debt (and possibly different inflation premiums as well).
- A **tax premium** may also be applicable to certain classes of bonds in some tax jurisdictions.[44]

For example, consider the expected return on a five-year Treasury instrument traded in a developed market when the real risk-free interest rate is 1.5 percent per year, the expected inflation rate over that horizon is 2.5 percent per year, and a one-year Treasury instrument has a yield to maturity of 4 percent per year. Suppose that the five-year Treasury instrument is priced to yield 5 percent. What is the source of the 5 percent to 4 percent spread? As government debt does not have default risk, the longer-term instrument does not bear a default risk premium. Nor does it have an illiquidity premium or differ in taxation from the one-year instrument. The spread would be accounted for as a 1 percent maturity premium.

EXAMPLE 15

The Long-Term Real Risk-Free Rate

The real risk-free rate is compensation for forgoing current consumption in exchange for certain future consumption. Historical real cash rates exhibit high volatility and differ through time and between countries. We distinguish between the current real rate (driven by cyclical factors) and the long-term real rate assumption (based on sustainable equilibrium conditions). In a free economy, the real rate equilibrates the productivity of the economy and society's time preference for consumption. On a forward-looking basis, we can form opinions about the size of the real rate by analyzing societal consumption time preferences and studying the economy's productivity. For developed countries, a range for the long-term real risk-free rate is 2.0 percent to 2.8 percent. Obviously, variation around this estimate has been and is likely to be substantial, but 2.4 percent is an indication of central tendency over the long term.

EXAMPLE 16

The Real Interest Rate and Inflation Premium in Equilibrium

The expected return to any asset or asset class has at least three components: the real risk-free rate, the inflation premium, and the risk premium. In equilibrium and assuming fully integrated markets, the real risk-free rate should be identical for all assets globally. Similarly, from the frame of reference of any individual investor, the inflation premium should be the same for all assets. For

44 For example, in the United States, bonds issued by private corporations are generally tax disadvantaged relative to bonds issued by the federal government, and a tax premium would compensate corporate bondholders. See Elton, Gruber, Agrawal, and Mann (2001) for evidence on the tax premium.

investors with different base currency consumption baskets, different inflation premiums are required to compensate for different rates of depreciation of investment capital.

The inflation premium is the compensation for the depreciation of invested principal because of *expected* price inflation. In equilibrium, we use the inflation rate that each market is using to compensate it for the loss of purchasing power.

EXAMPLE 17

The Risk Premium: Some Facts

The term "risk premium" is often used to refer to the total premium above the nominal default-risk-free interest rate. Some points to keep in mind:

- In comparing risk premium estimates, the analyst should make sure that a common benchmark for the risk-free rate is being used; if not, the estimates should be adjusted to a common risk-free-rate reference point.
- Some analysts do not view illiquidity as a kind of risk and may refer to an illiquidity premium in addition to the risk premium when estimating the required return on an illiquid asset.
- Modeling any risk premium requires an assessment of the degree of capital market integration. Capital market integration will be discussed in Section 3.1.4.

Examples 15, 16, and 17 provide some information on the real risk-free interest rate, including long-term levels. The inflation premium is typically a more volatile element of the yield of bonds. In standard discussions of term-structure theory, the term structure of interest rates for default-free government bonds can provide an estimate of inflation expectations. Furthermore, in markets with active issuance of inflation-indexed bonds, the yield spread at a given maturity of conventional government bonds over inflation-indexed bonds of the same maturity may be able to provide a market-based estimate of the inflation premium at that horizon. The analyst can use market yield data and credit ratings (or other credit models) to estimate the default risk premium by comparing the yields on bonds matched along other dimensions but differing in default risk. An analogous approach may be applied to estimating the other premiums.

3.1.3.3 The Equity Risk Premium The **equity risk premium** is the compensation required by investors for the additional risk of equity compared with debt (debt has a prior claim on the cash flows of the company). An estimate of the equity risk premium directly supplies an estimate of the expected return on equities through the following expression:

$$E(R_e) = \text{YTM on a long-term government bond} + \text{Equity risk premium} \quad (8)$$

where "long-term" has usually been interpreted as 10 or 20 years. (In many markets, bonds with maturities longer than 10 years are not available or actively traded.) As long as one is consistent with the choice of maturity in defining the equity risk premium, either choice is feasible. Equation 8 has been called the **bond-yield-plus-risk-premium method** of estimating the expected return on equity. From Equation 8, we also see that the *equity risk premium in practice is specifically defined as the expected excess return over and above a long-term government bond yield.*

A historical analysis has often been used as a point of departure in estimating the equity risk premium. Exhibit 9 gives the *ex post* data for the 111 years from 1900 to 2010. The standard deviation column represents the volatility in the difference between equity returns and bond returns on a year-by-year basis.

Exhibit 9 Historical Equity Risk Premiums around the World: 1900–2010

	Annual Realized Equity Risk Premium Relative to Long Bond Returns			
Country	**Geometric Mean**	**Arithmetic Mean**	**Standard Error**	**Standard Deviation**
Australia	5.9%	7.8%	1.9%	19.8%
Belgium	2.6	4.9	2.0	21.4
Canada	3.7	5.3	1.7	18.2
Denmark	2.0	3.4	1.6	17.2
France	3.2	5.6	2.2	22.9
Germany (ex-1922/23)	5.4	8.8	2.7	28.4
Ireland	2.9	4.9	1.9	19.8
Italy	3.7	7.2	2.8	29.6
Japan	5.0	9.1	3.1	32.8
Netherlands	3.5	5.8	2.1	22.2
Norway	2.5	5.5	2.7	28.0
South Africa	5.5	7.0	1.9	19.6
Spain	2.3	4.3	2.0	20.8
Sweden	3.8	6.1	2.1	22.3
Switzerland	2.1	3.6	1.7	17.6
United Kingdom	3.9	5.2	1.6	17.0
United States	4.4	6.4	1.9	20.5
World average	3.8	5.0	1.5	15.5

Source: Dimson, Marsh, and Staunton (2011), Table 10. See this source for the details of the equity and bond series used. Note that the world average is based on more markets than are shown in this exhibit.

From Exhibit 9, we can draw the following conclusions:

- The geometric mean historical equity risk premium ranged from a low of 2.0 percent (Denmark) to a high of 5.9 percent (Australia) with an average of 3.8 percent.
- The arithmetic mean historical equity risk premium ranged from a low of 3.4 percent (Denmark) to a high of 9.1 percent (Japan) with an average of 5.0 percent.
- As measured by the standard error (which applies to the arithmetic mean), for most markets there is considerable sampling error in the sample mean estimate of the (presumed unchanging) population mean equity risk premium. Consider the United States, with a standard error of 1.9 percent. Under a normality assumption, one could be only 68 percent confident that the population mean is between 4.5 percent (6.4 percent – 1.9 percent) and 8.3 percent (6.4 percent + 1.9 percent).
- The standard deviation column shows that there is a great amount of variation in the annual return difference between equities and bonds.

The size of *ex ante* equity risk premiums in international markets and the interpretation of the historical record for the purposes of estimating them have been the source of a lively, continuing, and unresolved debate. Grinold and Kroner (2002) and Dimson, Marsh, and Staunton (2002, 2006 and 2011) provide useful observations on the issues raised.

3.1.4 *Financial Market Equilibrium Models*

Financial equilibrium models describe relationships between expected return and risk in which supply and demand are in balance. In that sense, equilibrium prices or equilibrium returns are fair if the equilibrium model is correct.

Equilibrium approaches to setting capital market expectations include the Black–Litterman approach and the international CAPM–based approach presented in Singer and Terhaar (1997). The Black–Litterman approach reverse-engineers the expected returns implicit in a diversified market portfolio, combining them with the investor's own views in a systematic way that takes account of the investor's confidence in his or her views.[45] This approach is discussed at greater length in the reading on asset allocation.

Singer and Terhaar (1997) proposed an equilibrium approach to developing capital market expectations that involves calculating the expected return on each asset class based on the international capital asset pricing model (ICAPM),[46] taking account of market imperfections that are not considered by the ICAPM.[47]

Assuming that the risk premium on any currency equals zero—as it would be if purchasing power parity relationships hold—the ICAPM gives the expected return on any asset as the sum of:

- the (domestic) risk-free rate, and
- a risk premium based on the asset's sensitivity to the world market portfolio and expected return on the world market portfolio in excess of the risk-free rate.

Equation 9 is the formal expression for the ICAPM:

$$E(R_i) = R_F + \beta_i[E(R_M) - R_F] \tag{9}$$

where

$E(R_i)$ = the expected return on asset i given its beta
R_F = the risk-free rate of return
$E(R_M)$ = the expected return on the world market portfolio
β_i = the asset's sensitivity to returns on the world market portfolio, equal to $\mathrm{Cov}(R_i,R_M)/\mathrm{Var}(R_M)$

An important question concerns the identification of an appropriate proxy for the world market portfolio. Based on the criteria of Brinson, Diermeier, and Schlarbaum (1986, p. 17), the analyst can define and use the **global investable market** (GIM). The GIM is a practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.[48]

---

45 See Black and Litterman (1991, 1992). The notion of using reverse optimization to infer expected returns was first described in Sharpe (1974).

46 ICAPM has also been used as an acronym for the intertemporal capital asset pricing model developed by Merton (1973). In this reading, ICAPM refers to the international capital asset pricing model.

47 See also Terhaar, Staub, and Singer (2003). The specific suggestion of this approach is to use the factor-model-based estimate of the covariance matrix presented in Section 3.1.1.4.

48 See Brinson, Diermeier, and Schlarbaum (1986) for more details.

Equation 9 implies that an asset class risk premium, RP_i, equal to $E(R_i) - R_F$, is a simple function of the world market risk premium, RP_M, equal to $E(R_M) - R_F$:[49]

$$RP_i = \frac{\sigma_i}{\sigma_m}\rho_{i,M}\left(RP_M\right)$$

Moving the market standard deviation of returns term within the parentheses, we find that an asset class's risk premium equals the product of the Sharpe ratio (RP_M/σ_M) of the world market portfolio, the asset's own volatility, and the asset class's correlation with the world market portfolio:

$$RP_i = \sigma_i\rho_{i,M}\left(\frac{RP_M}{\sigma_M}\right) \tag{10}$$

Equation 10 is one of two key equations in the Singer–Terhaar approach. The Sharpe ratio in Equation 10 (i.e., RP_M/σ_M) is the expected excess return per unit of standard deviation of the world market portfolio. The world market portfolio's standard deviation represents a kind of risk (systematic risk) that cannot be avoided through diversification and that should therefore command a return in excess of the risk-free rate. An asset class's risk premium is therefore the expected excess return accruing to the asset class given its global systematic risk (i.e., its beta relative to the world market portfolio).

Equation 10 requires a market Sharpe ratio estimate. Singer and Terhaar (1997, pp. 44–52) describe a complete analysis for estimating it. As of the date of their analysis, 1997, they recommended a value of 0.30 (a 0.30 percent return per 1 percent of compensated risk). Goodall, Manzini, and Rose (1999, pp. 4–10) revisited this issue on the basis of different macro models and recommended a value of 0.28. For this exposition, we adopt a value of 0.28. In fact, the Sharpe ratio of the global market could change over time with changing global economic fundamentals.

To illustrate Equation 10, suppose that an investor predicts that the standard deviation of Canadian bonds will be 7.0 percent per year and that their correlation with the GIM is 0.54. Then, with our estimate of the market Sharpe ratio, we would estimate the risk premium as

$$7\% \times 0.54 \times 0.28 = 1.06\%$$

For Canadian equities, with a standard deviation of 17 percent and a 0.70 correlation with the GIM, we would estimate the equity risk premium as

$$17\% \times 0.70 \times 0.28 = 3.33\%$$

The Singer–Terhaar approach recognizes the need to account for market imperfections that are not considered by the ICAPM. We will consider two market imperfections: illiquidity and market segmentation.

In the discussion of bonds, we defined the illiquidity premium as compensation for the risk of loss relative to an investment's fair value if the investment needs to be converted to cash quickly. The ICAPM assumes **perfect markets** (markets without any frictional costs, where all assets trade in liquid markets). Thus, we need to add an estimated illiquidity premium to an ICAPM expected return estimate as appropriate. The ICAPM was formulated with developed securities markets such as the Canadian bond and equity markets in mind, and the Singer–Terhaar approach would not add an illiquidity premium to ICAPM expected return estimates for Canadian stocks and bonds.

---

49 The expression is derived as follows: $RP_i = \beta_i\left(RP_M\right) = \left[\mathrm{Cov}(R_i,R_M)/\sigma_M^2\right]\left(RP_M\right) = \left(\sigma_i\sigma_M\rho_{iM}/\sigma_M^2\right)\left(RP_M\right) = \sigma_i\rho_{iM}\left(RP_M/\sigma_M\right)$, where we have used the fact that $\mathrm{Cov}(R_i,R_M) = \sigma_i\sigma_M\rho_{iM}$.

However, the illustrated risk premium estimates for Canadian bonds and equities (1.06 percent and 3.33 percent, respectively) are those that would hold if Canadian bond and equity markets were perfectly integrated with other world asset markets. **Market integration** means that there are no impediments or barriers to capital mobility across markets. Barriers include not only legal barriers, such as restrictions a national emerging market might place on foreign investment, but also cultural predilections and other investor preferences. If markets are perfectly integrated, all investors worldwide participate equally in setting prices in any individual national market. Market integration implies that two assets in different markets with identical risk characteristics must have the same expected return. **Market segmentation** means that there are some meaningful impediments to capital movement across markets. Although many barriers to international capital flows have come down, some do persist and a number of asset markets are in practice at least partially segmented across national borders. The more a market is segmented, the more it is dominated by *local* investors. When markets are segmented, two assets in different markets with identical risk characteristics may have different expected returns. If an asset in a segmented market appears undervalued to a nondomestic investor *not* considering barriers to capital mobility, *after* such barriers are considered, the investor may not actually be able to exploit the opportunity.

Most markets lie between the extremes of perfect market integration and complete market segmentation. A home-biased perspective or partial segmentation is perhaps the best representation of most markets in the world today. We need first to develop an estimate of the risk premium for the case of complete market segmentation. With such an estimate in hand, the estimate of the risk premium for the common case of partial segmentation is just a weighted average of the risk premium assuming perfect market integration and the risk premium assuming complete segmentation, where the weights reflect the analyst's view of the degree of integration of the given asset market.

To address the task of estimating the risk premium for the case of complete market segmentation, we must first recognize that if a market is completely segmented, the market portfolio in Equations 9 and 10 must be identified as the *individual local market*. Because the individual market and the reference market portfolio are identical, $\rho_{i,M}$ in Equation 10 equals 1. (For example, if Canadian equities were a completely segmented market, the reference market portfolio and the individual market portfolio would each be a broad-based index for Canadian equities, and the correlation of such an index with itself would of course be 1.) The value of 1 for correlation is the maximum value, so all else being equal, the risk premium for the completely segmented markets case is higher than that for the perfectly integrated markets case and equal to the amount shown in Equation 11:

$$\mathrm{RP}_i = \sigma_i \left(\frac{\mathrm{RP}_M}{\sigma_M} \right) \tag{11}$$

This is the second key equation in the Singer–Terhaar approach. Assuming that Canadian bonds and equities trade in completely segmented markets, we would calculate respective risk premiums of[50]

$$7\% \times 0.28 = 1.96\%$$

and

$$17\% \times 0.28 = 4.76\%$$

50 For simplicity, we are assuming that the Sharpe ratios of the GIM and the local market portfolio (used in Equation 11) are the same.

Taking the degree of integration as 0.8 for both Canadian equities and bonds, our final risk premium estimates would be as follows:

- $RP_{Cdn\ FI} = (0.8 \times 1.06\%) + (0.2 \times 1.96\%) = 1.24\%$
- $RP_{Cdn\ equities} = (0.8 \times 3.33\%) + (0.2 \times 4.76\%) = 3.62\%$

Thus, assuming a risk-free rate of 4 percent, we would estimate the expected returns on Canadian bonds and equities as the sum of the risk-free rate and the relevant risk premium, as follows:

- Canadian bonds: $E(R_{Cdn\ FI}) = 4\% + 1.24\% = 5.24\%$
- Canadian equities: $E(R_{Cdn\ equities}) = 4\% + 3.62\% = 7.62\%$

To summarize, to arrive at an expected return estimate using the Singer–Terhaar approach, we take the following steps:

- Estimate the perfectly integrated and the completely segmented risk premiums for the asset class using the ICAPM.
- Add the applicable illiquidity premium, if any, to the estimates from the prior step.
- Estimate the degree to which the asset market is perfectly integrated.
- Take a weighted average of the perfectly integrated and the completely segmented risk premiums using the estimate of market integration from the prior step.[51]

The analyst needs to develop estimates of the degree of integration of an asset market, but as a starting point, research has suggested that developed market equities and bonds are approximately 80 percent integrated. To give a flavor of the variation that might be expected, research has also indicated that US and UK real estate is approximately 70 percent integrated; real estate in France, Germany, the Netherlands, and Switzerland is 60 percent integrated; emerging market equities and bonds are about 65 percent integrated; and at the low end of integration are assets such as timber at 50 percent (United States, Australia) or 40 percent (Argentina, Brazil, Chile, Uruguay). Currency and cash markets are 100 percent integrated.[52]

Another task for the analyst is estimating the illiquidity premium for an asset class. Estimating this premium for alternative investments presents a great challenge. Many such investments cannot be traded at all for some time (i.e., are **locked up**, as might be the case for early-stage venture capital). Rebalancing to a target allocation is not feasible during the lockup period and is relatively costly afterward.

EXAMPLE 18

Justifying Capital Market Forecasts

Samuel Breed, CIO of a university endowment, is presenting the capital market expectations shown in Exhibit 10 to the endowment's board of trustees.

51 Alternatively, we can substitute the Sharpe ratio of the "typical" local investor's investment portfolio for the GIM portfolio in Equation 10 and use the correlation of the asset class under consideration with that typical local portfolio.

52 See Staub (2005).

Exhibit 10 Capital Market Projections

Asset Class	Proxy	Projected 5-Year Annual Return (%)	Projected Standard Deviation (%)
Equities			
1. Large-cap US equity	S&P 500	8.8	16.5
2. Small/mid-cap US equity	Russell 2500	9.8	22.0
3. Ex-US equity	MSCI EAFE	9.2	20.0
Fixed Income			
4. Domestic fixed income	Bloomberg Barclays Aggregate	4.7	4.5
5. Non-US fixed income	Citi Non-US Govt.	4.6	9.5
Other Assets			
6. US real estate	NCREIF	7.6	14.0
7. Private equity	VE Post Venture Cap.	12.0	34.0
8. Cash equivalents	90-day T-bill	3.3	1.0
Inflation	CPI-U	2.6	1.4

Correlations:	1	2	3	4	5	6	7	8
1. Large-cap US equity	1.0							
2. Small/mid-cap US equity	0.85	1.0						
3. Ex-US equity	0.74	0.61	1.0					
4. Domestic fixed income	0.27	0.20	0.21	1.0				
5. Non-US fixed income	0.03	–0.03	0.22	0.32	1.0			
6. US real estate	0.64	0.52	0.47	0.20	0.03	1.0		
7. Private equity	0.63	0.57	0.63	0.20	0.10	0.45	1.0	
8. Cash equivalents	–0.10	–0.15	–0.25	0.30	–0.05	–0.06	0.07	1.0

Assume the following:

- The Sharpe ratio of the global investable market portfolio (GIM) is 0.28, and its standard deviation is 7 percent.
- The beta of private equity with respect to the GIM is 3.3, and the beta of small/mid-cap US equity is 2.06.

William Smyth, a trustee, questions various projections for private equity, as follows:

A "I have seen volatility estimates for private equity based on appraisal data that are much smaller than the one you are presenting, in which the volatility of private equity is much larger than that of small/mid-cap US equity. Your volatility estimate for private equity must be wrong."

B "The premium of private equity over small/mid-cap US equity is not justifiable because they both represent ownership interests in US business."

C "Using the ICAPM, the forecast correlation between private equity returns and small/mid-cap US equity returns is lower than your estimate indicates."

1 Evaluate whether Smyth's Comment A is accurate.

2 Evaluate whether Smyth's Comment B is accurate.

3 Evaluate whether Smyth's Comment C is accurate.

Solution to 1:

Smyth's Comment A is not accurate. Although private equity and small-cap stocks both represent ownership interests, private equity is not traded and appraisal data will tend to underestimate volatility.

Solution to 2:

Smyth's Comment B is not accurate. One justification for a higher expected return for private equity is that it has a lockup period and should therefore bear an illiquidity premium.

Solution to 3:

Smyth's Comment C is accurate. According to elementary portfolio theory, the correlation between two assets is given by $\beta_1\beta_2\sigma_M^2 / \sigma_1\sigma_2$. Thus, the correlation between private equity and small/mid-cap US equity is equal to $(3.3)(2.06)(7\%)^2/(34\%)(22\%) = 0.45$, which is lower than the estimate of 0.57 given in Exhibit 10.

The illiquidity premium for an alternative investment should be positively related to the length of the investment's lockup period or illiquidity horizon. How can the amount of the illiquidity premium be estimated? One estimation approach uses the investment's **multiperiod Sharpe ratio** (MPSR), which is based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment (i.e., compounded return over compounded cash return). The relevant MPSR is one calculated over a holding period equal to the investment's lockup period. There would be no incentive to invest in an illiquid alternative investment unless its MPSR—its risk-adjusted wealth—were at least as high as the MPSR of the market portfolio at the end of the lockup period. Suppose that an alternative investment has a lockup period of eight years and its ICAPM-given required rate of return is 12 percent but its MPSR is below that of the GIM—say, 0.67—at an eight-year horizon. If increasing its expected return to 20 percent makes the alternative investment's MSPR equal 0.67 at the eight-year horizon, then the estimate of the illiquidity premium is 20% – 12% = 8%.[53]

Example 19 illustrates the Singer–Terhaar approach. In the example, for simplicity's sake, the ICAPM betas are used to develop covariance estimates.

53 See Staub and Diermeier (2003) for more details.

EXAMPLE 19

Setting CME Using the Singer–Terhaar Approach

Zimmerman Capital Management (ZCM) is developing a strategic asset allocation for a small US foundation that has approved investment in the following five asset classes: US equities, US fixed income, non-US equities, non-US fixed income, and US real estate. The foundation limits nondomestic assets to no more than 12 percent of invested assets.

- The final set of expectations needed consists of the expected returns, standard deviations, and all distinct pairwise covariances of US equities, US fixed income, non-US equities, non-US fixed income, and US real estate. The investment time horizon is 10 years.
- A risk premium approach will be taken to developing expected return estimates following the methodology of Singer and Terhaar. Historical estimates of standard deviations will be used, and ICAPM betas will be used to develop estimates of covariances.
- Exhibit 11 supplies the standard deviation estimates and gives relevant inputs for other quantities needed. In addition, ZCM has gathered the following facts and estimates:
  - The Sharpe ratio of the GIM is estimated to be 0.28.
  - The standard deviation of the GIM is estimated to be 7 percent.
  - The risk-free rate of interest is 3 percent.
- Equities and bonds are assumed to be 80 percent integrated, and US real estate is assumed to be 70 percent integrated.

Exhibit 11 Equilibrium Approach to Risk Premium Estimation

Asset Class	Standard Deviation	Correlation with GIM	Premium to Equate Sharpe Ratio at Illiquidity Horizon
US equities	15.7%	0.85	0%
US fixed income	3.8	0.75	0
Non-US equities	15.6	0.80	0
Non-US fixed income	9.1	0.70	0
US real estate	11.5	0.50	0.30

Based on the information given, address the following problems:

1. Calculate the expected returns on US equities, US fixed income, non-US equities, non-US fixed income, and US real estate. Make any needed adjustments for illiquidity.
2. Show the calculation of the covariance between US equities and US fixed income.
3. Critique the following statement: "The ZCM risk premium estimates are low, given that the foundation has a very strong home-country bias, reflected in its limitation of nondomestic assets to no more than 12 percent of the portfolio."

Solution to 1:

To calculate the expected return for an asset class, we take the following steps. First, we calculate the risk premium of the asset class for two distinct cases: full integration and complete segmentation. In the calculation for either case, we take care to add any applicable illiquidity premium. Second, we average the two estimates of the risk premium for an asset class by weighting the full integration estimate by the assumed degree of integration and the complete segmentation estimate by (1 – assumed degree of integration). The result of this step is our informed estimate of the asset class's risk premium. Finally, adding the risk premium estimate to the risk-free rate yields our estimate of the expected return on the asset class.

Step 1

Using Equation 10, we find that in the fully integrated case,

$RP_{\text{US equities}} = 15.7\% \times 0.85 \times 0.28 = 3.74\%$

$RP_{\text{US FI}} = 3.8\% \times 0.75 \times 0.28 = 0.80\%$

$RP_{\text{non-US equities}} = 15.6\% \times 0.80 \times 0.28 = 3.49\%$

$RP_{\text{non-US FI}} = 9.1\% \times 0.70 \times 0.28 = 1.78\%$

$RP_{\text{US RE}} = (11.5\% \times 0.50 \times 0.28) + 0.30\% = 1.61\% + 0.30\% = 1.91\%$

Using Equation 11, we find that in the fully segmented case,

$RP_{\text{US equities}} = 15.7\% \times 0.28 = 4.4\%$

$RP_{\text{US FI}} = 3.8\% \times 0.28 = 1.06\%$

$RP_{\text{non-US equities}} = 15.6\% \times 0.28 = 4.37\%$

$RP_{\text{non-US FI}} = 9.1\% \times 0.28 = 2.55\%$

$RP_{\text{US RE}} = (11.5\% \times 0.28) + 0.30\% = 3.22\% + 0.30\% = 3.52\%$

Note that we added an illiquidity premium of 0.3 percent to the ICAPM derived premium estimates for real estate.

Step 2

We now weight each asset class's fully integrated and segmented premiums according to the assumed degree of integration.

$RP_{\text{US equities}} = (0.8 \times 3.74\%) + (0.2 \times 4.4\%) = 3.87\%$

$RP_{\text{US FI}} = (0.8 \times 0.80\%) + (0.2 \times 1.06\%) = 0.85\%$

$RP_{\text{non-US equities}} = (0.8 \times 3.49\%) + (0.2 \times 4.37\%) = 3.67\%$

$RP_{\text{non-US FI}} = (0.8 \times 1.78\%) + (0.2 \times 2.55\%) = 1.93\%$

$RP_{\text{US RE}} = (0.7 \times 1.91\%) + (0.3 \times 3.52\%) = 2.39\%$

Step 3

The expected return estimates are as follows:

$E(R_{\text{US equities}}) = 3\% + 3.87\% = 6.87\%$

$E(R_{\text{US FI}}) = 3\% + 0.85\% = 3.85\%$

$E(R_{\text{non-US equities}}) = 3\% + 3.67\% = 6.67\%$

$E(R_{\text{non-US FI}}) = 3\% + 1.93\% = 4.93\%$

$E(R_{\text{US RE}}) = 3\% + 2.39\% = 5.39\%$

Solution to 2:

Based on Equation 3b with one factor, the covariance between any two assets in a one-beta model (such as the ICAPM) is equal to the product of each asset's beta with respect to the market times the variance of the market. The needed betas can be calculated as

$\beta_{\text{US equities}} = (15.7\% \times 0.85)/7\% = 1.91$

$\beta_{\text{US FI}} = (3.8\% \times 0.75)/7\% = 0.41$

and the covariance between US equities and US fixed income returns as

$\text{Cov}(\text{US equities, US FI}) = 1.91 \times 0.41 \times (7\%)^2 = 38.37$ (in units of percent squared)

Solution to 3:

Although the client is correct about the foundation's home-country bias, the point being made is not correct. The equilibrium risk premium is determined by all investors, reflected in the overall degree of integration estimates.

3.2 Survey and Panel Methods

The **survey method** of expectations setting involves asking a group of experts for their expectations and using the responses in capital market formulation. If the group queried and providing responses is fairly stable, the analyst in effect has a panel of experts and the approach can be called a **panel method**. These approaches are based on the straightforward idea that a direct way to uncover a person's expectations is to ask the person what they are.

The oldest continuous survey of expectations is the so-called Livingston Survey, initiated in 1946 by Joseph Livingston, a Philadelphia journalist, and managed since 1990 by the Federal Reserve Bank of Philadelphia, part of the US Federal Reserve System. The survey covers real US GDP growth, CPI and PPI inflation, the unemployment rate, and 3-month T-bill and 10-year T-bond yields. In the United States, Welch surveyed financial economists for their views about the short- and long-term (30-year) equity risk premium in 1998, 2001, and 2009.[54] The results of the three Welch surveys for the 30-year equity risk premium are summarized in Exhibit 12.

Exhibit 12 Consensus Expectations of US Financial Economists of the Long-term (30-Year) US Equity Risk Premium

	2009 Survey	2001 Survey	1998 Survey
Mean	6.2%	5.5%	7.1%
Median	6.0	5.0	7.0
Interquartile range	5%–7%	4%–7%	6%–8.4%

Source: Welch (2000, 2001, 2009).

54 See Welch (2000) and Welch (2001). The 1998 survey had 226 respondents, while the 2001 survey had 510. Graham and Harvey (2001) report a survey of 10-year forecasts of the US equity risk premium by chief financial officers, but their survey question was not specific about whether an arithmetic or geometric mean estimate was sought.

A 2002 survey of global bond investors by Schroder Salomon Smith Barney found an average equity risk premium in the range of 2–2.5 percent, while a Goldman Sachs survey of global clients recorded a mean long-run equity risk premium of 3.9 percent.[55] Such surveys may be sensitive to the professional identity of the respondents. Lally, Roush, and Van Zijl (2004) found the predictions of practitioners for the New Zealand equity risk premium significantly higher than those of academics.[56] Besides direct questions on capital market expectations, for certain equity markets, there are commercial surveys of analysts' forecasts of long-term earnings growth rates that implicitly contain an equity market forecast given a DCF valuation model.

EXAMPLE 20

Short-Term Consumer Spending in the United Kingdom

Bryan Smith is researching the 6- to 12-month expectations for consumer spending in the United Kingdom as of the middle of 2003. One piece of evidence he gathers is changes in consumer sentiment in the United Kingdom as measured by the Economic Optimism Index, shown in Exhibit 13.

Exhibit 13 UK Consumer Economic Optimism Index (Year over Year Change in MORI Survey Data)

Note: Based on an index created from UK Consumer Optimism MORI survey data. The asterisk represents the forecast target for 2004 as of mid-2003.

Interpret Exhibit 13 as it relates to the probable path of consumer spending.

Solution:

Based on the reading at December 2003 of the UK Consumer Optimism Index, it appears that consumers are considerably more optimistic than in December 2002. Rising consumer optimism is a reflection of consumers feeling secure about their income stream and future. Rising consumer optimism suggests that near-term consumer spending will increase.

55 See Ilmanen, Byrne, Gunasekera, and Minikin (2002) and O'Neill, Wilson, and Masih (2002).
56 The median forecast was 7.0 percent for practitioners and 5.5 percent for academics.

3.3 Judgment

In a disciplined expectations-setting process, the analyst should be able to factually explain the basis and rationale for forecasts. Quantitative models such as equilibrium models offer the prospect of providing a non-emotional, objective rationale for a forecast. The expectations-setting process nevertheless can give wide scope to applying judgment—in particular, economic and psychological insight—to improve forecasts. In forecasting, numbers, including those produced by elaborate quantitative models, must be evaluated.

EXAMPLE 21

Judgment Applied to Correlation Estimation

William Chew's firm uses a multifactor model to develop initial correlation forecasts that are then challenged by professionals within the capital markets unit. Based on US historical data including periods of high inflation, Chew finds that the model forecasts a correlation between US equity and US bonds in the range of 0.40 to 0.45. Based on empirical evidence, Chew believes that the correlation between equity and bond returns is higher in high-inflation periods than in low-inflation periods. His firm's chief economist forecasts that in the medium term, US inflation will be low, averaging less than 3 percent per annum. In light of that forecast, Chew has decided that he will recommend a judgmental downward adjustment of the correlation to 0.30.

Other investors who rely on judgment in setting capital market expectations may discipline the process by the use of devices such as checklists. In any case, investment experience, the study of capital markets, and intelligence are requisites for the development of judgment in setting capital market expectations.

4 ECONOMIC ANALYSIS

History has shown that there is a direct yet fluid relationship between actual realized asset returns, expectations for future asset returns, and economic activity. The linkages are consistent with asset-pricing theory, which predicts that the risk premium of an asset is related to the correlation of its payoffs with the marginal utility of consumption in future periods. Assets with low expected payoffs in periods of weak consumption (e.g., business cycle troughs) should bear higher risk premiums than assets with high expected payoffs in such periods. Because investors expect assets of the second type to provide good payoffs when their income may be depressed, they should be willing to pay relatively high prices for them (implying lower risk premiums).[57]

Analysts need to be familiar with the historical relationships that empirical research has uncovered concerning the direction, strength, and lead-lag relationships between economic variables and capital market returns.

The analyst who understands which economic variables may be most relevant to the current economic environment has a competitive advantage, as does the analyst who can discern or forecast a change in trend or point of inflection in economic

57 See Cochrane (1999a, 1999b).

activity. Inflection points often present unique investment opportunities at the same time that they are sources of latent risk. Questions that may help the analyst assess points of inflection include the following:

- What is driving the economy in its current expansion or contraction phase?
- What is helping to maintain economic growth, demand, supply, and/or inflation rates within their current ranges?
- What may trigger the end of a particular trend?

The economic output of many economies has been found to have cyclical and trend growth components. Trend growth is of obvious relevance for setting long-term return expectations for asset classes such as equities. Cyclical variation affects variables such as corporate profits and interest rates, which are directly related to asset class returns and risk. In the following sections, we address business cycles and trend growth.

4.1 Business Cycle Analysis

In business cycle analysis, two cycles are generally recognized: a short-term **inventory cycle**, typically lasting 2–4 years, and a longer-term **business cycle**, usually lasting 9–11 years. Evidence for both these cycles goes back two centuries or more, but they are very far from working like clockwork. In particular, they can be disrupted by major shocks, including wars and shifts in government policy. Also, both the duration and amplitude of each phase of the cycle, as well as the duration of the cycle as a whole, vary considerably and are hard to predict.

Cycles mark variation in economic activity, so we should be clear on how that variation is measured. The chief measurements of economic activity are as follows:

- **Gross domestic product (GDP)**: GDP is a calculation of the total value of final goods and services produced in the economy during a year. The main expenditure components are Consumption, Investment, Change in Inventories, Government Spending, and Exports less Imports. The total value of goods and services can change because the quantities of goods and services change and/or because their prices change. To focus on increases in the quantity (output) of goods and services produced—which are directly associated with increases in the standard of living—rather than on price-driven increases in the value of output, economists focus on real GDP (reflecting an adjustment for changes in prices during the period). For brevity's sake in our discussion, "GDP" is understood as referring to "real GDP" unless otherwise stated.
- **Output gap**: The **output gap** is the difference between the value of GDP estimated as if the economy were on its trend growth path (sometimes referred to as **potential output**) and the actual value of GDP. A positive output gap opens in times of recession or slow growth. When a positive output gap is open, inflation tends to decline. Once the gap closes, inflation tends to rise. When GDP is above its trend value, the economy is under inflationary pressure. Many macroeconomists consider the output gap as the key measure of real activity for policy making because it provides information about future inflationary pressures as well as an output objective. However, because changing demographics and technology affect the economy's trend path, real-time estimates of the output gap can sometimes be quite inaccurate.
- **Recession**: In general terms, a **recession** is a broad-based economic downturn. More formally, a recession occurs when there are two successive quarterly declines in GDP.

The following sections discuss the inventory cycle and the business cycle in more detail.

4.1.1 *The Inventory Cycle*

Economists have found evidence of a short-term inventory cycle, lasting 2–4 years. The **inventory cycle** is a cycle measured in terms of fluctuations in inventories. The inventory cycle is caused by companies trying to keep inventories at desired levels as the expected level of sales changes.

In the up phase of the inventory cycle, businesses are confident about future sales and are increasing production. The increase in production generates more overtime pay and employment, which tends to boost the economy and bring further sales. At some point, there is a disappointment in sales or a change in expectations of future sales, so that businesses start to view inventories as too high. In the recent past, a tightening of monetary policy has often caused this inflection point. It could also be caused by a shock such as higher oil prices. Then, business cuts back production to try to reduce inventories and hires more slowly (or institutes layoffs). The result is a slowdown in growth.

It usually takes a year or two for business to correct inventory levels after an inflection point. A good indicator of the inventory position is the inventory/sales ratio. Exhibit 14 shows the inventory/sales ratio for the United States over the period 1992–2011. When the inventory/sales ratio has moved down, the economy is likely to be strong in the next few quarters as businesses try to rebuild inventory, as in early 2004. Conversely, when the ratio has moved sharply up, as in 2008-09, a period of economic weakness can be expected. Note that while this indicator has been trending down because of improved techniques such as "just in time" inventory management, the 2- to 4-year inventory cycle is still evident.

Exhibit 14 US Inventory/Sales Ratios

Source: FRED, Federal Reserve Economic Data, Federal Reserve Bank of St. Louis: Inventory to Sales Ratio: Total Business (ISRATIO); US Department of Commerce: Census Bureau. http://research.stlouisfed.org/fred2/series/ISRATIO; accessed 21 December 2011.

In the late 1990s, it was argued that improved and computerized techniques of inventory control would make the inventory cycle obsolete. In fact, the 2001 and 2008–09 recessions saw one of the steepest inventory corrections on record. The reason seems to have been that excess inventories were more visible more quickly than in the past, and businesses rapidly cut back production.

4.1.2 *The Business Cycle*

In addition to the inventory cycle, there is evidence of a longer cycle, often lasting 9–11 years, called the business cycle. The **business cycle** represents fluctuations in GDP in relation to long-term trend growth. A typical business cycle has five phases: initial recovery, early upswing, late upswing, slowdown, and recession.

1 **Initial Recovery** This is usually a short phase of a few months in which the economy picks up from its slowdown or recession. Generally, confidence is rising among businesses, although consumer confidence may still be at low levels since unemployment is still high. In the initial recovery phase, there are often stimulatory economic policies from the government in the form of lower interest rates or a budgetary deficit. The business cycle recovery is usually supported by a simultaneous upswing in the inventory cycle, which is sometimes the main cause of the recovery. Inflation will still be falling in the initial recovery phase. The output gap is still large.

   Capital market effects: Government bond yields may continue to come down through this phase in anticipation of a further decline in inflation but are likely to be bottoming. Stock markets may rise strongly at this point because fears of a longer recession (or even a depression) dissipate. Cyclical assets—and riskier assets, such as small stocks, higher-yield corporate bonds, and emerging market equities and bonds—attract investors and perform well.

2 **Early Upswing** After the initial recovery period, confidence is up and the economy is gaining some momentum. This is the healthiest period of the cycle, in a sense, because economic growth can be robust without any signs of overheating or sharply higher inflation. Typically, there is increasing confidence, with consumers prepared to borrow and spend more as unemployment starts to fall. Concurrently, businesses build inventories and step up investment in the face of strong sales and increased capacity use. Higher operating levels allow many businesses to enjoy lower unit costs, so that profits rise rapidly.

   Capital market effects: A key question is how long it will take before inflation starts to become a problem. Short rates are moving up at this time as the central bank starts to withdraw the stimulus put in place during the recession. Longer bond yields are likely to be stable or rising slightly. Stocks are still trending up. This phase usually lasts at least a year and often several years if growth is not too strong and the output gap closes slowly.

3 **Late Upswing** At this stage of the cycle, the output gap has closed and the economy is in danger of overheating. Confidence is high; unemployment is low. The economy may grow rapidly. Inflation starts to pick up, with wages accelerating as shortages of labor develop.

   Capital market effects: Typically, interest rates are rising as the monetary authorities become restrictive. Any heavy borrowing puts pressure on the credit markets. Central banks may aim for a "soft landing," meaning a period of slower growth to cool the economy but not a major downturn. Bond markets anxiously watch this behavior, and bond yields will usually be rising as a result of changed expectations. Stock markets will often rise but may be nervous too, depending on the strength of the boom. Nervous investors mean that equities are volatile.

4 **Slowdown** At this point, the economy is slowing, usually under the impact of rising interest rates. The economy is especially vulnerable at this juncture to a shock, which can turn a "soft landing" into a recession. Business confidence starts to waver. Despite the slowdown, inflation often continues to rise. The slowdown is exacerbated by the inventory correction as companies try to

reduce their inventory levels. This phase may last just a few months, as in the United States in 2000, or it may last a year or more, as in the United States in 1989–1990 and 2009–2011.

Capital market effects: Short-term interest rates are high and rising at first but then may peak. Bonds top out at the first sign of a slowing economy and then rally sharply (yields fall). The yield curve often inverts. The stock market may fall, with interest-sensitive stocks such as utilities and financial services performing best.

5 **Recession** A recession is conventionally defined as two successive quarterly declines in GDP. There is often a large inventory pullback and sometimes a large decline in business investment. Consumer spending on big-ticket items such as cars usually declines (although the US 2001 recession was an exception). Once the recession is confirmed, central banks ease monetary policy, but only cautiously at first. Recessions typically last six months to a year. Both consumer and business confidence decline. Profits drop sharply. In a severe recession, the financial system may be stressed by bad debts, making lenders extremely cautious. Often, recessions are punctuated by major bankruptcies, incidents of uncovered fraud, or a financial crisis. Unemployment can rise quickly, putting downward pressure on inflation.

Capital market effects: Short-term interest rates drop during this phase, as do bond yields. The stock market usually starts to rise in the later stages of the recession, well before the recovery emerges.

Exhibit 15 summarizes the characteristics of the five phases of the business cycle. The description given of business cycles is a stylized one. Each cycle is different because of specific events and trends that fall outside the stylized business cycle framework. Trends that have affected the business cycle from the 1990s through the late 2000s include the growing importance of China in world markets, the aging of populations, and the deregulation of markets. Events such as a petroleum or financial crisis can abruptly take the economy to the next phase of the business cycle or intensify the current phase.

Exhibit 15 Five Phases of the Business Cycle

Phase	Economy	Fiscal and Monetary Policy	Confidence	Capital Markets
1. Initial recovery	Inflation still declining	Stimulatory fiscal policies	Confidence starts to rebound	Short rates low or declining; bond yields bottoming; stock prices strongly rising
2. Early upswing	Healthy economic growth; inflation remains low		Increasing confidence	Short rates moving up; bond yields stable to up slightly; stock prices trending upward
3. Late upswing	Inflation gradually picks up	Policy becomes restrictive	Boom mentality	Short rates rising; bond yields rising; stocks topping out, often volatile
4. Slowdown	Inflation continues to accelerate; inventory correction begins		Confidence drops	Short-term interest rates peaking; bond yields topping out and starting to decline; stocks declining
5. Recession	Production declines; inflation peaks		Confidence weak	Short rates declining; bond yields dropping; stocks bottoming and then starting to rise

EXAMPLE 22

The Yield Curve, Recessions, and Bond Maturity

The yield spread between the 10-year T-bond rate and the 3-month T-bill rate has been found internationally to be a predictor of future growth in output.[58] The observed tendency is for the yield spread to narrow or become negative prior to recessions. Another way of saying the same thing is that the yield curve tends to flatten or become inverted prior to a recession. Effects that may explain a declining yield spread include the following: 1) Future short-term rates are expected to fall, and/or 2) investors' required premium for holding long-term bonds rather than short-term bonds has fallen. At least, the link between an expected decline in short-term rates from expected lower loan demand and declining output growth is economically somewhat intuitive.

When the yield spread is expected to narrow (the yield curve is moving toward inversion), long-duration bonds should outperform short-duration bonds. On the other hand, a widening yield spread (for example, an inverted yield curve moving to an upward-sloping yield curve) favors short-duration bonds.

4.1.3 *Inflation and Deflation in the Business Cycle*

Inflation simply means rising prices, while **deflation** means falling prices. At any given time, some prices are rising and others are falling. Thus, investors look at indexes of prices to discern the overall trend. Consumer price indexes, calculated from a basket of goods and services based on consumers' spending patterns, are commonly watched. Another set of price indexes which are closely watched are the GDP and consumer expenditure deflators, which are inflation indexes used to adjust or deflate the nominal series for inflation.

Inflation is linked to the business cycle, tending to rise in the late stages of a business cycle and to decline during recessions and the early stages of recovery. However, the analyst also needs to note any long-term trends in inflation in formulating capital market expectations.

EXAMPLE 23

Inflation, Disinflation, and Deflation

Today, people expect prices of goods and services and of investment assets to trend up over time. However, during most of the 19th century and through the 20th century prior to the 1960s, price inflation was negligible. Indeed, the price level in the United Kingdom fell for a large part of the 19th century. In the United States, the main period of inflation occurred during the Civil War (1861–65). Prices dropped for long periods otherwise. However, from the late 1950s until the late 1970s, inflation gradually accelerated almost everywhere, reaching over 10 percent in the United States and over 30 percent in the United Kingdom for brief periods. Then from about 1979, a period of disinflation set in as inflation gradually retreated back toward zero. Exhibit 16 illustrates the inflation rates in the United States and the United Kingdom since the 1950s.

58 See Estrella and Mishkin (1998).

Exhibit 16 US and UK Inflation over the Long Term

Source: Bloomberg.

Central bank orthodoxy for dealing with inflation rests on three principles:

- Central banks' policy-making decisions must be independent of political influence. If political pressure is brought to bear on central banks, they may be too loose in their monetary policy and allow inflation to gradually accelerate.
- Central banks should have an inflation target, both as a discipline for themselves and as a signal to the markets of their intentions. An inflation target also serves to anchor market expectations.
- Central banks should use monetary policy (primarily interest rates) to control the economy and prevent it from either overheating or languishing in a recession for too long.

By the end of the 20th century, inflation had been defeated almost everywhere. All the major countries enjoyed inflation below 3 percent, and only a handful of emerging countries suffered from double-digit inflation. The challenge is to keep inflation low without succumbing to deflation.

Deflation is a threat to the economy for two main reasons. First, it tends to undermine debt-financed investments. If the price of a debt-financed asset (e.g., new equipment or a house) declines in value, the value of the "equity" in the asset (i.e., the difference between the asset's value and the loan balance) declines at a leveraged rate. For example, if the value of a property financed with a 67 percent loan-to-value mortgage then declines by 5 percent, the value of the equity in the property declines by 15 percent. This phenomenon sometimes leads to panic sales to save some part of the equity and can lead to asset deflation of the kind seen in the United States in the 1930s, the United Kingdom in the early 1990s, and many Asian countries in the late 1990s in the aftermath of the Asian crisis.

Second, deflation undermines the power of central banks. In a deflationary environment, interest rates fall to levels close to zero. When interest rates are already very low, the central bank has less leeway to stimulate the economy by lowering interest rates. A very low interest rate environment during and after the global financial crisis of 2007–2009, accompanied by high unemployment, led central banks including those in the United States, United Kingdom, and Eurozone to engage in a relatively untested policy measure, **quantitative easing** (QE). In QE, a central bank conducts

large-scale purchases of high-quality fixed-income securities to inject liquidity into the financial system. Unlike conventional open market operations, QE is designed to provide ongoing and quasi-permanent increases in the level of bank reserves. In addition to government bonds, central banks have purchased mortgage-backed securities and high-quality corporate bonds in their QE operations.

Example 24 looks at some of the considerations that might enter into a short-term inflation forecast.

EXAMPLE 24

An Inflation Forecast for Germany

Early in 2011, Hans Vermaelen, a capital market analyst, has the task of making an inflation forecast for Germany over the next 6 to 12 months. Vermaelen gathers the following inputs and outputs:

Inputs

1. A survey of manufacturers, asking them whether they expect to see price declines for the products they sell in order to stay globally competitive in light of a then-strengthening euro.
2. Information on German manufacturing orders and consumer price inflation.
3. Data inputs for a multifactor model including the following variables:
   - prices of commodities;
   - prices for labor;
   - wholesale and producer price measures.

Outputs

1. The survey of manufacturers indicates that manufacturers are facing challenges passing some price increases to German customers. After initially lowering export product prices to maintain market share in the face of a rising euro, German manufacturers are now passing price increases on to their international customers, thereby restoring their profit margins.
2. Current year-over-year annual inflation of 2.6 percent is above the average annual rate of 1.6 percent experienced over the past 10 years and over the past 10 quarters. Manufacturing orders have increased at about a 9 percent average rate over the past year. However, over the past quarter, manufacturing orders have decrease at a 4 percent year-over-year rate. Exhibit 17 graphs inflation and manufacturing orders.
3. The multifactor model indicates a positive correlation between the inflation rate and manufacturing orders and a negative correlation between a strengthening local currency (euro) and inflation.

Exhibit 17 Inflation Pressure in Germany (Year over Year Consumer Inflation and Change in Manufacturing Orders)

Based on the above information, Vermaelen forecasts that inflation will decrease to a 1.6 percent rate over the next 6–12 months. Critique Vermaelen's forecast.

Solution:

The manufacturing orders have been decreasing recently at a 4 percent year-over-year rate versus a 9 percent average rate over the past year. This fact suggests that the German economy may be weakening. At the same time, the survey of manufacturers indicates that they are having difficulty passing along price increases to customers. These factors suggest a decrease in inflation from the recent 2.6 percent rate. Overall, it is reasonable to forecast a return to the recent average trend inflation rate of 1.6 percent.

Inflation tends to accelerate in the later stages of the business cycle, when the output gap has been closed. Inflation decelerates when, during a recession or in the early years afterward, there is a large output gap putting downward pressure on prices. As a result, the rate of inflation will decelerate to a low level and **deflation** (an increase in the purchasing power of a unit of currency) becomes possible.[59] Resistance to reduction in wages is a counterweight to deflationary pressures. Except in the worst circumstances, such as in the United States in the early 1930s, the rate of annual deflation is likely to be limited to about 2 percent, with wages holding steady.

During a recession, with falling inflation and interest rates, bonds generally post capital gains (for some bonds, deteriorating credit can offset such gains). In a strong upswing, bond yields will rise as investors fear that central banks will not hold inflation on target, resulting in capital losses to bondholders.

The impact of the inflation cycle on equities is more complex. In theory, as long as inflation stays near its expected or equilibrium level, the inflation rate is not very important. Higher inflation should be reflected in higher profits, so stocks will rise to compensate. However, signs that inflation is moving out of equilibrium indicate

59 The most extreme instances of deflation in the past hundred years occurred in the years surrounding the Great Depression (in particular, in the period 1926–1933).

a potential threat because rising inflation could mean that the central banks need to act to slow the economy. Falling inflation, or possible deflation, is a problem because it threatens a recession and a decline in asset prices.

Exhibit 18 shows how changes in the inflation (deflation) rate affect the relative attractiveness of asset classes.

Exhibit 18 Inflation/Deflation Effects on Asset Classes

	Cash	Bonds	Equity	Real Estate/ Other Real Assets
Inflation at or below expectations	Short-term yields steady or declining. [**Neutral**]	Yield levels maintained; market in equilibrium. [**Neutral**]	Bullish while market in equilibrium state. [**Positive**]	Cash flow steady to rising slightly. Returns equate to long-term average. Market in general equilibrium. [**Neutral**]
Inflation above expectations	Bias toward rising rates. [**Positive**]	Bias toward higher yields due to a higher inflation premium. [**Negative**]	High inflation a negative for financial assets. Less negative for companies/industries able to pass on inflated costs. [**Negative**]	Asset values increasing; increased cash flows and higher expected returns. [**Positive**]
Deflation	Bias toward 0% short-term rates. [**Negative**]	Purchasing power increasing. Bias toward steady to lower rates (may be offset by increased risk of potential defaults due to falling asset prices). [**Positive**]	Negative wealth effect slows demand. Especially affects asset-intensive, commodity-producing (as opposed to commodity-using), and highly levered companies. [**Negative**]	Cash flows steady to falling. Asset prices face downward pressure. [**Negative**]

4.1.4 *Market Expectations and the Business Cycle*

The description of a typical business cycle may suggest that forming capital market expectations for the short and medium terms is relatively straightforward. If the investor can identify the current phase of the cycle and correctly predict when the next phase will begin, he or she should be able to make money easily. Unfortunately, it is not that simple for several interrelated reasons.

First, the phases of the business cycle vary in length and amplitude. Recessions can be steep, and downturns (such as in the 1930s and, to a lesser extent, the early 1980s) can be frightening. Recessions can be short-lived affairs with only a small decline in output and only a modest rise in unemployment. Sometimes, the weak phase of the cycle does not even involve a recession but merely a period of slower economic growth or a "growth recession." A period of economic growth below trend will open up the output gap. A mild downturn, or growth recession, is most likely if the trend rate of growth of the economy is relatively rapid. For example, China—with a trend rate of annual growth of about 8 percent as of the early 2000s—will see unemployment rise and inflation decline if growth is only 5–6 percent. For the main industrial economies, with trend rates of annual growth of 2–4 percent, a mild downturn is more likely than a recession if some or all of the following conditions hold:

- The upswing was relatively short or mild.
- There was no bubble or severe overheating in the stock market or property market.

- Inflation is relatively low, so the central bank is willing to cut interest rates quickly.
- The world economic and political environments are positive.

EXAMPLE 25

The 1980–1982, 2001, and 2008–09 US Recessions

The US downturn in 1980–1982 was particularly severe. Inflation had reached 12–14 percent in early 1980, partly due to a rise in oil prices. The Board of Governors of the Federal Reserve System under its new chairman, Paul Volcker, was determined to eradicate inflation. The Fed kept interest rates high in 1982. In contrast, the 2001 recession was relatively mild. There had been a stock market bubble, but commercial property prices were not inflated and banks were in good shape. Because inflation was low, the Fed was willing to cut interest rates very rapidly.

The 2001 recession is instructive on the limitations of economic data, which are backward looking and often revised. After the terrorist attack of 11 September 2001 on the World Trade Center, much commentary focused on the risk that it would lead to a recession. In fact, the revised GDP data show that the economy had been in a recession since early in 2001 and began to come out of it starting in October 2001. At the time, it was clear that the economy was weak and therefore growing at less than the trend rate, so bond yields fell and the stock market declined.

In the late 2000s, the collapse of a bubble (speculative run-up) in housing prices, along with a crisis in subprime mortgages, led to a global financial crisis and recessions in most developed countries. The US recession saw a peak-to-trough decline in GDP of 5.1 percent, marking the most severe of post World War II US recessions. A low inflationary environment permitted the Fed to pursue expansionary monetary policy, though with limited impact on economic growth and unemployment.

4.1.5 *Evaluating Factors that Affect the Business Cycle*

For the purposes of setting capital market expectations, we need to focus business cycle analysis on four areas:

- consumers;
- business;
- foreign trade; and
- government activity, both **monetary policy** (concerning interest rates and the money supply) and **fiscal policy** (concerning taxation and governmental spending).

Consumer spending amounts to 60–70 percent of GDP in most large developed economies and is therefore typically the most important business cycle factor.

Business investment has a smaller weight in GDP than consumer spending but is more volatile.

Foreign trade is an important component in many smaller economies, for which trade is often 30–50 percent of GDP. However, for the large economies, such as the United States and Japan, foreign trade is typically only around 10–15 percent of GDP and correspondingly less important. The same range holds true for the European Union (EU) in relation to trade outside the EU (although between countries within the EU, trade generally represents a higher percentage of GDP).

Finally, government policy can influence the business cycle. There are three motivations for government to intervene in the cycle. First, both the government and monetary authorities may try to control the cycle to mitigate severe recessions and also, on occasion, to moderate economic booms. Second, the central bank monetary authorities often have an inflation target and they will consciously try to stimulate or constrain the economy to help meet it. Third, because incumbent politicians prefer to hold elections during economic upswings, they may try to influence fiscal and/or monetary policy to achieve this end.

4.1.5.1 Taking the Pulse of Consumers The principal sources of data on consumer spending are retail sales, miscellaneous store sales data, and consumer consumption data. Like most data, consumer spending can be erratic from month to month and can be affected by unusual weather or holidays (such as New Year celebrations).

By far the most important factor affecting consumption is consumer income after tax, which depends on wage settlements, inflation, tax changes, and employment growth. Employment growth is often closely watched because data are usually available on a very timely basis. Most countries have some particular series that analysts scrutinize. In the United Kingdom, besides the unemployment rate, the British Retail Consortium (BRC) retail sales survey is closely watched. In the United States, the monthly non-farm payrolls as well as the weekly new unemployment claims are regular market movers when they diverge from expectations.

If the household savings rate remained constant, then changes in income would exactly predict changes in spending. But the savings rate does change over time, influenced generally by consumer confidence in future jobs and income and also by changes in asset prices. Consumer confidence survey data are also watched closely as indicators of whether consumers are likely to raise or lower their savings rates.

4.1.5.2 Taking the Pulse of Business Data on business investment and spending on inventories reveal recent business activity. As already mentioned, both tend to be relatively volatile so that it is not uncommon for business investment to fall by 10–20 percent or more during a recession and to increase by a similar amount during strong economic upswings. Data for inventories need careful interpretation, however. A report of rising inventories may mean that businesses are very confident of sales and are spending on inventories ahead of expected sales. This would normally be the case in the early stages of an inventory cycle upswing and is bullish for economic growth. But at the late stage of the inventory cycle, a rise in inventories may be involuntary because sales are lower than expected. Such news would be negative.

Exhibit 19 US ISM Manufacturing PMI

Source: FRED, Federal Reserve Economic Data, Federal Reserve Bank of St. Louis: ISM Manufacturing: PMI Composite Index (NAPM); Institute for Supply Management. http://research.stlouisfed.org/fred2/series/NAPM; accessed 21 December 2011.

Some of the most useful data on business are surveys. A particularly useful one is the purchasing managers index (PMI) published for several decades by the Institute of Supply Management (ISM) in the United States (formerly the National Association of Purchasing Managers). The PMI is one of the best indicators of the US economy. In the 1990s, the ISM added a survey of non-manufacturing companies, which is beginning to acquire a useful track record. In recent years, most developed countries have developed PMIs using a similar methodology. Exhibit 19 presents US manufacturing PMI data for the years 1948 to 2011. The lower points on the graph coincide predominantly with shaded areas that indicate recessionary periods, when manufacturing activity declines.

The PMI is based on answers to a series of questions about the company's position, including production plans, inventories, prices paid, prices received, and hiring plans. Each component is reported as well as an overall index. The indexes are calibrated so that 50 should be the breakeven point for manufacturing growth. These surveys are particularly useful because of their timeliness.

4.1.5.3 Monetary Policy Monetary policy is sometimes used as a mechanism for intervention in the business cycle. For example, monetary policymakers may use stimulative measures (increasing money supply growth and/or lowering short-term interest rates) when the economy is weak and use restrictive measures (decreasing money supply growth and/or raising short-term interest rates) when the economy is in danger of overheating. If unemployment is relatively high and there is excess productive capacity, then a rate of GDP growth higher than the trend rate will be tolerated for a period of time. This scenario is typical of the recovery and early upswing phases of the business cycle. In the late upswing phase, the economy is threatening to overheat and monetary authorities will restrict money supply to slow growth. If they get it wrong and a recession emerges, then they may cut interest rates to restore growth. Finally, if a major financial crisis threatens the financial system, they may also cut interest rates and increase liquidity and availability of credit, as was seen in the United States in 1987, 1998, 2001, and following the global financial crisis of 2007–2009.

The key variables watched by monetary authorities include:

- the level of unemployment;

- the rate of inflation;
- the pace of economic growth; and
- the amount of excess capacity still available (if any);

A common means for the largest central banks to effect monetary policy has been setting short-term interest rates to levels that are meant to control inflation without inhibiting economic growth. Central banks often see their role as smoothing out the growth rate of the economy to keep it near its long-term sustainable trend rate—in effect, neither too hot nor too cold. A change in short-term interest rates affects the economy through a number of different mechanisms, which vary in their effects at different times.

Lower interest rates encourage more borrowing by consumers and businesses. Lower interest rates also usually result in higher bond and stock prices. These in turn encourage consumers to spend more and encourage businesses to invest more. From an international trade perspective, lower interest rates usually lower the value of a currency and therefore stimulate exports.

The effect of a cut in interest rates also depends on the absolute level of interest rates, not just the direction of change. For example, suppose that interest rates have been raised from 3 to 6 percent to address inflation concerns and then, in response to a recession, are lowered to 4 percent. The lowering of interest rates might stimulate the economy, but interest rates are still higher than where they started. In other words, what matters is not just whether interest rates have most recently been moved up or down but where they stand in relation to their average or "neutral" level. It is common to think of this "neutral" level as a point of interest rate equilibrium within the economy. The concept of the neutral level of interest rates is an important one, though in reality, it is impossible to identify precisely. Conceptually, the argument is that a neutral level of short-term interest rates should include a component to cover inflation and a real rate of return component. For example, in the United States, if inflation is targeted at 2 percent and the economy is growing at 2 percent, many economists argue that the neutral level of interest rates is about 4 percent.

The Taylor Rule One way to assess the central bank's stance and to predict changes is through the so-called **Taylor rule**.[60] In essence, this rule links a central bank's target short-term interest rate to the rate of growth of the economy and inflation. A simple approach to this rule (giving equal weights to GDP growth and inflation) is given by the following Taylor rule equation:

$$R_{\text{optimal}} = R_{\text{neutral}} + \left[0.5 \times \left(\text{GDPg}_{\text{forecast}} - \text{GDPg}_{\text{trend}}\right) + 0.5 \times \left(I_{\text{forecast}} - I_{\text{target}}\right)\right] \quad (12)$$

where

R_{optimal} = the target for the short-term interest rate
R_{neutral} = the short-term interest rate that would be targeted if GDP growth were on trend and inflation on target
$\text{GDPg}_{\text{forecast}}$ = the GDP forecast growth rate
$\text{GDPg}_{\text{trend}}$ = the observed GDP trend growth rate
I_{forecast} = the forecast inflation rate
I_{target} = the target inflation rate

60 See Taylor (1993).

The Taylor rule gives the optimal short-term interest rate as the neutral rate plus an amount that is positively related to the excess of the forecasts of GDP and inflation growth rates above their trend or target values. For example, assume that a current short-term interest rate of 4 percent is the neutral rate. Thus, if the United States is forecast to achieve its 2 percent trend rate of growth and 2 percent inflation target, then the Fed would be happy with the federal funds rate at the neutral rate of 4 percent. At 4 percent, the Fed would expect that the GDP growth and inflation rates would remain at trend or targeted levels. The Taylor rule then states that if the forecast GDP growth rate and/or the forecast inflation rate are above the trend or target level, short-term interest rates need to be raised by *half* the difference between the forecast and the trend or target. Conversely, GDP growth and/or inflation rates below trend or target would motivate the Fed to lower the fed funds rate. (The **federal funds rate**, or fed funds rate for short, is the interest rate on overnight loans of reserves [deposits] at the Fed between Federal Reserve System member banks.)[61] The belief is that when GDP forecast growth is below trend, lowering the interest rate will stimulate output by lowering corporations' cost of capital. When forecast inflation is below target, lowering the interest rate is expected to help the inflation rate return to target through its stimulative effect on the money supply.

EXAMPLE 26

A Taylor Rule Calculation

Assume the following scenario:

- The neutral value of the short-term interest rate is 3.5 percent.
- The inflation target is 2.5 percent.
- The GDP trend rate of growth is 3 percent.

If the inflation forecast is 4 percent and the forecast for GDP growth is 1 percent, what is the optimal short-term interest rate?

Solution:

According to the Taylor rule,

$$\begin{aligned} R_{\text{optimal}} &= R_{\text{neutral}} + \left[0.5 \times \left(\text{GDP}g_{\text{forecast}} - \text{GDP}g_{\text{trend}}\right) + 0.5 \times \left(I_{\text{forecast}} - I_{\text{target}}\right)\right] \\ &= 3.5\% + \left[0.5\left(1.0\% - 3.0\%\right) + 0.5\left(4.0\% - 2.5\%\right)\right] \\ &= 3.5\% + \left(-1.0\% + 0.75\%\right) \\ &= 3.5\% - 0.25\% \\ &= 3.25\% \end{aligned}$$

The GDP growth forecast by itself implies that the short-term interest rate should be lowered by 1 percentage point, because GDP growth is under trend. Partially offsetting the effect of below-trend GDP growth is the interest rate increase implied by above-target inflation. Net, the Taylor rule implies that the central bank should lower short-term rates by 25 bps to 3.25 percent.

Historically, the Taylor rule has provided a reasonably accurate description of central banks' behavior.

61 According to US law, Federal Reserve System member banks are required to hold reserves at the Fed equal to a fraction of the deposits with the banks. In the Eurozone, banks have broadly similar requirements that relate to holding reserves at national central banks.

Money Supply Trends Trends in the money supply can be a good indicator of monetary conditions and of the trend of the economy. Over the long run, there has been a reasonably stable relationship between the growth in money supply and the growth in nominal GDP (inflation plus real growth). If money growth is particularly strong in relation to nominal GDP, chances are that growth will accelerate in the near future and that inflation may eventually accelerate.

What Happens When Interest Rates Are Zero or Negative? Prior to the 2007–2009 global financial crisis, it was generally accepted that central banks could not successfully implement negative interest rate policies. The belief in a "zero lower bound" on policy rates was based on an assumption that individuals would choose to hold currency (coins and notes) if faced with earning a negative interest rate on short-term instruments, including deposits. The move towards holding currency would drain deposits and reserves from the banking system, causing bank balance sheets to shrink. The resulting credit contraction would put upward pressure on interest rates, thwarting the central bank's attempt to maintain negative rates. The contraction of credit would likely also put additional downward pressure on economic growth, thereby reinforcing the need for stimulative policies.

This line of reasoning raised questions about the effectiveness of traditional monetary policy when the economy is so weak that economic growth fails to respond to (nominal) interest rates approaching zero. Following the global financial crisis, central banks faced with this situation pursued less conventional measures.

One important measure was quantitative easing (QE) in which the central banks committed to large-scale, ongoing purchases of high-quality domestic fixed-income securities. These purchases were funded by creating an equally large quantity of bank reserves in the form of central bank deposits. As a result of QE, central bank balance sheets and bank reserves grew significantly and sovereign bond yields fell. QE was pursued by (among others) the US Federal Reserve, the European Central Bank, the Bank of Japan, and the Bank of England.

Conventional reasoning suggests that QE should have resulted in the desired growth in nominal spending. In theory, banks could use the increased reserves to extend loans and low interest rates would stimulate businesses and households to borrow. The borrowing was expected to fund capital expenditure by businesses and current consumption and purchases of durables (e.g., houses and cars) by households, thereby stimulating the economy. With interest rates low, investors were expected to bid up the prices of stocks and real estate. Although asset prices did increase and businesses that could issue bonds borrowed heavily, proceeds were more often used to fund dividends and stock buybacks rather than capital expenditures. At the same time, household spending ability was significantly curtailed by the legacy of the global financial crisis.

Whether or not QE was effective remains subject to debate. To achieve desired levels of economic growth, central banks began to try the previously unthinkable: targeting negative interest rates. The central banks of Denmark, Sweden, Japan, Switzerland, and the euro area are among those that adopted negative policy rates. Contrary to the notion of a "zero lower bound," negative policy rates have proven, as of the beginning of 2017, to be sustainable.

The move into currency did not occur as expected because the scale and speed of transactions inherent in modern economies today cannot be supported using cash as the primary method of exchange. Trillions of dollars change hands daily to facilitate trade in goods, services, and financial instruments. These transactions cannot be accomplished using physical cash. Bank deposits and bank reserves held at the central bank, rather than as vault cash, have an implicit yield or convenience value that cash

does not. As long as this value exceeds the explicit cost of holding those deposits—in the form of a negative interest rate—there is no incentive to convert deposits into cash. In such circumstances, negative policy rates may be achievable and sustainable.

In theory, using negative nominal rates to stimulate an economy should work similarly to using low but still positive rates. Businesses and consumers are encouraged to hold fewer deposits for transaction purposes; investors are encouraged to seek higher expected returns on other assets; consumers are encouraged to save less and/or borrow more against future income; businesses are encouraged to invest in profitable projects; and banks are encouraged to use their reserves in support of larger loan books. All of this is expected to stimulate economic growth.

However, for consumers, investors, businesses, and banks to behave as above, each must believe they will be adequately rewarded for taking the inherent risks. In a negative interest rate environment, these entities are likely to have greater levels of uncertainty as to whether they will be adequately compensated for risks taken, and therefore may not act as desired by monetary policy makers. As a result, the effectiveness of expansionary monetary policy is more tenuous at low and negative interest rate levels than at higher interest rate levels.

EXAMPLE 27

Monetary Policy in the Eurozone Compared with the United States in 2001 and 2010

Both Europe and the United States saw a sharp economic slowdown in 2001. The Fed responded by cutting the fed funds rate from 6.50 percent to 1.75 percent during 2001. In contrast, the European Central Bank (ECB), the central bank for the Eurozone, cut interest rates from 4.75 percent to 3.50 percent, a much less aggressive move. The reasons for these different responses were twofold:

- In 2001, US CPI inflation stood at 2.6 percent, well within the Fed's likely informal target range of 1–3 percent inflation. Coincidentally, the Eurozone also had inflation of 2.6 percent in mid-2001, but this rate was above the explicit target range of 0–2 percent.
- In the United States, unemployment rose rapidly during 2001 from about 4 percent to nearly 6 percent, opening an output gap in the economy. In contrast, Eurozone unemployment was constant at 8 percent for most of 2001, rising only slightly at the end of the year. Hence, the ECB welcomed the slowdown as a way to put downward pressure on inflation.
- In response to the financial crisis and ensuing recession in the period of 2007–2009, both the ECB and the Fed acted in a coordinated manner by first flooding their respective markets with liquidity and then cutting interest rates to or close to zero. To further address stubborn stagnation in economic growth and high unemployment, the Fed and ECB resorted to such non-traditional measures as implementing bond buying programs which came to be known as Quantitative Easing I and II (QE I and QE II).

Implications of Negative Interest Rates for Capital Market Expectation Long-run capital market expectations typically take the level of the "risk-free rate" as a baseline to which various risk premiums are added to arrive at long-run expected returns for risky assets such as long-term bonds and equities. The implicit assumption is that the risk-free rate is at its long-term equilibrium level. When short-term rates are negative, rather than using the observed negative rate, the long-run equilibrium short-term rate

can instead be used as the baseline rate in these models. This rate can be estimated using the neutral policy rate (R_{neutral}) in the Taylor rule (or more generally in the central bank's presumed reaction function) adjusted for a modest spread between policy rates and default-free rates available to investors.

In forming capital market expectations for shorter time horizons, consideration must be given to the expected path of interest rates. Paths should be considered that, on average, converge to the long-run equilibrium rate estimate. With negative policy rates in place, this means a negative starting point. In theory, many possible scenarios, each appropriately weighted by its likelihood, should be considered. In practice, it may suffice to consider only a few scenarios. Because shorter horizons provide less opportunity for the impact of events to average out, the shorter the forecast horizon the more important it is to consider deviations from the most likely path.

Negative policy rates are expected to produce asset class returns similar to those occurring in the contraction and early recovery phrases of a "more normal" business/policy cycle. While such historical periods may provide a reasonable starting point in formulating appropriate scenarios, it is important to note that negative rate periods may indicate severe distress in the economy and thus involve greater uncertainty regarding the timing and strength of recovery.

Key considerations when forming capital market expectations in a negative interest rate environment include the following:

- Historical data are less likely to be reliable.
  - Useful data may exist on only a few historical business cycles, which may not include instances of negative rates. In addition, fundamental structural/institutional changes in markets and the economy may have occurred since this data was generated.
  - Quantitative models, especially statistical models, tend to break down in situations which differ from those on which they were estimated/calibrated.
  - Forecasting must account for differences between the current environment and historical averages. Historical averages, which average out differences across phases of the cycle, will be less useful.
- The effects of other monetary policy measures occurring simultaneously (e.g., quantitative easing) may distort market relationships such as the shape of the yield curve or the performance of specific sectors.

Incorporating uncertain dynamics including negative interest rates into capital market expectations over finite horizons is much more difficult than projecting long term average levels. As noted, this is because asset prices depend not only on investor expectations regarding longer term "equilibrium" levels, but also on the path taken to get there.

4.1.5.4 Fiscal Policy **Fiscal policy** means manipulating the budget deficit to influence the economy. Governments increase spending or cut taxes to stimulate the economy and cut spending or raise taxes to slow the economy. In analyzing fiscal policy, or the so-called "fiscal stance," it is crucial to remember two points. First, an analyst should focus on the *changes* in the government budgetary deficit, not its level. For example, although the Japanese budget deficit has been running at around 8 percent of GDP for many years (as of 2005), it has not been a continuous stimulus to the economy. But if the deficit rose to 10 percent, that increase could represent a stimulus. Conversely, a reduction in the deficit would represent a tighter policy.

Second, it is only changes in the deficit due to *deliberate changes* in government fiscal policy that matter. The budget deficit will constantly change in response to the economy without any change in fiscal policy. During recessions, the deficit tends to

rise because tax revenues fall and government spending on unemployment benefits increases. In contrast, when the economy grows strongly, the budget deficit naturally falls.

Linkages with Monetary Policy It is useful to consider the overall mix of fiscal and monetary policy. If fiscal and monetary policies are both tight, then the situation is unambiguous and the economy is certain to slow. Similarly, if both monetary policy and fiscal policy are expansionary, then the economy can be expected to grow. However, monetary and fiscal policies are sometimes at odds with one another. These situations create opportunities for investors as well as risks.

The fiscal/monetary mix usually shows up in the shape of the yield curve. Exhibit 20 illustrates the four possibilities. When both fiscal and monetary policies are loose, the yield curve tends to be steeply upward sloping. When fiscal policy is tightened while monetary policy remains loose, bond yields tend to fall and the yield curve comes back to a more moderate upward slope.

Exhibit 20 Policy Mix and the Yield Curve

		Fiscal Policy	
		Loose	**Tight**
Monetary Policy	**Loose**	Yield curve steep	Yield curve moderately steep
	Tight	Yield curve flat	Yield curve inverted

If monetary and fiscal policies are both tight, the yield curve is typically inverted. Finally, when monetary policy is tight but fiscal policy is loose, the yield curve tends to be flat.

4.2 Economic Growth Trends

The economic growth trend is the long-term growth path of GDP. The long-term growth path reflects the average growth rate around which the economy cycles. The differences between economic trends and cycles need to be understood. Economic trends exist independently of the cycle but are related to it. Business cycles take the economy through an alternating sequence of slow and fast growth, often including recessions and economic booms.

Economists are concerned with a variety of trends besides the economic growth trend, because that trend is determined by other economic trends, such as population growth and demographics, business investment and productivity, government structural policies, inflation/deflation, and the health of banking/lending processes.

Trends are more easily forecast than cycles, but there are always uncertainties. In practice, it is often difficult to know which trends are most important. Moreover, some trends or changes in trends are by definition not open to forecasting. These are often called "shocks." Examples include wars that cause market dislocations, abrupt changes in government tax or trade policies, and the sudden collapse in an asset market or in an exchange rate. Often, these abrupt changes in trend affect the overall paradigm of capital market expectations. One example of a paradigm-changing shock was the revelation of accounting irregularities at Enron and other US companies in 2002. Investors' perceptions both of the reliability of companies' earning statements and of corporate leaders' attitudes profoundly shifted. Changes in regulations reinforced these shifts. In contrast, other trends such as demographics are usually very much in the background because they change only very gradually.

While shocks are not forecastable, investors do try to assess the risk that they will occur. Unrest in the Middle East may push up the price of oil as well as "safe haven" investments such as gold, the Swiss franc, and US government bonds. If a particular tax change is being considered, markets may partially anticipate it in the pricing of such assets. Some events do come unexpectedly, and they are the ones likely to have the greatest impact as investors struggle to understand their implications.

EXAMPLE 28

Cycles and Trends: An Example

Consider the following hypothetical passage describing the German economy in late 2010:

- *After a recession in 2009 and stagnation in the first quarter of 2010, the German economy picked up. Starting in the second quarter of 2010, it grew at 2.1 percent annualized. Exports led the way, and business investment picked up. Consumer spending grew strongly in early 2010.*
- *Significant progress on labor market reforms and pension reforms by the government, as well as increased sales to India and China, boosted confidence. R & D spending increases led to significant export growth which was further assisted by a weak Euro. In response, the Bundes Bank increased the economic growth forecast from 1.9% to 3.0%, which was above the projected trend growth rate of 2.5%.*

These two statements contain information about the economy. The first refers to the business cycle, while the second describes other economic trends. The final sentence is a mixture of cycle and trend information. It provides the government forecast for economic growth in the following year (cyclical information) but also implies an estimate for the long-term average rate of growth that the German economy is believed capable of achieving (2.5 percent per year).

The expected trend rate of economic growth is a key input in discounted cash flow models of expected return. First, a country with a higher trend rate of growth may offer equity investors a particularly good return. Second, a higher trend rate of growth in the economy allows actual growth to be faster before there is a danger of inflation.

The trend rate of growth of the economy is usually thought not to change much over time. Indeed, for the United Kingdom, historically the first industrial economy, it would appear that GDP has had a 2–2.5 percent trend growth rate for two hundred years with very little variation. However, most countries have had periods of faster and slower trend growth during their development. Emerging countries naturally can more easily have faster growth as they catch up with the leading industrial countries. But the more developed they become, the more likely it is that their growth will slow. This effect has been very obvious in the case of Japan. After Japan's GDP grew at an annual average rate of 11 percent in the 20 years leading up to 1973, growth in the next 17 years averaged only 3.9 percent and then fell to 1.6 percent between 1990 and 2003.

4.2.1 *Consumer Impacts: Consumption and Demand*

Consumers can be counted upon as the largest source of aggregate economic growth in both developed and developing economies. It is interesting to note that although consumers spend more in response to perceived increases in their wealth due to a "wealth effect," overall consumer consumption is quite stable over the business cycle. Milton Friedman (1957) developed an explanation for this stability in his permanent income hypothesis. The **permanent income hypothesis** asserts that consumers'

spending behavior is largely determined by their long-run income expectations. Temporary or unexpected (or one-time) events such as benefiting from an inheritance might temporarily increase an individual's demand for items that might not ordinarily be purchased, but overall spending patterns remain largely determined by long-run expectations. However, if an unexpected event (e.g., winning the lottery) produced an ongoing series of incoming cash flows, it would be expected to permanently alter an individual's spending patterns since the flows would be ongoing and could be depended upon over the long term.

In similar fashion, when temporary events reduce the income flows of consumers, individuals typically reduce the amount they save to maintain their long-term spending patterns. Only when income disruptions occur over the long term may individuals capitulate and reduce their consumption—out of necessity. Thus, consumer trends are usually stable or even countercyclical over a business cycle. When incomes rise the most (during the cyclical expansion phase), spending increases less than income rises. When incomes fall as an economy's growth slows or declines, consumption falls only a fraction and usually only for a relatively short period of time.

4.2.2 *A Decomposition of GDP Growth and Its Use in Forecasting*

The simplest way to analyze an economy's aggregate trend growth is to split it into

- growth from changes in employment (growth from labor inputs), and
- growth from changes in labor productivity.

For longer-term analysis, growth from changes in employment is broken down further into growth in the size of the potential labor force and growth in the actual labor force participation rate (e.g., more or fewer women or older people working; "growth" can be positive or negative).

For example, annual US GDP growth used to be thought of as likely to average 2.5 percent over the long term. This number results from adding a 1 percent growth in the potential labor force, a 0.5 percent growth in labor force participation, and a 1 percent annual growth in labor productivity.

During the late 1990s, there were signs that productivity had risen perhaps to around 2.5 percent annually, so estimates of trend growth were raised to about 4 percent or somewhat less. In contrast, the figures for many developing countries would be closer to 2 percent potential labor force growth, 1 percent growth in labor force participation, and 3–4 percent growth in labor productivity, suggesting that annual growth could average 6–7 percent over a long period. Exhibit 21 shows the US economic trend growth since 1960.

A more sophisticated approach to economic trend growth estimation breaks down the growth in labor productivity into two components, just as growth from labor inputs was analyzed into two components. Productivity increases come from investment in equipment or new machines (growth from capital inputs) and from **growth in total factor productivity** (TFP growth), known also as technical progress and resulting from increased efficiency in using capital inputs.

To summarize, with this approach, the trend growth in GDP is approximately the sum of the following:

- growth from labor inputs, comprising
  - growth in potential labor force size and
  - growth in actual labor force participation, plus
- growth from labor productivity, comprising
  - growth from capital inputs and
  - TFP growth (i.e., growth from increase in the productivity in using capital inputs).

Exhibit 21 US Business Cycles and Economic Trend Growth

Source: Bloomberg.

The potential sources of TFP growth include technological shocks and shifts in government policies. In historical analyses, TFP is often taken simply as a "residual"—that is, output growth that is not accounted for by the other factors.[62]

Many fast-growing emerging countries are successful because they invest heavily and therefore quickly build capital. In Singapore and China, for example, between 30 percent and 40 percent of GDP is invested annually. Slower-growing countries in South America have typically been able to manage capital investment rates of only 15–20 percent of GDP. It is likely, therefore, that the relatively fast rates of economic growth in Asia owe much to the higher rates of capital investment.

The rapid rate of investment helps explain why stock market returns may not be strong despite the rapid growth in the economy. Ultimately, stock market returns depend on the rate of return on invested capital. If capital is growing fast, returns on invested capital are driven down.

Future economic growth trends can be forecast using the model just given. For example, economic trend growth rates in Japan and many parts of Europe are forecast to be relatively low over the next few decades because labor force growth will be constrained by slow population growth. In contrast, the United States—with its relatively young population and high immigration—should enjoy faster labor force growth. Europe and Japan could, however, change the outlook if they could achieve a higher labor force participation rate. Changes to employment laws, pension entitlements, and child care facilities could encourage more women and older people to enter the workforce.

Trend growth will also be boosted if investment is stronger. For example, the surge in economic growth in the United States in the 1990s was partly linked to higher investment. The combination of an economic boom, higher stock market valuations, and a high level of investment in new opportunities in computers and networking in turn boosted overall productivity. Opinions still differ as to how much of the increase in productivity was due to "more machines" and how much was due to greater TFP. Part of the problem is how to value the machines, since computer prices have been falling sharply while their power increases.

62 This component is known as the Solow residual estimate of TFP growth.

By 2005, Europe had not seen a comparable surge in productivity. Investment has not been as strong, and various rigidities seem to be in the way of raising TFP. For example, in the United Kingdom, planning (zoning) restrictions on new large shops on the scale of Wal-Mart in the United States may have limited the scope of retailing efficiencies. Continental European labor laws, which restrict redundancies, or layoffs, also may have made companies move relatively slowly in "de-layering" bureaucracies by using the advantages of networking.

EXAMPLE 29

Forecasting GDP Trend Growth

Cynthia Casey is reviewing a consultant's forecast that Canadian GDP will grow at a long-term 3.5 percent annual rate. According to Casey's own research, a 3.2 percent growth rate is more realistic. Casey and the consultant agree on the following assumptions:

- The size of the Canadian labor force will grow at 1 percent per year based on population projections.
- Labor force participation will grow at 0.25 percent per year.
- Growth from capital inputs will be 1.5 percent per year.

Determine the reason for the discrepancy between Casey's forecast and the consultant's forecast.

Solution:

Casey and the consultant agree on three of the four components of GDP growth, so the reason for the discrepancy in their GDP growth forecasts must be disagreement about the value of the fourth component, total factor productivity growth. For Casey to arrive at a 3.2 percent growth rate estimate, she must be assuming that total factor productivity growth will be 3.2% – (1% + 0.25% + 1.5%) = 0.45%. By contrast, the consultant is predicting that total factor productivity growth will be 3.5% – (1% + 0.25% + 1.5%) = 0.75%. Thus, the consultant is more optimistic than Casey about GDP growth from increases in the productivity in using capital inputs.

4.2.3 *Government Structural Policies*

Government structural policies refer to government policies that affect the limits of economic growth and incentives within the private sector. Government policies affect economic growth trends in profound ways. In the first three-quarters of the 20th century, governments increasingly intervened in the economy in most countries. This intervention often took the form of outright government ownership of large enterprises, combined with labor market and product market regulation. Starting in the 1980s, the trend to privatization led by former Prime Minister Thatcher in Britain substantially reduced the amount of government ownership in most economies. However, the trend toward heavy government regulation of the economy, other than through direct ownership, remains a powerful one.

The following are elements of a pro-growth government structural policy:

1 **Fiscal policy is sound**. Fiscal policy is sometimes used to influence the business cycle and can play a useful role. For example, decreasing a budget surplus (or increasing a budget deficit) may be a justifiable economic stimulus during a recession. But countries that regularly run large deficits tend to have one or more of three potential problems. First, a government budget deficit often

brings a current account deficit (the so-called "twin deficits" problem), which means that the country must borrow abroad. Eventually, when the level of foreign debt becomes too high, that borrowing must be scaled back. This usually requires a large and potentially destabilizing devaluation of the currency. Second, if the deficit is not financed by borrowing, it will ultimately be financed by printing money, which means higher inflation. Third, the financing of the deficit takes resources away from private sector investment, and private sector investment is usually more productive for the country as a whole. It is for all these reasons that investors prefer to see governments hold the budget deficit close to zero over the long term.

2 **The public sector intrudes minimally on the private sector**. According to economic theory, a completely unfettered competitive market would probably supply too little in the way of public goods, such as national defense, and too much in the way of goods with negative externalities, such as goods whose manufacture pollutes the environment.[63] However, the thrust of economic theory is that the marketplace usually provides the right incentives to individuals and businesses and leads to an efficient allocation of scarce resources. Recognizing this, many countries have privatized government-owned businesses over the last few decades and reduced regulations affecting business. The most damaging regulations for business tend to be labor market rules (e.g., restricting hiring and firing) because such regulations tend to raise the **structural level of unemployment** (the level of unemployment resulting from scarcity of a factor of production); however, such regulations are also the most difficult to lift.

3 **Competition within the private sector is encouraged**. Competition is important for trend growth because it drives companies to be more efficient and therefore boosts productivity growth. In the last several decades, the reduction of trade tariffs and barriers has been very important in increasing competition in the goods sector. Recent advances in networking technologies have spread that competition into the service sector. Another positive government policy is openness to foreign investment. However, note that competition makes it more difficult for companies to earn high returns on capital and thus can work against high stock market valuations.

4 **Infrastructure and human capital development are supported**. Projects supporting these goals may be in partnership with the private sector. Building health and education infrastructure has important economic benefits.

5 **Tax policies are sound**. Governments provide a range of goods, including defense, schools, hospitals, and the legal system. They also engage in a certain amount of redistribution of income directly, through pensions and welfare programs. As a result, developed country governments typically collect between 30 percent and 50 percent of GDP in taxes. According to economic theory, taxes distort economic activity by reducing the equilibrium quantities of goods and services exchanged. A decrease in total societal income and efficiency is the cost of redistributing wealth to the least well-off. As a result, investors often look with skepticism on governments that impose high overall tax burdens. Sound tax policy involves simple, transparent, and rarely altered tax rates; low marginal tax rates; and a very broad tax base.

---

63 A **public good** is a good that is not divisible and not excludable (a consumer cannot be denied it); because of these properties, a public good cannot be priced or traded. An **externality** is a result of a transaction or process that spills over to the public.

4.3 Exogenous Shocks

Exogenous shocks are events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example. How do shocks contrast with economic trends? Over time, trends in an economy are likely to stay relatively constant. As such, they should already be discounted in market expectations and prices. Exogenous shocks may have short-lived effects or drive changes in trends. They are typically not built into prices or at most are only partially anticipated.

Most shifts in trends are likely to come from shifts in government policies, which is why investors closely watch both specific measures and the overall direction of government policy (e.g., consumer friendly, business friendly, export friendly).

The biggest impact occurs when there is new government or a major institutional shift. For example, a major fiscal law that prevents the government from borrowing beyond certain limits can be a very effective constraint on excessive spending. A decision to make the central bank more independent or to enter a currency union could have a major impact on the economy. Such government-induced impacts typically are swiftly felt.

Some shocks do not affect trends but are felt in a more immediate or short-term manner. While they are often negative, they are not always so. In 1986, the unexpected breakup of an OPEC meeting without an agreement to cut production led to a sharp decline in oil prices. This event played an important role in keeping inflation low for several years after that. The fall of the Berlin wall triggered German reunification and a "peace dividend" for governments as they cut defense spending.

The creation and assimilation of new products, markets, and technologies provide a positive, longer-term impact on economic trends. Too often, analysts focus on shorter-term benefits, under-appreciating the evolving nature of the technologies and the scope of their effects. For example, the evolution of communication technologies from the telegraph, telephone, phonograph, wireless (cellular and satellite), and internet has been a source of great positive economic impact. These gains show up in TFP growth.

Shocks cannot be forecast in general. But there are two types of economic shock that periodically affect the world economy and often involve a degree of contagion, as problems in one country spread to another. Oil shocks are important because a sharp rise in the price of oil reduces consumer purchasing power and also threatens higher inflation. Financial shocks, which can arise for a variety of reasons, threaten bank lending and therefore economic growth.

4.3.1 *Oil Shocks*

Crises in the Middle East regularly produce spikes in oil prices. Military conflicts that led to declines in world production of oil occurred in 1973–1974, 1979, 1980, 1990, and 2003–2004. Even though oil is a smaller input to the world economy now than it was in the 1970s, a sudden rise in prices affects consumers' income and reduces spending. Inflation rates also rise, though here the effect is ambiguous. Although inflation moves up initially, the contractionary effect of higher oil prices restricts employment and opens up an output gap so that, after a period, inflation slows to below the level where it otherwise might have been.

There have also been episodes of declining oil prices, most notably in 1986 and again in 1999. These tend to have the effect of extending the economic upswing because they contribute to lower inflation. Low oil prices and low inflation boost economic growth that can contribute to overheating, as was seen in the United States in 1987 and again in 1999–2000. Dependence on Middle East oil remains high, and the sources of political instability in the region remain numerous.

4.3.2 *Financial Crises*

Periodic financial crises affect growth rates either directly through bank lending or indirectly through their effect on investor confidence. In the last few decades, events in emerging markets have been the cause of several crises. The Latin American debt crisis of 1982, the Mexican currency crisis of 1994, the Asian financial crisis of 1997, and the Russian crisis of 1998 are examples. The last was particularly important because it threatened both financial markets and investment banks with widespread collapse. The reason was a possible domino effect due to the subsequent collapse of Long-Term Capital Management (LTCM), a large US hedge fund. Most of LTCM's positions had been based on expectations of declining risk spreads. When the Russian crisis sent those spreads upward, it triggered a crisis. Among central banks, the US Federal Reserve's response to these emerging market crises was particularly proactive. The Fed injected liquidity into the system, thereby reducing US interest rates and moderating the impact on financial institutions.

There have been other financial crises. Banks are always potentially vulnerable after a major decline in asset prices, particularly property prices, as in the United States in the early 1990s. In that case, the Fed's response was to keep interest rates low for a prolonged period to provide sufficient liquidity to ensure that the payment system could continue. That action would have been more difficult in a world of low inflation or deflation. Financial crises are therefore potentially more dangerous in a low interest rate environment.

4.4 International Interactions

In general, the dependence of any particular country on international interactions is a function of its relative size and its degree of specialization. Large countries with diverse economies, such as the United States, tend to be less influenced by developments elsewhere than small countries, such as Chile, whose production depends significantly on a few commodities like copper. Increasing globalization of trade, capital flows, and direct investment means that practically all countries are increasingly affected by international interactions.

4.4.1 *Macroeconomic Linkages*

Countries' economies are directly affected by changes in the foreign demand for their exports. This is one way that the business cycle in one country can affect that in others. But there are other international linkages (other than trade) at work, such as those resulting from cross-border direct business investment. The United States has often been the leader in such investment. As a result, an economic slowdown in the United States frequently makes companies worldwide more cautious about investment and hiring.

However, the US economy and the economies of other developed countries are clearly not perfectly integrated. For example, continental Europe did not suffer a recession in 1990 despite the US recession because the stimulative effects of German reunification outweighed the negative effects of the US slowdown. Similarly, while the United States and most other countries suffered a weak economy in the first half of 2003, China's economy boomed under the influence of stimulative monetary and fiscal policies.

4.4.2 *Interest Rate/Exchange Rate Linkages*

One of the linkages of most concern to investors involves interest rates and exchange rates. Sometimes, short-term interest rates are affected by developments in other countries because one central bank pursues a formal or informal exchange rate link with another currency. Some governments *unilaterally* peg their currencies firmly or

loosely to one of the major currencies, usually the US dollar or the euro. This strategy is much less common now than it was before the Asian crisis in 1997, but it is still practiced in Asia (notably Hong Kong) and by members of the Gulf Cooperation Council (Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates, and the Sultanate of Oman). Also, various countries in Africa and Eastern and Central Europe peg to the euro.

The countries that follow this strategy find two benefits. First, domestic business has some reassurance that exchange rates are not going to fluctuate wildly. Second, by pegging the exchange rate, a "pegged" country often hopes to control inflation. This consideration was important in Europe under the Exchange Rate Mechanism (an exchange rate regime established in preparation for the introduction of the euro) and was also the reason for Argentina's convertibility plan, which tied the peso to the dollar in the early 1990s but collapsed amidst a severe economic crisis in 2001.

If a country is following such an exchange rate policy, then the level of interest rates will depend on overall market confidence in the peg. A high degree of confidence in the exchange rate peg means the interest rate differential can converge to near zero. For example, the Hong Kong dollar has been pegged to the US dollar. Interest rate differentials were near zero in 2000–2001 after an uncertain period in 1997–1999, when Hong Kong interest rates were periodically much higher than those in the United States because of the handover of sovereignty to China. But if the markets see the peg policy as unsustainable, then investors will demand a substantial interest differential.

If a country is known to be linking its currency to another, then bond yields of the weaker currency are nearly always higher. Hence, in Europe, Polish bond yields bear a spread over euro bond yields. If the expectation were that the zloty/euro exchange rate would remain broadly the same as its current level over the long term, then bond yields in Poland would converge with those in the Eurozone for bonds of equal credit risk. An expectation of a stable exchange rate might be justified by a belief in the Polish government's determination to maintain parity or by a perception that inflation and the competitiveness outlook for Poland obviate the need for a devaluation. If, however, markets anticipate a devaluation at some stage before Poland joins the euro, then a bond yield spread should remain in place.

Even if countries are not trying to link their currencies, bond yields can diverge substantially between countries. For example, if one country's exchange rate is severely undervalued and is expected to rise substantially against another country's, then bond yields in the first country will be lower than they would otherwise be in relation to the other country.

Exchange rates can be over- or undervalued, requiring an offset from bond yields, for a number of reasons, such as government action on *short-term* interest rates. For example, the Exchange Rate Mechanism was maintained as long as it was by using high short-term interest rates to limit speculation against currencies.

Misvaluation can also happen when bond yields reflect a particularly strong economy. In 1984, US bond yields averaged 12.5 percent despite an annual inflation of 4 percent. These high real and nominal rates were due to the combination of the increasing US budget deficit, a strong private sector economy, and a tightening monetary policy. In comparison, Germany had bond yields of 8 percent with an annual inflation of 2.5 percent. Hence, investors in the United States could enjoy real yields 3 percent above those seen by investors in German bonds: 8.5% real US yield – 5.5% real German yield = 3% excess real yield difference in favor of the United States. This yield difference was enough to take the dollar up substantially in 1983–1985, leaving the bond markets in some degree of equilibrium, although the US dollar was then viewed as overvalued.

Obviously, *nominal* bond yields vary between countries according to those countries' different inflation outlooks and other factors. It is sometimes thought that *real* bond yields ought to be similar in different countries because international capital

flows will equalize them. However, movements in exchange rates to under- or overvalued levels can compensate for different real bond yields. Although real yields can and often do vary among countries, they tend to move together. In the example above from 1984, bond yields in both the United States and Germany were comparatively high in relation to inflation and overall historical experience.

The key factor linking bond yields (especially real bond yields) is world supply and demand for capital or the perceptions of supply and demand. Take the example of the collapse of world bond markets and the sharp rise in bond yields in 1994. These events seem to have been partly due to a perception that synchronized world growth would force short- and long-term interest rates up as the demand for world savings exceeded the supply. Since in the end, the demand has to equal the supply, interest rates everywhere rose to choke off demand and/or stimulate more supply. Similarly, in 2001, bond yields fell everywhere as private demand for capital dropped off in the face of a world slowdown.

4.4.3 *Emerging Markets*

There are some special considerations in setting capital market expectations for emerging countries. Here, we outline some of the key differences from major economies and look briefly at country risk analysis techniques and data sources that analysts use in evaluating emerging markets.

4.4.3.1 Essential Differences between Emerging and Major Economies Emerging countries are engaged in a catch-up process. As a result, they need higher rates of investment than developed countries in physical capital and infrastructure and in human capital. But many emerging countries have inadequate domestic savings and therefore rely heavily on foreign capital. Unfortunately, managing the consequent foreign debt often creates periodic crises, dealing a major blow to investors in emerging stocks and bonds.

Very often, emerging countries have a more volatile political and social environment than developed countries. In comparison with developed countries, emerging countries tend to have a relatively large percentage of people with low income and few assets and a relatively small middle class with its typically major stake in political and economic stability.

Most emerging countries need major structural reform to unlock their potential, which can be difficult to achieve in a volatile political environment. The potential for growth is often blocked by governments protecting vested interests. As a result, the International Monetary Fund (the IMF, an international organization entrusted with fostering global monetary and financial stability) and the World Bank (a group of five international organizations responsible for providing finance to developing countries) have often placed conditions on aid both to manage the risk of crises and to promote growth. For countries within an IMF program, analysts often focus closely on a country's progress in meeting the targets.

Even the largest emerging countries are relatively small in world terms, and their economies are often concentrated in a few areas such as particular commodities or in a narrow range of manufactured goods. Others rely heavily on oil imports and are thus vulnerable to fluctuation in oil prices or are dependent on continuing capital inflows.

4.4.3.2 Country Risk Analysis Techniques Investors in emerging bonds focus on the risk of the country being unable to service its debt (make promised payments of interest and principal). Investors in stocks need to assess the growth prospects of emerging countries as well as their vulnerability to surprises. A common approach is to use a

checklist of various economic and financial ratios and a series of qualitative questions. Following are six questions that country risk analysis seeks to answer, with suggestions for data to analyze and points to look for.

1 *How sound is fiscal and monetary policy?*

If there is one single ratio that is most watched in all emerging market analysis, it is the ratio of the fiscal deficit to GDP. Most emerging countries have deficits and are engaged in a perpetual struggle to reduce them. Deficits are a major cause of slow growth and frequently a factor in serious crises. A persistent ratio above 4 percent is regarded with concern. The range of 2–4 percent is acceptable but still damaging. Countries with ratios of 2 percent or less are doing well.

If the fiscal deficit is large for a sustained period, the government is likely to build up significant debt. In developing countries, governments usually borrow in the short term from domestic lenders in local currency and from overseas in foreign currency. The Argentinean crisis in 2001 was essentially the result of too much government debt. For a developing country, the level of debt that would be considered too high is generally lower than for developed countries. Countries with a ratio of debt of more than about 70–80 percent of GDP are extremely vulnerable.

2 *What are the economic growth prospects for the economy?*

The most successful countries in Asia have been able to grow at annual rates of 6–8 percent on a sustained basis. Others have achieved a respectable rate of 4–6 percent per annum. Annual growth rates of less than 4 percent generally mean that the country is catching up with the industrial countries slowly, if at all. It also means that, given some population growth, per capita income is growing very slowly or even falling, which is likely to bring political stresses.

Investors usually welcome a wave of reform because it will typically boost economic growth and the stock market. But growth may slow down after that unless there is further reform or new opportunities are opened up. One of the best indicators of the structural health of an economy is the Economic Freedom Index, published by a consortium of research institutes around the world (www.freetheworld.com). This index consists of a range of indicators of the freedoms enjoyed by the private sector, including tax rates, tariff rates, and the cost of setting up companies. Markets such as the United States, Singapore, and Hong Kong have scored well. The index has been found to have a broad positive correlation with economic growth.

3 *Is the currency competitive, and are the external accounts under control?*

Managing the currency has proven to be one of the most difficult areas for governments. If the exchange rate swings from heavily undervalued to seriously overvalued, there are negative effects on business confidence and investment. Moreover, if the currency is overvalued for a prolonged period, the country is likely to be borrowing too much, creating a large current account deficit and a growing external debt.

The size of the current account deficit is a key measure of competitiveness and the sustainability of the external accounts.[64] Any country with a deficit persistently greater than 4 percent of GDP is probably uncompetitive to some degree. Current account deficits need to be financed. If the deficits are financed through debt, servicing the debt may become difficult. A combination of currency depreciation and economic slowdown will likely follow. The slowdown will also usually cut the current account deficit by reducing imports. Note, however, that a small current account deficit on the order of 1–3 percent of GDP is probably sustainable, provided that the economy is growing. A current account deficit is also more sustainable to the extent that it is financed through foreign direct investment rather than debt, because foreign direct investment creates productive assets.

4 *Is external debt under control?*

External debt means foreign currency debt owed to foreigners by both the government and the private sector. It is perfectly sensible for countries to borrow overseas because such borrowing serves to augment domestic savings. But borrowing needs to be kept within reasonable bounds or lenders will begin to question its sustainability. The resulting reluctance to lend new money may lead to an exodus of capital as money invested in local bonds and stocks flows out.

Analysts watch several measures of debt burden. The ratio of foreign debt to GDP is one of the best measures. Above 50 percent is dangerous territory, while 25–50 percent is the ambiguous area. Another important ratio is debt to current account receipts. A reading above 200 percent for this ratio puts the country into the danger zone, while a reading below 100 percent does not.

5 *Is liquidity plentiful?*

By liquidity, we mean foreign exchange reserves in relation to trade flows and short-term debt. Traditionally, reserves were judged adequate when they were equal in value to three months' worth of imports. However, with the vastly greater importance of debt and capital flows, we now relate reserves to other measures. An important ratio is reserves divided by short-term debt (debt maturing in less than 12 months). A safe level is over 200 percent, while a risky level is under 100 percent.

Excess short-term borrowing is present in most emerging market crises. This is partly a result of the fact that countries often find it more difficult to borrow longer-term in the period leading up to the crisis. But if the country borrows too much, even short-term lending eventually stops and the country is typically in crisis very quickly thereafter.

6 *Is the political situation supportive of the required policies?*

If the economy of the country is healthy, with fast growth, rapid policy liberalization, low debt, and high reserves, then the answer to this question matters less. Poor political leadership is unlikely to create a crisis. However, if the economic indicators and policy are flashing warning signals, the key issue becomes whether the government will implement the necessary adjustment policies. Cutting the budget deficit, which usually requires some combination of higher

---

64 To briefly review accounting for cross-border flows, the **balance of payments** (an accounting of all cash flows between residents and nonresidents of a country) consists of the current account, dominated by the trade balance (reflecting exports and imports), and the financial account, consisting of portfolio flows (from security purchases and sales—e.g., bonds and equities) and foreign direct investment (FDI) by companies (e.g., Toyota Motor Corporation building an automobile assembly plant in the United States), as well as flows such as borrowing from and deposits with foreign banks. The sum of the current account and the financial account, or the **overall trade balance**, should be zero.

taxes and lower spending, is always painfully difficult, especially if the economy is weak already. Other key policy changes are reforms such as privatization and the ending of monopolies.

In summary, the evaluation of emerging economies uses many of the same tools as the evaluation of developed countries but places a greater emphasis on the balance of payments, debt, liquidity, and politics. The analysis pays off because despite serious risks caused by political instability and periodic crises, many emerging countries grow faster than developed countries and offer good investment opportunities. Since the Asian crisis in 1997, investors are much more conscious of the potential risks, which include market declines, fixed or quasi fixed exchange rates, major recessions, and contagion. The worst losses have been suffered in the countries that turned out to be the weakest politically.

4.5 Economic Forecasting

Having reviewed some practical basics of macroeconomics for the investment analyst with many real-world illustrations, we can now indicate some of the disciplines that the analyst can apply to economic forecasting. Often, analysts consider the implications of a variety of approaches, which will often raise questions that lead to productive analysis and insight. We may distinguish at least three distinct approaches:

- Econometric models, the most formal and mathematical approach to economic forecasting.
- Leading indicators: variables that have been found to lead (precede) turns in the economy.
- Checklists, requiring the subjective integration of the answers to a set of relevant questions.

In the following, we address each of these approaches in turn.

4.5.1 *Econometric Modeling*

Econometrics is the application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.[65] Whereas generic data analysis can involve variables of all descriptions (possibly including economic, security characteristic, demographic, and statistical variables), econometric analysis focuses on economic variables, using economic theory to model their relationships.

Econometric models vary from small models with just one equation or perhaps a handful of equations to large, complex models with hundreds of equations. However, they all work in essentially the same way. A model is created of the economy based on variables suggested by economic theory. Optimization (frequently the least-squares criterion from regression analysis) using historical data is used to estimate the parameters of the equations. The estimated system of equations is used to forecast the future values of economic variables, with the forecaster supplying values for the exogenous variables. For example, such a model may require the forecaster to enter an exchange rate, an interest rate, and commodity prices. But the model then uses the estimated past relationships to forecast the future.

A very simple model is presented in the following series of equations:

1 GDP growth = function of (Consumer spending growth and investment growth)

65 There are also quantitative approaches reflecting **unstructured modeling**—that is, modeling without a theory on the underlying structure—such as vector autoregression (VAR), that may be appropriate for certain types of economic forecasting. See Diebold (2004) for an introduction to VAR.

2 Consumer spending growth = function of (Consumer income growth lagged one period and Interest rate*)

3 Investment growth = function of (GDP growth lagged one period and Interest rate*)

4 Consumer income growth lagged one period = Consumer spending growth lagged one period

Here, the asterisk (*) denotes an exogenous variable. So, with this four-equation model estimated on past data and with the actual data for the variables lagged one period, together with the modeler's exogenous forecasts for the interest rate, the model will solve for GDP growth in time in the current period. Note that the final equation asserting that consumer income growth is always identical to consumer spending growth assumes a static relationship between these two variables.

Additional variables make a model more complex, more realistic, but often more difficult to construct, estimate, and interpret. Most models will incorporate variables such as government spending, employment, the savings rate, money supply, exports, and imports. However, it is by no means certain that larger models are superior to smaller models. Also, different models have different structures, and these structures reflect the views of the modeler both in what variables are included and in how they interrelate with one another. Monetarist models, for example, rely heavily on money-supply-related variables and relationships.

Econometric models are widely regarded as very useful for simulating the effects of changes in certain variables. For example, they can be useful for assessing the impact of a 10 percent rise in oil prices or a rise in income tax rates or a faster growth rate in trading partners on consumer demand.[66] Econometric models have several limitations. First, econometric models require the user to find adequate measures for the real-world activities and relationships to be modeled, and these measures may not be available. Variables may also be measured with error. Relationships among the variables may change over time because of changes in the structure of the economy; as a result, the econometric model of the economy may be misspecified.

In practice, therefore, skillful econometric modelers use a great deal of personal judgment in arriving at forecasts. Very often, the first run of the model will generate a forecast that the modelers do not believe. So, they will go back and change some of the exogenous variables to arrive at a forecast they do believe. The great merit of the econometric approach, however, is that it constrains the forecaster to a certain degree of consistency and also challenges the modeler to reassess prior views based on what the model concludes.

In practice, model-based forecasts rarely forecast recessions well, although they have a better record in anticipating upturns. For example, the US economic upswing that gathered pace in the second half of 2003 was well forecast by econometric models.

4.5.2 *Economic Indicators*

Economic indicators are economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle. **Lagging economic indicators** and coincident indicators are indicators of recent past and current economic activity, respectively. A **leading economic indicator** (LEI) is a variable that varies with the business cycle but at a fairly consistent time interval before a turn in the business

66 Mehra and Peterson (2005) found that in the United States a 10 percent increase in oil prices is associated with the level of consumer spending at the end of six quarters being 0.80 percent to 1.60 percent lower than it otherwise would be.

cycle. Most analysts' greatest interest is leading indicators because they may provide information about upcoming changes in economic activity, inflation, interest rates, and security prices.

Leading indicator–based analysis is the simplest forecasting approach to use because it requires following only a limited number of variables. The indicators are best thought of as early signs of probable events to come.

Many private sector forecasters try to gain an edge in identifying the factors that best predict the path of the economy and use their own proprietary indicators. Nevertheless, a good place to start for most investors is the leading indicators published by national governments or, in some countries, by established private organizations such as the Conference Board in the United States.

Analysts may use both individual LEIs and composite LEIs, reflecting a collection of economic data releases that are combined to give an overall reading. Composite LEIs combine these releases using weights based on an analysis of their forecasting usefulness in past cycles. They can also be combined in a so-called **diffusion index**, which measures how many indicators are pointing up and how many down. For example, if 7 out of 10 are pointing upward, then the odds are that the economy is accelerating.

We review a selection of LEIs, both individual and composite, by geographic region:

Worldwide[67]

OECD Composite Leading Indicators (CLI) (www.oecd.org). The Organization for Economic Cooperation and Development (OECD) is a Paris-headquartered organization comprising 35 member countries as of December 2016. The OECD publishes CLI on Friday of the first full week of each month (these releases relate to information on production two months earlier). The indexes are based on a range of variables (5 to 11 for each country), such as share prices, industrial production data, building permits, and monetary data that may have predictive value for the course of the business cycle. A Total OECD Composite Leading Indicator is published, as well as indexes for the 35 member countries and for regions including:

- Big Four European countries (France, Germany, Italy, and United Kingdom);
- Euro area (European Monetary Union [EMU] countries);
- G–7 (Canada, France, Germany, Italy, Japan, United Kingdom, and United States);
- OECD-Europe (the EMU countries plus others);
- Total OECD countries (OECD-Europe plus other non-European members); and
- NAFTA (Canada, Mexico, and the United States).

The OECD publishes the six-month rate of change (annualized) in the monthly index numbers. Some analysts follow the six-month rate of change series more closely than the monthly index numbers because it may filter out the meaningless variation (noise) in the monthly numbers.[68]

Europe

Selected indicators include the following:

- **Eurozone Harmonized Index of Consumer Prices** (HICP) (epp.eurostat.ec.eu.int). Eurostat, the statistical office of the EU, publishes a composite index of inflation in the Eurozone. The European Central Bank (ECB) developed this index for use in inflation targeting, and indexes standardized

67 See *Guide to Economic Indicators*, 5th ed. (The Economist, 2003).
68 See Baumohl (2005), p. 328.

on the ECB methodology have been developed for individual EU countries. Inflation indexes are not in general viewed as leading indicators. However, because of the ECB's strong focus on inflation containment, an unexpected increase in this index may presage events such as an interest rate increase.

- **German Industrial Production** (www.destatis.de). The Statistisches Bundesamt Deutschland (German Federal Office of Statistics) publishes in the second week of each month an index of German industrial production relating to production data two months earlier. Germany is Europe's largest economy and has frequently ranked among the top two exporters in the world. (As of 2009, its largest export partners were France, 10.1 percent; United States, 6.7 percent; United Kingdom, 6.6 percent; Netherlands, 6.6 percent; Italy, 6.3 percent; Austria, 5.7 percent; Belgium, 5.2 percent; China, 4.7 percent; and Switzerland, 4.5 percent.)[69] This series is closely watched as a leading indicator for the German and Eurozone economies.
- The **German IFO Business Survey** (www.ifo.de) and the **French Monthly Business Survey** (www.insee.fr), both released during the fourth week of the month being surveyed, are influential surveys of German and French business executives, respectively. Analysts focus on the answers to the forward-looking component of these series (a six-month-ahead time frame for the German series and a three-month-ahead time frame for the French series) for indications of Eurozone industrial production over the next several months. France is the Eurozone's second-largest economy.

Asia Pacific

Selected indicators include the following:

- The **Tankan Survey** of the Bank of Japan (www.boj.or.jp). Japan's central bank's detailed quarterly survey of business, published at the start of April, July, and October and in mid-December, is a rich source for information on Japanese business conditions and the expectations of business executives. Japan has been ranked among the world's three largest economies and has been the world's largest producer of foreign direct investment. Furthermore, the Japanese yen is one of the world's most important currencies: The Bank of Japan has the world's largest reserves of foreign currency and gold, and the bank has frequently been active in foreign exchange markets. As of the end of 2010, the major export partners of Japan were China, 19.4 percent; United States, 15.7 percent; South Korea, 8.1 percent; Hong Kong, 5.5 percent; and Thailand, 4.4 percent. Japan's largest import partners were China, 22.1 percent; United States, 9.9 percent; Saudi Arabia, 5.2 percent; UAE, 4.2 percent; South Korea, 4.1 percent; and Indonesia, 4.1 percent.
- **China Industrial Production** (www.stats.gov.cn). China's National Bureau of Statistics (NBS) releases monthly data on industrial production usually four weeks after the month being surveyed. These data are measures of the value added by light industry (mainly producing consumer goods) and heavy industry (producing durable goods such as factory equipment and automobiles). Baumohl (2005) provides a critique of the reliability of these data. Valuing the Chinese currency (called the renminbi or yuan) on a purchasing power parity basis (defined in Section 4.6.9.1), as of 2010, China ranked as the world's second-largest economy.

South America

69 See "The World Factbook" at www.cia.gov.

- **Brazil Industrial Production** (www.ibge.gov.br). The Brazilian Institute for Geography and Statistics releases monthly data on industrial production approximately 40 days after the end of the month surveyed. This series is probably the closest watched by analysts. As of the end of 2004, Brazil represented more than 40 percent of South America's total GDP. With an estimated population of over 185 million as of 2005, Brazil is also by far the most populous South American country. As of 2010, Brazil's major export partners were China, 15.2 percent; United States, 9.6 percent; Argentina, 9.2 percent; Netherlands, 5.4 percent; and Germany, 4.0 percent. Its major import partners were the United States, 15.0 percent; China, 14.1 percent; Argentina, 7.9 percent; Germany, 6.9 percent; and South Korea, 4.6 percent.

North America[70]

- The Conference Board's **Index of Leading Economic Indicators**. The Conference Board is a private, nonprofit, New York City-headquartered research organization that took over the management of this series from the US Commerce Department in 1995. The Conference Board releases this monthly series three weeks after the end of the month reported upon, as well as coincident and lagging indexes. Exhibit 22 shows the 10 components of the US leading indicator index, which is normally quoted as a weighted index but is also available as a diffusion index. The Conference Board also publishes indexes for Australia, France, Germany, Japan, Korea, Mexico, Spain, and the United Kingdom, researching the best indicators to use for each country. The United States is the world's largest economy. As of 2010, the United States' largest exporting partners were Canada, 19.4 percent; Mexico, 12.8 percent; China, 7.2 percent; and Japan, 4.7 percent. Its largest importing partners were China, 19.5 percent; Canada, 14.2 percent; Mexico, 11.8 percent; Japan, 6.3 percent; and Germany, 4.3 percent.

Exhibit 22 US Composite Indexes: Components and Standardization Factors

Leading Index	Factor
1. Average weekly hours, manufacturing	0.2552
2. Average weekly initial claims for unemployment insurance	0.0307
3. Manufacturers' new orders, consumer goods and materials	0.0773
4. Vendor performance, slower deliveries diffusion index	0.0668
5. Manufacturers' new orders, non-defense capital goods	0.0183
6. Building permits, new private housing units	0.0271
7. Stock prices, 500 common stocks	0.0391
8. Money supply, M2	0.3550
9. Interest rate spread, 10-year Treasury bonds less federal funds	0.1021
10. Index of consumer expectations	0.0284
Coincident Index	
1. Employees on nonagricultural payrolls	0.5426
2. Personal income less transfer payments	0.1890
3. Industrial production	0.1493
4. Manufacturing and trade sales	0.1191

70 This example draws on Baumohl (2005).

Exhibit 22 (Continued)

Lagging Index	
1. Average duration of unemployment	0.0373
2. Inventory/sales ratio, manufacturing and trade	0.1239
3. Labor cost per unit of output, manufacturing	0.0615
4. Average prime rate	0.2822
5. Commercial and industrial loans	0.1112
6. Consumer installment credit to personal income ratio	0.1880
7. Consumer price index for services	0.1959

Source: Conference Board, www.globalindicators.org.

In a given index, the component factors are inversely related to the standard deviation of the month-to-month changes in each component. They are used to equalize the volatility of the contribution from each component and are "normalized" to sum to 1. When one or more of the components are missing, the other factors are adjusted proportionately to ensure that the total continues to sum to 1.

As Exhibit 22 shows, the Conference Board's LEI index consists of seven nonfinancial and three financial components (#7, #8, and #9). Of particular note is #5, provided by the Institute of Supply Management (ISM), which is a professional organization of purchasing managers. This release comes out on the first business day of each month and so is one of the earliest pieces of information on the business cycle available in a given month. This release receives more attention than #3, also from the ISM. Because capital goods orders are more sensitive to the business cycle than consumer goods, the release of #5 is often a market-moving event. Another interesting component is #7, the S&P 500 Index, which historically has been a good leading indicator of the stock market.

In contrast with the release of some of its individual components, the release of the LEI index is rarely a market-moving event because some of its components are already public.

Traditionally, the general rule was that three consecutive months of increases, or three consecutive months of decreases, signaled an upturn or downturn in the economy within three to six months. The Conference Board and others have also indicated other rules for interpreting changes in the index.

Exhibit 23 plots the composite LEI against quarterly GDP changes (expressed as a seasonally adjusted annual rate, or SAAR). The left vertical axis represents percentage changes and applies to real GDP changes; the right vertical axis shows index levels and applies to LEI levels.

Exhibit 23 US: Leading Indicators and GDP

Source: Bloomberg.

The US LEI index gave a somewhat ambiguous signal ahead of the 1990 recession but performed much better in the most recent cycle. In the late 1990s, it correctly showed that the Asian crisis was not threatening a US downturn. Then, in 2000, it peaked in January. By midyear, it was clearly falling, well before there was general agreement that the economy was slowing. In 2003, it picked up strongly in May and continued to rise rapidly, correctly signaling a strong recovery. The strong uptick after the recession of 2008–09 in the face of a tepid US recovery (as indicated by the declining quarter-over-quarter GDP change) is once again an ambiguous signal.

4.5.3 *Checklist Approach*

Formally or informally, many forecasters consider a whole range of economic data to assess the future position of the economy. Checklist assessments are straightforward but time-consuming because they require looking at the widest possible range of data. The data may then be extrapolated into forecasts via objective statistical methods, such as time-series analysis, or via more subjective or judgmental means. An analyst may then assess whether the measures are in an equilibrium state or nearer to an extreme reading.

Inflation reports provided by many central banks or through the minutes of central bank meetings give an idea of the range of indicators that may be included in checklists related to preparing general economic forecasts.

Exhibit 24 is an example of a checklist for evaluating economic growth. In effect, the forecaster asks a series of questions about likely components of spending and then, aggregating the information gathered, reaches a conclusion about the outlook for the economy. Such an approach involves a substantial amount of subjective judgment as to what is important in the economy.

Exhibit 24 Checklist for Economic Growth

Spending Components	Focus
1 Where in the cycle is the economy now?	Aggregate activity
■ Review previous data on GDP growth and its components (consumer spending, business investment, inventories, net exports, and government spending).	Aggregate activity
■ How high is unemployment relative to estimates of "full employment"?	Consumer
■ Has unemployment been falling?	Consumer
■ How large is the output gap?	Business
■ What is the inventory position?	Business
■ Where is inflation relative to target, and is it threatening to rise?	Inflation
2 How strong will consumer spending be?	Consumer
■ Review wage/income patterns.	Consumer
■ How fast will employment grow?	Consumer
■ How confident are consumers? Consumer confidence indexes.	Consumer
3 How strong will business spending be?	Business
■ Review survey data (e.g., purchasing managers indexes).	Business
■ Review recent capital goods orders.	Business
■ Assess balance sheet health of companies.	Business
■ Assess cash flow and earnings growth trends.	Business
■ Has the stock market been rising?	Business
■ What is the inventory position? Low inventory/sales ratio implies GDP strength.	Business
4 How strong will import growth be?	Government
■ Exchange rate competitiveness and recent movements.	Government
■ Strength of economic growth elsewhere.	Government
5 What is the government's fiscal stance?	Government
6 What is the monetary stance?	Central bank
■ Review recent changes in interest rates.	Central bank
■ What do real interest rates tell us?	Central bank
■ What does the Taylor rule tell us?	Central bank
■ Monetary conditions indexes (i.e., trends in asset prices and exchange rate).	Central bank
■ Money supply indicators.	Central bank
7 Inflation	Inflation
■ How fast is inflation rising, or are prices falling?	Inflation

Example 30 is a simple illustration of the checklist approach.

EXAMPLE 30

An Analyst's Forecasts

As a capital market analyst at a large money management firm, Charles Johnson has developed a list of six broad questions for evaluating the economy. The questions are given below with his responses for his own national market. The current inflation rate is 2 percent per year.

A Is consumer spending increasing or decreasing? *Johnson*: Consumer spending is increasing at a lackluster rate of 0.75 percent per annum.

B Are business conditions and fundamentals growing stronger or weakening? *Johnson*: Based on recent values of manufacturers' new orders for consumer goods and materials and non-defense capital goods, business demand is weakening.

C What is the consensus forecast for the GDP growth rate over the next year? *Johnson*: The median forecast from a survey of economists is that GDP will decline from a 3.5 percent to a 3.0 percent annual growth rate.

D Are government programs and fiscal policy becoming more restrictive or expansive? *Johnson*: Political support for a stimulative fiscal policy is absent; fiscal policy will be neutral.

E Is monetary policy neutral, tightening, or loosening? *Johnson*: Monetary policy is neutral.

F Is inflation in a steady state (state of equilibrium)? *Johnson*: The current inflation rate of 2 percent is close to a steady state value.

Based on the information given, what conclusions will Johnson reach concerning:

1 inflation over the next six months?

2 short-term interest rates?

Solution to 1:

Based on the expected slow growth in consumer demand and weakening business demand, inflation should remain muted over the next six months.

Solution to 2:

Reduced aggregate economic activity and stable inflation should allow for stable to falling interest rates.

The subjectivity of the checklist approach is perhaps its main weakness. The checklist's strength is its flexibility. It allows the forecaster to take changes in the structure of the economy into account quickly by changing the variables or the weights assigned to variables within the analysis. The next section summarizes the three chief approaches.

4.5.4 *Economic Forecasting Approaches: Summary of Strengths and Weaknesses*

Exhibit 25 summarizes the advantages and disadvantages of forecasting using econometric models, leading indicators, and checklists.

Exhibit 25 Advantages and Disadvantages of Three Approaches to Economic Forecasting

Advantages	Disadvantages
Econometric Models Approach	
■ Models can be quite robust with many factors used that can approximate reality. ■ Once models are built, new data may be collected and consistently used within models to quickly generate output. ■ Provides quantitative estimates of the effects on the economy of changes in exogenous variables.	■ Most complex and time-consuming to formulate. ■ Data inputs and relationships not easy to forecast and not static. ■ Requires careful analysis of output. ■ Rarely forecasts recessions well.
Leading Indicator–Based Approach	
■ Usually intuitive and simple in construction. ■ May be available from third parties. ■ May be tailored for individual needs. ■ A literature exists on the effective use of various third-party indicators.	■ Historically, has not consistently worked, as relationships between inputs are not static. ■ Can provide false signals.
Checklist Approach	
■ Limited complexity. ■ Flexible: allows structural changes to be easily incorporated.	■ Subjective. ■ Time-consuming. ■ Complexity has to be limited due to the manual nature of the process.

4.6 Using Economic Information in Forecasting Asset Class Returns

Movements in economic variables play a key role in forming investors' expectations. Although some investors, such as pure bottom-up stock pickers or fully hedged arbitrage specialists, do not care much about the way that economic developments move markets, it is important for most investors. In this section, we look at how the principal asset classes are moved by different economic variables.

4.6.1 *Cash and Equivalents*

Cash managers make money through selection of the maturity of the paper in their portfolio or, if permitted by investment policy, by taking credit risk. Longer maturities and lower credit ratings reward the extra risk with higher expected returns. Managers lengthen or shorten maturities according to their expectations of where interest rates will go next. Normally, longer-maturity paper will pay a higher interest rate than shorter-maturity paper, even if overnight interest rates are expected to remain the same, because the risk of loss is greater for the longer-term paper if this expectation is not fulfilled. If further rises in rates are expected over time, then 6- and 12-month paper should offer even higher rates than shorter-term paper.

The overnight interest rate is targeted by the central bank and will normally vary only slightly from the target set. For example, in the United States, the Federal Reserve's target for the fed funds rate along with open market operations usually ensures the overnight interest rate is close to the target. (**Open market operations** are the purchase or sale by a central bank of government securities, which are settled using

reserves, to influence interest rates and the supply of credit by banks.) Occasional variations are due normally to liquidity factors, especially close to year-end or during unusual market turbulence. In other countries, the target rate may be the repo rate (repurchase rate), as in the Eurozone, where the European Central Bank conducts open market operations.

At any given time, the yield curve of interest rates of a particular security (e.g., Treasury bills or interest rate futures) reflects the market's expectations of rates over that period. The money manager is trying to be ahead of others in correctly forecasting those levels. In practice, this means forecasting both the behavior of the economy and the reaction of the central bank to that behavior. It also means understanding what the markets currently anticipate and distinguishing between future data surprises and what is already factored into expectations (i.e., likely to have no effect on the market). Money managers therefore spend a great deal of time in so-called "central bank watching."

EXAMPLE 31

Central Bank Watching and Short-Term Interest Rate Expectations

At the beginning of 2000, the US stock market bubble peaked and the economy was strong. At this point, one-month US interest rates stood at about 5.7 percent per annum, with the six-month yield about 40 basis points higher at 6.1 percent per annum. Interest rates had already moved up in 1999, but the market was expecting the Federal Reserve to announce additional small increases in rates to help slow the economy and avoid rising inflation. A money manager might have been tempted to buy the longer-term paper, given its higher yield. However, the Federal Reserve raised interest rates faster than expected, with the fed funds rate moving up from 5.5 percent to 6.5 percent by June 2000. The best place to be was therefore at the short end of the curve, because by May 2000, one-month paper could be bought to yield 6.5 percent per annum and six-month paper could be bought to yield 6.8 percent per annum. During periods of rising short-term rates, keeping maturities short is a good strategy.

Early summer 2000 turned out to be the peak for US interest rates, and rates were cut sharply in 2001 when the US economy went into recession. In November 2000, shortly before the markets began to expect that the Fed would cut interest rates sharply, six-month rates of 6.7 percent per annum were available, just above one-month rates of 6.5 percent per annum. In the first months of 2001, the Fed cut rates rapidly and one-month yields fell to 4 percent per annum by May 2001 with an average yield of only just over 5 percent per annum.

Consider a manager who, during the summer of 2000, correctly anticipated the actions of the Fed in 2001. For such a manager, contrast the appropriateness of the following two strategies:

- An investment strategy of rolling over one-month paper.
- An investment strategy of buying longer-maturity paper (in this case, six-month paper).

Solution:

The second strategy is superior, as it would lock in the higher yields for six months in a declining interest rate environment. By contrast, the first strategy counts on interest rates rising, not declining. The first strategy would produce higher returns only if interest rates rose.

4.6.2 *Nominal Default-Free Bonds*

Nominal default-free bonds are conventional bonds that have no (or minimal) default risk. Conventional government bonds of developed countries are the best example. Thus, our focus is on the government yield curve. One way to think of the yield on a government bond is that it reflects the expected future short-term Treasury bill yields over the same horizon. Another approach, which is more useful for longer-term bonds, is to break down the yield into at least two components. First, the so-called real bond yield is determined by the growth rate of GDP and the supply and demand for capital. Second, yields are affected by forecast inflation over the investment period. For default-risk-free bonds, the credit spread or default risk premium is zero. Investors may thus assess whether bonds are cheap or expensive according to their view on whether the markets are too optimistic or too pessimistic based on real yields and inflation.

Historically, taking the period 1900–2010, the average annual real return on long-term government bonds above inflation was 2.3 percent for the United States and 2.2 percent for the United Kingdom.[71] However, there is some evidence that investors underestimated inflation during several periods, including the world wars and the peacetime inflation of the 1960s and 1970s. Hence, a better estimate of the *ex ante* expectations for annual returns above inflation (i.e., real yields) is 2–4 percent.

The investor then needs to forecast the inflation rate over the long term. For example, if 10-year bonds yield 5 percent and inflation is forecast at 2 percent, then the investor is hoping to receive approximately a 3 percent real return. If his or her judgment is that annual inflation is likely to be only 0.5 percent or perhaps that deflation will occur, then these bonds will be particularly attractive. Conversely, if inflation is thought likely to accelerate—for example, to 6 percent—then the bonds are very unattractive because they will not compensate for this higher inflation rate and will likely fall below par value during their lifetime as market yields rise.

For investors buying and selling long-term bonds over a shorter time period, the emphasis is on how bond yields will respond to developments in the business cycle and changes in short-term interest rates. News of stronger economic growth usually makes bond yields rise (prices fall) because it implies greater demand for capital and perhaps higher inflation too. Changes in short-term rates have less predictable effects on bond yields. More often than not, a rise in short-term rates will lead to a rise in longer-term bond yields. However, a rise in rates will sometimes be expected to slow the economy, and bond yields could fall as a result. If bond markets expect that central banks will exactly achieve their inflation objectives, then bond yields should not change on inflation expectations but nevertheless could go up and down according to changes in short rates (with higher short rates making bonds less attractive in relative terms).

As bond investors look toward the long-term picture, they must carefully assess the future effects of inflation, which erodes the future purchasing power of the yields earned on their fixed-income investments. In the 1970s, bond investors in the United States and most major countries suffered severe losses in real terms because of unexpected inflation. Yields in the 1960s were at single-digit levels, and yet inflation in the following 15 years moved up into double digits. In the 1980s, after this bad experience, investors were apprehensive of a new surge in inflation and therefore demanded higher yields (a higher inflation premium). Hence, yields were often 4–6 percent above recorded inflation—much higher than normal. As of early 2005, with inflation very low, US bond investors have begun to believe not only that inflation will stay low, but also that there is a risk of deflation. Thus, as inflation fears declined during the 1990s, the inflation premium in bond yields likewise declined, reducing overall

71 See Dimson, Marsh, and Staunton (2011).

nominal yields. In recent years, the inflation premium embedded in bond yields fell further, to unusually low levels in the first half of 2003, when deflation fears reached a high point and bond yields registered as little as 1–2 percent above recorded inflation.

4.6.3 *Defaultable Debt*

Defaultable debt is debt with some meaningful amount of credit risk—in particular, most corporate debt. For corporate debt, such as certificates of deposit and bonds, the spread over Treasuries represents at least in part the market's perception of default risk.[72] Individual securities move in response to particular corporate circumstances, but the market as a whole responds primarily to changes in short-term rates and changes in the business cycle. During a business cycle, spreads tend to rise during a recession because companies are under stress from both weak business conditions and, typically, higher interest rates. Sometimes, borrowing from banks or in the commercial paper market becomes more difficult too, so that companies can be severely squeezed. Default rates typically rise during recessions. Investors demand higher rates to pay for the uncertainties and possible surprises, such as fraud. In contrast, during periods of strong economic growth, spreads narrow as fears of default decline.

4.6.4 *Emerging Market Bonds*

Emerging market debt refers here to the sovereign debt of nondeveloped countries. So far, we have considered only government issues and regarded them as virtually risk-free from a credit point of view. Almost all of the main industrial country governments, the members of the OECD area, are AAA rated by the rating agencies and likely to remain so. Japan is the main exception (rated AA), with its rapidly rising debt/GDP ratio an increasing concern. In practice, even in Japan, rising debt is more likely to lead to a bout of inflation than an outright default, as long as governments can control monetary policy and therefore can ultimately print money to pay off debts. Emerging market bonds, as an asset class, are different in that the country is borrowing in a foreign currency. The government therefore cannot simply inflate its way out of a problem in servicing the debt, and so the risk of default is correspondingly higher. Assessing this risk, using what is known as country risk analysis, involves a large array of economic and political factors. Much of country risk analysis comes down to predicting policy moves and therefore often hinges on politics—that is, whether a government has the power to follow the necessary policies to stabilize the economy. Emerging market bonds are usually analyzed by developed market investors in terms of their spread over domestic Treasuries compared to similarly rated domestic corporate debt.

4.6.5 *Inflation-Indexed Bonds*

Many governments now issue bonds linked to inflation, so in principle, we can directly observe the market's forecast of inflation by comparing the yield of these indexed bonds with the yield on similarly dated conventional bonds. Examples of this important class of bonds are Treasury Inflation-Protected Securities (TIPS) in the United States and Index-Linked Gilts (ILGs) in the United Kingdom. These provide a fixed coupon (the real portion) plus an adjustment equal to the change in consumer prices. In principle, indexed bonds are the perfect risk-free asset because, unlike conventional bonds, they entail no risk from unexpected inflation. However, the yield on indexed bonds still changes over time, and in practice it varies with three economic factors.

First, the yield goes up and down with the real economy and particularly with the level of short-term interest rates. If real yields generally are high because the economy is strong, then real yields on TIPS and ILGs will be higher. Second, yields fall if inflation

72 Other factors, such as differences in taxation or the presence or absence of a call provision, can also account for part of this spread.

accelerates because these securities are more attractive when inflation is volatile. In other words, their value in hedging against inflation risk is higher. Finally, as with all assets, the yield can vary according to institutional supply and demand. In practice, tax effects and the limited size of the market (particularly for TIPS in the United States) may also distort the real yield; thus, investors usually find it worthwhile to forecast all three components (real yield, inflation, and supply and demand).

The yield-related relationships that affect indexed fixed-income securities can be shown as in Exhibit 26.

Exhibit 26 The Macroeconomy and Real Yields

Economic Observation	Effect on Real Bond Yields
Economic growth rising (falling)	Rise (fall)
Inflation expectations rising (falling)	Fall (rise)
Investor demand rising (falling)	Fall (rise)

4.6.6 *Common Shares*

To relate economic analysis to common equity valuation, it is useful to think of economic factors, first, in the way that they affect company earnings and, second, in the way that they affect interest rates, bond yields, and liquidity. The two views combined provide a forecast for the equity markets and can lead to new investor ideas and trading activity. Particular economic factors will also affect the outlook for specific companies—for example, the price of oil or the demand for airline travel. Here, we focus on the impact on the overall stock market.

4.6.6.1 Economic Factors Affecting Earnings In the long term, the trend growth in aggregate company earnings is mainly determined by the trend rate of growth of the economy. A faster-growing economy is likely to show faster average earnings growth, while a slower economy is correlated with slower earnings growth. The trend rate of growth of an economy is dependent on labor force growth, the level of investment, and the rate of labor productivity growth. Variations in growth rates among countries are usually due to past overinvestment, government overregulation or political instability, or the bursting of a major asset price bubble.

EXAMPLE 32

Economic Return Drivers: Energy and Transportation

Willem DeVries is researching the macroeconomic return drivers of the energy and transportation industries. He has gathered the information in Exhibit 27 from a US investment manager's research report.

Exhibit 27 Correlations of GDP, Inflation, and Interest Rates with Industry Sales, Earnings, and Dividends[73]

	Energy Industry			Transportation Industry		
	GDP	Inflation	Interest Rates	GDP	Inflation	Interest Rates
Sales	+0.10	+0.77	+0.78	+0.58	+0.75	+0.74
Earnings	+0.13	+0.66	+0.67	+0.81	+0.26	+0.25
Dividends	+0.16	+0.03	+0.05	+0.65	−0.03	−0.08

Using only the information given, compare and contrast the macroeconomic return drivers of the energy and transportation industries.

Solution:

The larger positive correlations between GDP and the transportation industry's sales, earnings, and dividends compared to the corresponding correlations for the energy industry are an indication that transportation companies are more procyclical.

Sales for the energy and transportation industries are approximately equally positively related to inflation and interest rates. However, earnings are less positively correlated with inflation and interest rates for the transportation industry. Transportation companies appear to be less able to pass through to customers the increased costs of higher inflation and interest rates. These observations should be helpful when one is using economic factors to draw inferences on future industry fundamentals.

Over the shorter term, the share of profits in GDP varies with the business cycle and is influenced by a variety of factors, including final sales, wages, capacity utilization, and interest rates.

During a recession, earnings are depressed because of reduced sales and a set amount of fixed costs. Capacity utilization is typically low. In severe recessions, earnings can disappear altogether for many companies. Other companies, less affected by the cycle (e.g., food companies), may see very little change in earnings. Companies that can maintain earnings growth through recessions receive high market valuations from investors.

During the early stages of an economic upswing, earnings recover strongly. One reason is the rise in capacity utilization and increasing employment. Many costs stay the same while volume rises, which brings large increases in profits. Wage awards usually remain modest because of continuing relatively high unemployment, so that most of the productivity gains flow straight into profits. A second factor is often the efficiency gains made during the recession that become evident when output rises. A leaner, fitter company emerges from recession as some of the fat built up during the growth years, including both obvious waste and "luxury" projects, is cut out.

Later in the economic upswing, wage growth starts to quickly rise, profits contract, and earnings growth slows. Some companies, generally the ones with large fixed costs and a pronounced sales cycle, are more sensitive to the business cycle than others. These are called **cyclical stocks**. Examples include car manufacturers and chemical producers.

73 Analysis excerpted from a Duff & Phelps Investment Management Co. study of the 1,000 largest US companies over 1990–2003, using annual data.

Example 33 shows an analyst methodically organizing the economic analysis to formulate an answer to a client's question on the equity risk premium.

EXAMPLE 33

Researching US Equity Prospects for a Client

In the beginning of 2004, Michael Wu has one of his regular quarterly meetings with an institutional client for whom he manages a US equity portfolio. The economic forecasts of Wu's firm covering the next 12–18 months are consistent with the client's view that short-term interest rates will be increasing from 3.0 percent to 3.5 percent while long-term government bonds will return 5.5 percent. The client views US equities as currently slightly overvalued. The client is not optimistic about long-term prospects for US equities either and states to Wu that the long-term US equity risk premium will be in the range of 1.0 percent to 2.5 percent. The client asks Wu to help him decide, based on economic analysis, whether a 1.0 percent or 2.5 equity risk premium is more likely.

Wu summarizes his firm's research in Exhibit 28.

Exhibit 28 Current and Expected Economic/Market Trends: United States

Category	Expected Economic Trends/Impact Forecast: Short-Term (1 Year)	Expected Economic Trends/Impact Forecast: Long-Term (> 1 Year)	Comments on Economic Measures and Categories
Macroeconomy	$E_{(Trend)}$: Slowing GDP growth $E_{(Economic\ Impact)}$: Negative: Growth slowing from 4 percent to a lower rate	Average growth [3.1% annual GDP growth] $E_{(Trend)}$: Stable $E_{(Economic\ Impact)}$: Neutral	High current economic growth rate is due to fiscal and monetary stimuli and is not sustainable. Overall economic growth rate to slow to a lower 3.1% rate beyond 1-year time horizon.
Consumer	$E_{(Trend)}$: Improving consumer spending $E_{(Economic\ Impact)}$: Positive	$E_{(Trend)}$: Stable $E_{(Economic\ Impact)}$: Positive	Looking forward, stabilization in employment patterns and personal income will aid the consumer component of the economy.
Business	$E_{(Trend)}$: Stable $E_{(Economic\ Impact)}$: Neutral	$E_{(Trend)}$: Stable $E_{(Economic\ Impact)}$: Positive	The low base against which current results are being compared has aided profit and sales growth rate comparisons. Productivity growth has been aided by the weak employment (hiring) practices of the past few years. As employment rises, profit and productivity increases will diminish. Export-oriented businesses will be in the best position over the next few years as the US dollar is expected to decline further. Sales and profits showing signs of strength but are being compared to weak prior year results.

(continued)

Exhibit 28 (Continued)

Category	Expected Economic Trends/Impact Forecast: Short-Term (1 Year)	Expected Economic Trends/Impact Forecast: Long-Term (> 1 Year)	Comments on Economic Measures and Categories
Central bank	Economic strength and fiscal deficits likely to put pressure on short-term interest rates; slightly higher inflation $E_{(Trend)}$: Declining stimulation $E_{(Economic\ Impact)}$: Negative	$E_{(Trend)}$: Stable $E_{(Economic\ Impact)}$: Neutral Short-term rates and inflation rate will stabilize near long-term average rates	Monetary stimulus expected to be reduced in light of the increased economic strength. The stronger economy will place upward pressure on short-term interest rates and on the rate of inflation near-term, but short-term interest rates and inflation are expected to quickly stabilize near their long-term average rates.
Government	$E_{(Trend)}$: Stable measures $E_{(Economic\ Impact)}$: Positive	$E_{(Trend)}$: Weakening $E_{(Economic\ Impact)}$: Negative	Fiscal stimulus (i.e., deficit spending and tax cuts) is giving a current boost to GDP. More work must be done to cut the budget deficit and to deal with a declining dollar. The US government needs to deal with the problem of increasing long-term transfer payment costs.

Note: Expected economic trends are denoted by $E_{(Trend)}$, while expected economic impact is denoted by $E_{(Economic\ Impact)}$.

Using only the information in Exhibit 28, address the following problems:

1. State and justify a long-term expected return for equities within the client's guidelines.
2. Comment on whether the economic data support the client's belief that the equity market is overvalued.

Solution to 1:

The consumer and business sectors are critical for corporate profits, and the long-term forecast strengths of these sectors are a positive for US equities. The central bank appears to be a neutral factor long-term. Although the government sector is a negative, it is not expected to push inflation and interest rates above their long-term averages. Overall, a 2.5 percent equity risk premium, at the upper end of the client's range, appears to be justified by the positive economic outlook, which would lead to a forecast of an 8.0 percent arithmetic average return on equities. (A long government bond expected return of 5.5% + expected equity risk premium of 2.5% = 8.0% expected equity return over the forecast period.)

Solution to 2:

By contrast to the long-term forecasts, the short-term economic forecasts of decelerating growth and increasing interest rates might constitute a negative for short-term equity returns. However, the analyst would need to evaluate whether current market prices incorporate this information before concurring in the client's assessment.

4.6.6.2 The P/E Ratio and the Business Cycle The price-to-earnings ratio of a stock market is the price that the market is willing to pay for the earnings of that market. During the business cycle, the P/E ratio tends to be high and rising when earnings are expected to rise. For example, the P/E would be high in the early stages of an economic recovery, or when interest rates are low and the return on fixed-rate investments such

as cash or bonds is less attractive. Conversely, P/Es are likely to be low and falling if the outlook for earnings worsens (e.g., in an economic slump). Nevertheless, P/Es of cyclical companies may be above their own historical means during economic downturns as investors anticipate a sharp future earnings recovery when the economy turns up (a phenomenon known as the Molodovsky effect).

P/E ratios vary over longer periods too. In general, they are lower for an economy stuck on a slower growth path. During the 1990s, P/E ratios were at relatively high levels (e.g., multiples greater than 20 in the United States). At the time, some saw this situation as reflecting the benign economic influences of falling inflation, relatively low interest rates, fast productivity and profits growth, and a relatively stable economy. Another view was that these valuations were too high and would decline in the future, and this view has been borne out since 2000.

High inflation rates tend to depress P/E ratios. Inflation can distort the economic meaning of reported earnings, leading investors to value a given amount of reported earnings less during inflationary periods, which tends to lower observed P/Es during those periods. Consequently, comparisons of current P/E with past average P/E that do not control for differences in inflation rates may be suspect.[74]

4.6.6.3 Emerging Market Equities Empirical evidence points to *ex post* equity risk premiums for emerging markets that are on average higher and more volatile than those in developed markets. *Ex post*, emerging market equity risk premiums in US dollar terms appear to be positively correlated with expansion phases in G–7 economies as proxied by industrial production.[75] Transmission channels for G–7 macroeconomic fluctuations to developing economies include trade (demand for many of the goods produced by emerging countries, such as natural resources, is procyclical), finance, and direct sectoral linkages. In addition to evaluating linkages, the analyst needs to do considerable country and often sector-specific research to appraise the prospects for equity investments in a particular emerging country.

4.6.7 *Real Estate*

Ling and Naranjo (1997, 1998) identify growth in consumption, real interest rates, the term structure of interest rates, and unexpected inflation as systematic determinants of real estate returns. Interest rates are linked with a number of factors that affect the supply and demand for real estate, such as construction financing costs and the costs of mortgage financing. In general, lower interest rates are net positive for real estate valuation, resulting in lower capitalization rates.

In Example 34, an analyst with a one-year horizon applies a checklist approach to economic forecasting in modifying baseline historical capital market forecasts. The set of asset classes includes real estate.

EXAMPLE 34

Modifying Historical Capital Market Expectations

Cortney Young is an investment analyst in a firm serving an international clientele. Young's firm has developed the baseline forecasts shown in Exhibit 29 for six asset classes that are particularly relevant for UK-focused portfolios. The forecasts are based on a recent part of the historical record of the asset classes. Young is currently working on establishing capital market expectations for mean

74 For more details, see Bodie, Kane, and Marcus (2001).
75 See Salomons and Grootveld (2003).

return and standard deviation of returns for these six asset classes based on a one-year horizon; she focuses first on the UK equities, UK intermediate-term bonds, UK long-term bonds, and UK real estate.

Exhibit 29 Baseline Forecasts

Asset Class	Mean Annual Returns (%)	Standard Deviation of Returns (%)
UK equities	9.72	15.3
Non-UK equities	8.94	11.6
UK intermediate-term bonds	3.60	6.5
UK long-term bonds	4.42	7.7
International bonds	4.81	8.3
UK real estate	12.63	8.7

Young's economic analysis leads her to the conclusions on the UK economy shown in Exhibit 30.

Exhibit 30 Economic Conclusions

Economic Category	Economic Conclusion
Consumers	Consumer spending is expected to be stronger over the next year with very positive effects for the UK economy.
Business	Business spending, revenues, and profits are expected to show solid growth in year-over-year results over the next 12 months.
Government	Tax policies are stable. Government is currently a source of moderate economic stimulation.
Central bank	It is anticipated that the Bank of England (the central bank) will want to hold short-term interest rates steady over the next year. The inflation target is 2 percent.
Inflation rates	The inflation rate is expected to increase to 2.2 percent per year over the next year.
Other/Unique	The UK economy is expected to outperform other major economies over the next 12 months. The growth of the real estate sector will moderate.

1. Explain the expected impact on UK asset classes of each of Young's economic conclusions.
2. Demonstrate and justify the direction of judgmental modifications that Young might make to the baseline forecasts of her firm.

Solution to 1:

Young reaches the conclusions shown in Exhibit 31.

Exhibit 31 Market/Asset Class Conclusions

Economic Conclusion	Market/Asset Class Impact
Consumers	Consumers are creating a positive investment environment for corporate profits and therefore for UK equities and credit quality. However, if spending rises much more steeply than anticipated, we might expect upward pressure on both short-term and long-term interest rates that would be a negative for bonds and real estate.
Business	The economic conclusion is a positive for UK equities and bonds via improved credit quality. However, predicted business growth may put upward pressure on wages, costs, and inflation rates.
Government	The government sector conclusion is a slight positive for the economy at this time.
Central bank	The expected steady interest rate environment is a positive factor for the UK investment market. If the economy expands too quickly, there may be pressure from the central bank for higher interest rates looking out 12 months.
Inflation rates	The current stable inflation picture should have a positive impact on the economy and on the financial assets we are comparing in this analysis.
Other/Unique	Returns to UK real estate should moderate from unusually high rates.

Solution to 2:

The arrows in Exhibit 32 indicate the direction of adjustment to the baseline forecasts.

Exhibit 32 Modifications to Capital Market Forecasts for UK Asset Classes

Asset Class	Average Annual Returns	Average Annual Standard Deviation
UK equities	↑	↓ or →
Intermediate bonds	→	↑
Long-term bonds	→	↑
Real estate	↓	↑

The growth outlook for consumers and businesses is a strong positive for UK equities. The steady central bank, government, and inflation outlooks suggest below-average or at least unchanged volatility. The outlook of steady interest rates is neutral for intermediate- and long-term bonds, but the uncertainty about the economy overheating suggests an increase in risk. Real estate's returns should decrease from the high baseline forecast. The break with the past trend growth should translate into higher risk for real estate.

4.6.8 *Currencies*

The exchange rate between two countries reflects the balance of buyers and sellers. One major reason for buying and selling foreign currencies is to facilitate trade in goods and services (exports and imports). If a country begins to import more, the currency will tend to depreciate (all else being equal). Hence, considerable attention is usually paid to determining a competitive exchange rate at which the trade balance—or, more broadly, the current account balance (which includes services and transfers)—is zero.

Governments and central banks are often concerned with maintaining a competitive exchange rate and may try to do so by buying or selling foreign currencies or by raising or lowering interest rates.

However, trade is only one motive for purchases and sales of foreign currency and it has become relatively less important. The other motive is international flows of capital. Companies wishing to invest in a country are likely to be buyers of the currency as they bring in capital to build assets. Strong domestic economic growth and an opening of new industries to foreign ownership are two possible drivers of a rise in foreign direct investment that will likely push up a currency too. The liberalization of capital flows and the increasing trend toward global diversification mean that there may also be inflows to buy local stocks, bonds, or short-term instruments, including deposits. These flows can be volatile and may quickly reverse. The foreign direct investment is likely to be more stable.

Portfolio flows may be influenced by the growth of the economy or by domestic interest rates. When interest rates are high, inflows are likely to be higher and the currency value rises. Conversely, falling interest rates often weaken a currency. However, the link between interest rates and the currency sometimes works the other way. This is because investors may see higher interest rates as slowing the economy. If a currency departs from the level that equilibrates trade for a long time, the resulting deficits or surpluses may eventually become too large for capital flows to finance. Among the major currencies, there are often prolonged over- and undervaluations around a long-term equilibrium level. For this reason, many governments in emerging countries use some combination of capital controls and currency management (pegs, currency boards, managed floats, etc.) to try to keep the currency competitive. This approach tends to lead to stability for extended periods punctuated by periodic sudden, large movements.

EXAMPLE 35

A Currency Example

Between 1990 and July 1997, the Bank of Thailand managed the Thai baht in a narrow range. Over time, a gradual loss of competitiveness through higher inflation pushed the current account deficit up to 8 percent of GDP, financed by strong capital inflows. In 1996, the economy slowed and capital inflows faltered, prompting speculation that the baht might fall. The central bank intervened heavily to defend the baht in early 1997 but by midyear had exhausted its reserves and was forced to float the currency. Within a few months, the baht halved in value and other currencies in the region were also under pressure. The Asian crisis of 1997 had begun.

Forecasting exchange rate movements is widely viewed as especially difficult. For this reason, some investors try to fully hedge currency exposure. Others see opportunities in currency forecasting because of the volatility of many exchange rates and the highly liquid markets. The following sections review the major approaches to exchange rate forecasting.

4.6.9 *Approaches to Forecasting Exchange Rates*

There are four broad approaches to forecasting exchange rates, and most forecasters probably use a combination of them all.

4.6.9.1 Purchasing Power Parity **Purchasing power parity** (PPP) asserts that movements in an exchange rate should offset any difference in the inflation rates between two countries.[76] PPP reflects the idea that exchange rates should find a level that keeps different countries broadly competitive with each other.

To illustrate PPP, suppose that over a five-year period, Canadian prices are forecast to increase by 10.41 percent (equal to 2 percent annual inflation) while Eurozone prices are forecast to show 15.93 percent growth (equal to 3 percent annual inflation). Over the five-year period, the Canadian–Eurozone inflation differential is 10.41% – 15.93% = –5.52%. PPP would predict that the Canadian dollar will appreciate against the euro by approximately the same percentage. For example, if the exchange rate is C$1.3843 per euro, PPP would predict an exchange rate of approximately (1 – 0.0552) × (C$1.3843 per euro) = C$1.3079 per euro.

PPP in broad terms does seem to be useful in the long run—say, over periods of five years or longer. Furthermore, governments and central banks take PPP very seriously in their approach to exchange rates because periods of under- or overvaluation of a currency may lead to sudden exchange rate instability or be destabilizing for business.

However, with the huge rise in capital flows over the last three decades, exchange rates can depart from PPP levels for long periods of time. PPP is often not a useful guide to the direction of exchange rates in the short or even medium run (up to three years or so). There are also times when factors other than PPP dominate exchange rate movements. This usually happens when a large current account deficit is opening up and the markets question whether a growing deficit can be financed. Markets then focus on what level of the currency is needed to correct the deficit.

4.6.9.2 Relative Economic Strength The **relative economic strength forecasting approach** focuses on investment flows rather than trade flows. It suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate. Sometimes, demand comes from a higher short-term deposit rate in that country combined with an expectation that the currency will stay the same or appreciate. More recently, the focus has been on the pace of economic growth and the existence of attractive investment opportunities in general.

When interest rates are relatively high in a country, capital moves into that country and, as a result, the currency strengthens. Even if investors begin to see the exchange rate as overvalued in some long-term sense, they may still be content if they feel the extra yield compensates for that overvaluation. However, once the exchange rate reaches an excessive level, they will question whether the high yield is enough to justify the likely exchange rate depreciation.

What is the role of short rates? There is little question that short-term interest rates can influence exchange rates but primarily over a short-term time horizon. The level of short-term interest rates influences the extent to which speculators are willing to bet against a currency. If interest rates in a particular country are especially high, speculators are less likely to short that currency because that currency will probably strengthen as a result of the higher interest rates. Similarly, very low interest rates on Japanese yen in recent years have periodically encouraged investors to borrow yen to fund other investments (a so-called carry trade).

It can be helpful to combine the PPP and relative strength approaches. The relative strength approach indicates the response to news on the economy but does not tell us anything about the level of exchange rates. The PPP approach indicates what level of the exchange rate can be regarded as a long-term equilibrium. By combining the two, we can generate a more complete theory.

---

76 The definition refers to relative PPP, the form of PPP most economists are concerned with. See Solnik and McLeavey (2004) for further details.

4.6.9.3 Capital Flows The **capital flows forecasting approach** focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment (FDI). Inflows of FDI into a country increase the demand for the country's currency, all else being equal.

From 1999 onward, there was considerable focus on this approach because of the surprising strength of the dollar versus the euro. This situation coincided with a clear increase in long-term flows from the Eurozone to the United States, especially FDI and US equities. This capital was being attracted into the United States by the boom in the domestic economy and the attractiveness of equity assets, particularly in the internet and technology sectors, until at least 2001.

Note that long-term capital flows may have the effect of reversing the usual relationship between short-term interest rates and the currency. This is explained by the fact that a cut in short-term rates would be expected to boost economic growth and the stock markets, thereby making long-term investments more attractive. In this environment, central banks face a dilemma. Whereas they might want to raise interest rates to respond to a weak currency that is threatening to stimulate the economy too much and boost inflation, the effect may actually be to push the currency lower. Hence, the effectiveness of monetary policy is much reduced.

This appeared to be a problem for the Eurozone at times during 2001. As the economy slowed, the ECB was reluctant to cut interest rates because of rising inflation and a weak currency. The inaction seemed to make the currency weaker. Similarly, the Fed's aggressive cutting in the first half of 2001 pushed the dollar higher, which attracted capital and thus reduced the impact of lower interest rates in stimulating the economy.

4.6.9.4 Savings–Investment Imbalances The **savings–investment imbalances forecasting approach** explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate. Although it is not easy to use for forecasting, this approach can sometimes help with understanding why currencies depart from equilibrium for long periods. It starts from the fact that the current account deficit of a country is the sum of its government deficit and private sector deficit. For example, in the United States in 2004, the current account deficit was estimated at about 6 percent of GDP, with the government deficit at about 5 percent and the private sector deficit at about 1 percent. In contrast, Japan had a current account surplus of 4 percent of GDP, with a government deficit of 8 percent balanced by a private sector surplus of 12 percent of GDP. So, in Japan, the private sector was financing the government deficit as well as an outflow of capital.

However, if the private sector or government currency-related trends change, then the current account position must change too and the exchange rate moves to help achieve that. Suppose that an economy suddenly begins to expand rapidly, driven by a new government budget deficit or bullish entrepreneurs. If domestic savings do not change, there will be excess demand for capital as investment tries to exceed savings. The only way that investment can exceed savings in reality is for foreign savings to be used, since the accounts have to balance. But this solution requires a deficit on the current account of the balance of payments.

So, where does this deficit on the current account come from? Some of it may arise simply because imports are strong due to the buoyant economy or because exports are weak as companies focus on the domestic market. But if that is not enough, the exchange rate needs to rise. If capital flows are attracted to the country, either due to high interest rates or due to attractive expected returns on investments, then the exchange rate will indeed rise as needed.

Because trade takes time to adjust, the exchange rate will frequently depart far from generally accepted equilibrium rates for prolonged periods, typically two to four years. Eventually, the rising currency will widen the current account deficit sufficiently and the domestic currency may start to decline. Of course, it needs to stay reasonably strong as long as domestic investment exceeds savings.

If the economy becomes weak enough at this point and domestic investments no longer exceed domestic savings, then the currency will also weaken. To return to a current account surplus, the exchange rate may need to drop to a level well below its equilibrium rate. Hence, there is a risk that the currency could swing sharply to an undervalued position.

EXAMPLE 36

The USD/Euro Exchange Rate, 1999–2004

The euro was first established as a currency at the beginning of 1999. To the surprise of nearly everyone, it started trading weakly, its value against the US dollar falling from about US$1.17 to a low of US$0.82 in late 2000. But beginning in 2001 and accelerating in 2002–2004, the dollar fell. In 2004, the euro reached US$1.37. On a PPP basis, the euro probably lies in the range of US$1.10-US$1.20. So, in the course of five years, the exchange rate cycled around that level. These swings can be considered according to the three explanations below.

Relative economic strength: This approach explains why the dollar rose strongly in 1999–2000, with faster economic growth and consequent higher interest rates in the United States. In 2001, the fact that the US economy was weaker than that of the Eurozone helps to explain why the dollar peaked and went sideways during that year. The explanation breaks down in 2002–2003, however. Despite the superior performance of the US economy over the Eurozone in 2002 and beyond, the dollar retraced its path all the way back to its starting point.

Capital flows: This approach explains more about the dollar's recent moves. The dollar's strength in 1999–2000 was matched by massive long-term inflows into the United States in the form of foreign direct investment and equity purchases. In 2001, these flows fell off rapidly, though there were still large inflows into US bonds. The current account deficit had expanded by then as a result of the strong dollar, so the capital flows were no longer large relative to the necessary inflow to finance the deficit. Hence, the dollar's decline.

Savings–investment imbalances: During 1999–2000, the US economy grew very rapidly with pressure to reduce domestic savings and increase investment. Households reduced savings, encouraged by low and falling unemployment and the rising stock prices. Businesses cut savings because they saw major new investment opportunities. The result was a soaring US dollar opening up the current account deficit, further encouraged by the inflow of capital described above. In 2001–2002, the private sector deficit was slashed drastically as companies cut back on borrowing and spending. The government cut taxes and shifted the government accounts from surplus to deficit. But the dollar still fell back against the euro because the current account deficit needed to be in the 4–6 percent range to balance the internal savings balances. Hence, the dollar fell back from its still-overvalued position and nosed into undervalued territory.

This approach, if correct, suggests that the dollar's weakness (at least in 2004–2005) may be limited by the continued large government borrowing requirement and low private savings. Beyond 2005, however, the dollar could reach past lows if either the government makes a major effort to reduce the budget deficit or an economic slowdown prompts increased private savings.

4.6.10 *Government Intervention*

Since the developed world moved to floating rates in the early 1970s, periodic attempts have been made to control exchange rates. However, economists and the markets have been skeptical about whether governments really can control exchange rates with market intervention alone because of three factors. First, the total value of foreign exchange trading, in excess of US$1 trillion *daily*, is large relative to the total foreign exchange reserves of the major central banks combined. Second, many people believe that market prices are determined by fundamentals and that government authorities are just another player. Third, experience with trying to control foreign exchange trends is not encouraging in the absence of capital controls. Unless governments are prepared to move interest rates and other policies, they cannot expect to succeed.

4.7 Information Sources for Economic Data and Forecasts

Having presented economic analysis for capital market expectations setting, we can indicate several fruitful sources for gathering economic data. The sources we present link to many other useful resources.

The main sources of leading indicators are the Conference Board and national sources. Most other economic data also come from national statistical sources, such as central banks and government statistical offices. Some survey data come from other organizations, such as the Institute of Supply Management. Useful international sources include the OECD, IMF, and World Bank. A list of websites is provided below.

Forecasts from econometric models are published by governments. The OECD publishes forecasts twice a year in its *Economic Outlook* reports. The IMF publishes forecasts, and various private sector forecasters also publish forecasts, though these are sometimes proprietary. Exhibit 33 summarizes some sources for researching US markets.

Exhibit 33 A Selection of Data Sources for Researching US Markets

Categories of Economic Interest	Factor Measures	Data Use LT	Data Use ST	Data Source
Economic fundamentals	Measures of economic output/growth (e.g., GDP, industrial production)	✓		www.bea.gov Bloomberg
	General price level stability	✓		
Consumers	Employment/unemployment	✓		Bloomberg
	Measures of consumption/income	✓		www.bea.gov
	Measures of savings, investment, and leverage	✓		
	Measures of sentiment	✓		U. of Michigan Survey
Business	Measures of profitability	✓		www.bea.gov
	Measures of productivity	✓		Federal Reserve Bank
	Industry price level stability	✓	✓	Internal or third-party research; Trade pub.
	Capacity utilization rates		✓	
Central bank	Measures of monetary policy	✓	✓	www.stls.frb.org
	General price level stability (inflation)	✓	✓	Bloomberg
	Assessment of central bank independence		✓	Internal analysis

Exhibit 33 (Continued)

Categories of Economic Interest	Factor Measures	Data Use LT	Data Use ST	Data Source
Government	Fiscal policy	✓	✓	Congressional Budget
	Assessment of exchange rate stability/trends	✓	✓	Office; Bloomberg Internal; www.wto.org
	Measures of political stability	✓		Internal analysis
	Assessment of legal system's ability to protect assets (including intangible assets) and ability to settle disputes (due process)	✓		Internal analysis
Economic technical factors	Capital flows		✓	Internal/third-party research;
	Sector/industry supply and demand		✓	
				Trade publications
Market fundamentals	Rates of return	✓	✓	Relative (industry) internal research;
	Valuation trends (e.g., equity P/E multiples)	✓	✓	
	Asset class price volatility			Third-party research; Trade publications
	Large-cap equities	✓		
	Corporate bonds vs. overall market	✓	✓	
	Short sovereign debt		✓	
	Exchange rate movements	✓		
Market technical factors	Ratio of advances/declines in equity market		✓	Reuters;
	Corporate bond issuance (market yield)		✓	Internal research
Other: unique; social; political	Demographic influences	✓	✓	Internal; third-party
	Seasonal patterns of consumption	✓	✓	Third-party; Trade pub.
	Current account trends; net exports versus imports	✓	✓	Bloomberg

Some additional useful resources include the following:

- www.imf.org
- www.worldbank.org
- www.oecd.org
- www.federalreserve.gov
- www.ecb.int
- www.bankofengland.co.uk
- www.boj.or.jp/en (the English site for the Bank of Japan)
- www.bis.org
- www.nber.org (the website of the National Bureau of Economic Research, the US organization that dates business cycles; it contains useful data and research on past business cycles)

SUMMARY

In this reading, we have discussed how investment professionals address the setting of capital market expectations.

- Capital market expectations are essential inputs to deciding on a strategic asset allocation. The process of capital market expectations setting involves the following steps:
  1. Specify the final set of expectations that are needed, including the time horizon to which they apply.
  2. Research the historical record.
  3. Specify the method(s) and/or model(s) that will be used and the information needs for developing expectations.
  4. Determine the best sources for information needs.
  5. Interpret the current investment environment using the selected data and methods, applying experience and judgment.
  6. Formulate the set of expectations that are needed, documenting conclusions.
  7. Monitor actual outcomes and compare to expectations, providing feedback to improve the expectations-setting process.
- Among the challenges in setting capital market expectations are *the limitations of economic data* (including lack of timeliness as well as changing definitions and calculations); *data measurement errors and biases* (including transcription errors, survivorship bias, and appraisal [smoothed] data); *the limitations of historical estimates* (including nonstationarity); *ex post risk as a biased risk measure* (historical prices may reflect expectations of a low-probability catastrophe that did not occur); *biases in analysts' methods* (including data-mining bias and time-period bias); *the failure to account for conditioning information*; *the misinterpretation of correlations*; and *psychological traps* (including the anchoring trap, the status quo trap, the confirming evidence trap, the overconfidence trap, the prudence trap, and the recallability trap); and *model uncertainty*.
- The tools for formulating capital market expectations include formal tools, survey and panel methods, and judgment. Formal tools include statistical tools, discounted cash flow models, the risk premium approach, and financial market equilibrium models. Analyst judgment includes economic and psychological insight.
- Economic output has cyclical and growth trend components. The cyclical components include the inventory cycle (measured in terms of fluctuation of inventory) and the business cycle (representing fluctuations in GDP in relation to long-term trend growth). A typical business cycle has five phases: initial recovery, early upswing, late upswing, slowdown, and recession. Each of the two cyclical components has implications for variables such as interest rates and corporate profits, which are important for capital market expectations. The economic trend growth component (the long-term growth path of GDP) is important particularly for setting long-term expectations.
- Consumer spending is typically the most important factor affecting GDP (it often accounts for 60–70 percent of GDP). Retail sales and consumer consumption are closely watched for indications of consumer spending.

- Business investment has a smaller weight in GDP than consumer spending but is more volatile. Data on business investment and spending on inventories reveal recent real business activity.
- Fiscal policy and monetary policy are means by which governments attempt to influence the business cycle.
- Monetary policymakers often target inflation rates and use the central bank's influence over interest rates to achieve policy goals. The Taylor rule gives the optimal short-term interest rate as the neutral rate plus an amount that is positively related to the excess of the GDP and inflation growth rates above their respective trend and target values.
- If monetary and fiscal policies are both tight, the yield curve is typically inverted. When monetary policy is tight but fiscal policy is loose, the yield curve tends to be flat. An inverted yield curve has often preceded a recession.
- In managing cash and equivalents, central bank actions are closely watched.
- For investors buying and selling nominal default-free bonds for the short term, developments in the business cycle and changes in short-term interest rates must be closely watched. News of stronger economic growth usually makes bond yields rise. For long-term investors, inflation expectations are of great importance. For holders of corporate bonds and other defaultable debt, the spread over Treasuries in relation to the business cycle is an important factor.
- Investing in emerging market debt involves special considerations, such as country risk analysis. Emerging market governments borrow in a foreign currency and so cannot simply inflate their way out of a problem in servicing the debt; this limitation increases the risk of default.
- Inflation-indexed bonds are not exposed to the risk of unexpected inflation. Generally, yields on such instruments rise with real economic growth and the level of short-term interest rates.
- Investors in common shares should analyze economic factors, first, in the way that they affect company earnings and, second, in the way that they affect interest rates, bond yields, and liquidity. The trend growth in the aggregate economy largely determines the trend growth in aggregate corporate earnings.
- During the economic cycle, the P/E ratio tends to be high and rising when earnings are expected to rise but low and falling if the outlook for earnings worsens. P/E ratios are usually lower for an economy stuck on a slower growth path. High inflation often tends to depress P/E ratios.
- Among the systematic factors affecting real estate returns are growth in consumption, real interest rates, the term structure of interest rates, and unexpected inflation.
- Among the factors affecting exchange rate movements are purchasing power parity, relative economic strength, capital flows, and savings–investment imbalances.

PRACTICE PROBLEMS

1 An analyst is assembling data for use in her firm's expectations-setting process. Several historical measures have been collected and used to set expectations on inflation and consumer consumption trends. Previously, only the most recent 25 years of historical data concerning these measures had been collected and analyzed. Now, an executive has suggested extending the starting point of the data 25 years further back to make the overall analysis more robust. Discuss why the inclusion of the additional data may present problems for the expectations-setting process despite the request's objective of making the analysis more robust.

2 Seth Bildownes is an analyst who has prepared forecasts regarding the current capital market environment. He recently gave his presentation to the managing directors of his firm. Excerpts of his presentation follow:

> "Noting that year-end holiday sales have been weak over the past several years, I believe that current expectations should be likewise muted. In fact, just last week, I had an occasion to visit Harrods and noticed that the number of shoppers seemed quite low. The last time I saw a retail establishment with so little pedestrian traffic at the beginning of December was in 1990, and that coincided with one of the worst holiday sales periods in the past 50 years. Thus, there will be no overall year-over-year retail sales growth this holiday season."

A Identify any psychological traps that may be interfering with the creation of Bildownes' forecasts.

B Recommend a way to mitigate the bias caused by any trap identified in Part A.

3 An investor is considering adding three new securities to his internationally focused fixed-income portfolio. The securities under consideration are as follows:

- 1-year US Treasury note (noncallable);
- 10-year BBB/Baa rated corporate bond (callable);
- 10-year mortgage-backed security (MBS) (government-backed collateral).

The investor will invest equally in all three securities being analyzed or will invest in none of them at this time. He will only make the added investment provided that the expected spread/premium of the equally weighted investment is at least 0.5 percent (50 bps) over the 10-year Treasury bond. The investor has gathered the following information:

Real risk-free interest rate	1.2%
Current inflation rate	2.2%
Spread of 10-year over 1-year Treasury note	1.0%
Long-term inflation expectation	2.6%
10-year MBS prepayment risk spread (over 10-year Treasuries)[a]	95 bps

Practice Problems and Solutions: *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Dennis W. McLeavey, CFA, and Jerald E. Pinto, CFA, editors. © 2007 CFA Institute. All rights reserved.

10-year call risk spread	80 bps
10-year BBB credit risk spread (over 10-year Treasuries)	90 bps

[a] This spread implicitly includes a maturity premium in relation to the 1-year T-note as well as compensation for prepayment risk.

Using only the information given, address the following problems using the risk premium approach:

A Calculate the expected return that an equal-weighted investment in the three securities could provide.

B Calculate the expected total risk premium of the three securities, and determine the investor's probable course of action.

4 An Australian investor currently holds a A$240 million equity portfolio. He is considering rebalancing the portfolio based on an assessment of the risk and return prospects facing the Australian economy. Information pertaining to the Australian investment markets and the economy has been collected in the following table:

10-Year Historical	Current	Capital Market Expectations
10-yr avg govt. bond yield: 6.2%	10-yr govt. bond yield: 3.8 %	
Avg annual equity return: 8.2%	Year-over-year equity return: –9.4%	
Avg annual inflation rate: 2.8%	Year-over-year inflation rate: 2.6%	Expected annual inflation: 3.5%
Equity market P/E (beginning of period): 15.0x	Current equity market P/E: 14.5x	Expected equity market P/E: 14.0x
Avg annual income return: 2.0%		Expected annual income return: 1.5%
Avg annual real earnings growth: 6.0%		Expected annual real earnings growth: 5.0%

Using the information in the table, address the following problems:

A Calculate the historical Australian equity risk premium using the bond-yield-plus-risk-premium method.

B Calculate the expected annual equity return using the Grinold–Kroner model (assume no change in the number of shares outstanding).

C Using your answer to Part B, calculate the expected annual equity risk premium.

5 An analyst is reviewing various asset alternatives and is presented with the following information directly pertaining to the broad equity market in Switzerland and various industries within the Swiss market that are of particular investment interest.

Expected risk premium for overall global investable market (GIM) portfolio	3.5%
Expected standard deviation for the GIM portfolio	8.5%
Expected standard deviation for Swiss Health Care Industry equity investments	12.0%
Expected standard deviation for Swiss Watch Industry equity investments	6.0%
Expected standard deviation for Swiss Consumer Products Industry equity investments	7.5%

- Assume that the Swiss market is perfectly integrated with world markets.
- Swiss Health Care has a correlation of 0.7 with the GIM portfolio.
- Swiss Watch has a correlation of 0.8 with the GIM portfolio.
- Swiss Consumer Products has a correlation of 0.8 with the GIM portfolio.

A Basing your answers only upon the data presented in the table above and using the international capital asset pricing model—in particular, the Singer–Terhaar approach—estimate the expected risk premium for the following:

i. Swiss Health Care Industry.

ii. Swiss Watch Industry.

iii. Swiss Consumer Products Industry.

B Judge which industry is most attractive from a valuation perspective.

6 Consider the information given in the following table:

Eurodollar Short Rates (as of Start of Month)

Month	1-Month Rates	6-Month Rates	Spread: 6-Mo. vs. 1-Mo.
Jan 20X0	5.71%	6.14%	43 bps
Feb 20X0	5.80	6.26	46
Mar 20X0	5.97	6.35	38
Apr 20X0	6.07	6.48	41
May 20X0	6.47	6.93	46
Jun 20X0	6.58	6.90	32
Jul 20X0	6.54	6.84	30
Aug 20X0	6.53	6.75	22
Sept 20X0	6.54	6.68	14
Oct 20X0	6.53	6.64	11
Nov 20X0	6.54	6.61	07
Dec 20X0	6.58	6.28	–30
Jan 20X1	5.48	5.16	–32
Feb 20X1	5.13	4.82	–31
Mar 20X1	4.98	4.58	–40

A Determine the implicit economic forecast in the interest rate data given.

B For a one-year holding period extending from 1 March 20X0 to 1 March 20X1, determine the relative merits of buying a six-month security now and then another one in six months, or purchasing a one-month Eurodollar security and then rolling that security over each month at the then-prevailing yield.

7 **A** How might an analyst use the data reflected below to confirm her suspicion that the country is currently experiencing an output gap?

Variable	3/31/2009	3/31/2010	3/31/2011
GDP (index)	129.0	128.5	128.0
Unemployment rate	10.5%	11.0%	11.5%
Capacity utilization rate	80.5%	80.0%	80.0%
Inflation rate	9.0%	8.5%	7.0%

B Given your response in Part A, would you expect inflation over the next year to accelerate or decline?

8 Based on the trends that may be calculated from the following economic measures, which of the countries below would be expected to achieve higher economic growth rates over the next year if current trends are sustained? Justify your response.

	Croatia (Millions of Kuna)		Czech Republic (Millions of Koruna)	
Economic Measures	**Qtr 1**	**Qtr 2**	**Qtr 1**	**Qtr 2**
Consumer spending	28	30	350	386
Business capital investment	12	13	205	250
Government investment/fiscal spending	10	11	110	140
Other miscellaneous GDP factors	–1	–2	–58	–111
Total GDP	49	52	607	665

9 **A** Based on targets for inflation and overall economic growth rate and on actual observations of inflation and economic growth rates, apply the Taylor rule to estimate what short-term interest rate level should be an appropriate target for monetary authorities.

B Explain why the monetary action suggested by the Taylor rule output may not actually be taken by central bank authorities.

Economic Measures	GDP Trend/Inflation Target (%)	Forecast (%)
Year-over-year increase in GDP	3.2	2.6
Inflation rate	2.0	4.0
Short-term interest rate (neutral value)	4.0	

10 Pharmavest is an investment advisory firm that focuses solely on companies within the health care (HC) sector. The firm conducts research and manages several commingled health sector funds. Pharmavest is conducting an analysis of health sector companies that have business exposures to the economies of Europe and the United States. The following tables show current and historical economic data and Pharmavest's forecasts of the most likely economic outcomes for the next year in Europe and the United States. In the tables, "Y/Y" is short for "year-over-year."

Using the economic categories shown in the tables, compare and contrast European and US economic trends and forecasts. Indicate and justify which economic region is expected to provide a relative advantage for the health care sector (Europe or the United States).

Europe

	3-Year Trend	1-Year Trend	Current Measure	1-Year Forecast
Broad economic output measure	Stable	Improving	1.3% Y/Y GDP growth in HC	3.0% Y/Y GDP growth in HC
Economic impact of consumers	Stable	Improving	8.9% consumer spending HC % of GDP	10.0% consumer spending HC % of GDP
Economic impact of businesses	Weakening	Improving	4.0% HC business profits 3.6% HC sales	5.5% HC business profits 8.0% HC sales
Economic impact of central bank	Improving/ stimulative	Stable	2.7% avg. short interest rates 2.6% inflation	2.8% avg. short interest rates 2.7% inflation
Economic impact of government	Stimulative	Stimulative but stable	5.0% government spending % of GDP (fiscal stimulus)	5.0% government spending % of GDP (fiscal stimulus)
Other unique economic factors, population growth, demographics	Stable	Stable	49 average age of aggregate population	49 average age of aggregate population

United States

	3-Year Trend	1-Year Trend	Current Measure	1-Year Forecast
Broad economic output measure	Stable	Improving	3.8% Y/Y GDP growth in HC	2.8% Y/Y growth in HC
Economic impact of consumers	Stable	Improving	9.6% consumer spending HC % of GDP	9.5% consumer spending HC % of GDP
Economic impact of businesses	Stable	Improving	5.2% HC business profits 9.0% HC sales	5.0% HC business profits 9.0% HC sales
Economic impact of central bank	Stimulative	Stable	1.0% avg short interest rates 2.2% inflation	2.2% avg short interest rates 2.5% Inflation
Economic impact of government	Stimulative	Increasingly stimulative	6.0% government spending % of GDP (fiscal stimulus)	6.5% government spending % of GDP (fiscal stimulus)
Other unique economic factors, population growth, demographics	Stable	Stable	44 average age of aggregate population	44 average age of aggregate population

11 Plim Ltd. is a manufacturing company in Finland that is a defined-benefit pension plan sponsor. Plim intends to increase its overall plan diversification by making an investment in Country X. The table below provides data for Country X indexes representing various economic variables.

Based only on the data presented, from the perspective of year-end 2011, indicate whether the 1-year trend for each of the economic variables is stronger than, weaker than, or the same as its 3-year and 20-year data trend growth rates.

Economic Index Data for Country X

Variable	Year-End 2008	Year-End 2009	Year-End 2010	Year-End 2011	20-Yr. L/T Average Annual % Increase
GDP	118.3	121.3	124.3	127.4	4.2
Consumer spending	1,569.2	1,596.2	1,584.3	1,647.7	2.5
Business spending	650.1	632.0	707.8	726.9	2.6
Inflation	2,749.8	2,901.1	3,133.1	3,446.4	14.3
Government spending (% of GDP)	16.2	16.5	16.0	15.8	3.6

12 **A** List five general elements of a pro-growth government structural policy.

B For each of the variables given below, describe the change or changes in the variable that would be pro-growth and determine the element of a pro-growth government structural policy that would best describe the change or changes.

i. Tax receipts as a percent of GDP.

ii. Government tariff receipts.

iii. Number of publicly funded schools.

iv. Number of state-owned businesses.

v. Long-term average budget deficit as a percent of GDP.

13 Identify four differences between developed economies and emerging market economies.

14 In late 2011, K.C. Sung is planning an asset allocation strategy but would first like to assess Country M's current economic environment, then make a forecast for the economic conditions expected over the succeeding six- to nine-month period. Sung has learned that the leading indicator measures that he has compiled are quite indicative of current economic activity. However, Sung has seen over time that these specific measures impact many parts of the economy and thus are also predictive of potential longer-term (six- to nine-month) economic impacts as the initial economic activities create jobs and other beneficial output throughout Country M's economy.

Leading Indicators: Component Contributions and Total Index	June 2011	July 2011	August 2011 (Most Current Period)
Consumer orders growth	–0.01	0.02	0.07
Business capital goods orders growth	0.04	0.05	0.04
Central bank money supply growth	0.12	0.15	0.16
Total index value	111	115	116

Using the leading indicator approach to forecasting, draw a conclusion for Country M's economy for the next six to nine months using only the above table.

15 Other than changes in the rate of inflation, specify two factors that impact the yields available on inflation-indexed bonds.

16 J. Wolf is an individual investor who intends to make an additional investment in various South Korean–based assets based on the outcome of your capital market expectations-setting framework analysis. Your analysis should use the data provided in the following table. However, each measure should be analyzed independently of the other measures. While examining the forward-looking one-year forecast relative to the data provided for the recent trends, indicate whether the equity market impact and the corporate fixed-income market impact would be positive or negative. Justify your answer considering the likely risk premium impact that would result if the one-year forecast actually occurred.

Index Data (South Korea)	Current Index Measure	Index 1-Year Forecast	South Korean Equity Market Impact	Corporate Fixed-Income Market Impact
GDP	159	173		
Consumer spending	432	430		
Business profits	115	100		
Central bank money supply	396	455		
Government spending relative to tax receipts	1,385	1,600		

17 Discuss four approaches to forecasting exchange rates.

18 Looking independently at each of the economic observations below, indicate the country where an analyst would expect to see a strengthening currency for each observation.

	Country X	Country Y
Expected inflation over next year	2.0%	3.0%
Real (inflation-adjusted) government 10-year bond rate	4.8%	5.1%
Short-term (1-month) government rate	1.9%	5.0%
Expected (forward-looking) GDP growth over next year	2.0%	3.3%
New national laws have been passed that enable foreign direct investment in real estate/financial companies	Yes	No
Current account surplus (deficit)	8.0%	–1.0%

19 Fap is a small country whose currency is the fip. Ten years ago, the exchange rate with the Swiss franc (CHF) was 3 fips per 1 CHF, the inflation indexes were equal to 100 in both Switzerland and Fap, and the exchange rate reflected purchasing power parity (PPP). Now, the exchange rate is 2 fips per 1 CHF. The Swiss inflation index level is at 150, and the Fap inflation index is at 140.

A What should the current exchange rate be if PPP prevails?

B Are fips over- or undervalued, according to PPP, relative to CHF?

SOLUTIONS

1 The chief point is that extending the data series further back in time increases the risk of using data representing more than one regime. The analyst also needs to be aware of adjustments or revisions to the data, which can create inconsistencies in the data and make interpretation of those data difficult. The analyst must be sure that any adjustments to the data were made on a consistent and uniform basis. Furthermore, the analyst needs to be aware that variable definitions and calculation methods may have changed over the original and extended periods.

2 **A-B.** Drawing an inference that current sales expectations might be muted due to the weak sales numbers posted over the past several years is an example of the *status quo trap.* An objective assessment of early sales figures, surveys of shoppers, and collecting data about retail order patterns and shipments represent more unbiased bases for a year-end sales forecast.

The *confirming evidence trap* was evident when Bildownes used the recent observation of the number of customers in a single department store as further support of his forecast for weak year-end retail sales. To help prevent this bias, an analyst could undertake more observations and then honestly and independently assess them with equal rigor before drawing a conclusion.

Bildownes also seemed to be strongly influenced by his memory of previous weak year-end sales periods being associated with low pedestrian traffic during early December 1990. In assuming that a correlation witnessed in the past will repeat again without further analysis, Bildownes has fallen into the *recallability trap.* To counter this forecast-tainting bias, Bildownes should emphasize objective assessments of data, rather than personal memories, in forecasting.

In drawing the conclusion that "there will be no overall year-over-year retail sales growth this holiday season," Bildownes has fallen into the *overconfidence trap.* This trap relates to the natural tendency for individuals to be overconfident about the accuracy of their forecasts. The easiest way to help prevent this trap from biasing a forecast is to admit the possibility that the forecast may be inaccurate and to increase the range of possible outcomes around the primary target outcome.

3 **A**

	Real risk-free rate (%)	+	Expected inflation (%)	+	Spreads or premiums (%)	=	Expected annual fixed-income return (%)
1-year US T-note	1.2	+	2.6	+	0	=	3.8
10-year corp. bond	1.2	+	2.6	+	1.0 + 0.8 + 0.9	=	6.5
10-year MBS	1.2	+	2.6	+	0.95	=	4.75

Note: We assign the 10-year corporate a 1% maturity premium based on the 10-year over 1-year government spread.

Estimate of the expected return of an equal-weighted investment in the three securities: (3.8% + 6.5% + 4.75%)/3 = 5.02%

B The average spread at issue is [0 + (1.0% + 0.8% + 0.9%) + 0.95%]/3 = 1.22%. As 1.22% − 1% = 0.22% is less than 0.5 percent, the investor will not make the investment.

4 **A** The historical equity risk premium is 2.0%, calculated as follows:

Historical equity returns	–	Historical 10-Year government bond yield	=	Historical equity risk premium
8.2%	–	6.2%	=	2.0%

B The Grinold–Kroner model states that the expected return on equity is the sum of the expected income return (1.5%), the expected nominal earnings growth return (8.5% = 3.5% from inflation + 5.0% from real earnings growth), and the expected repricing return (–3.45%). The expected change in market valuation of –3.45% is calculated as the percentage change in the P/E level from the current 14.5x to the expected level of 14.0x: (14 – 14.5)/14.5 = –3.45%.

Thus, the expected return is 1.5% + 8.5% – 3.45% = 6.55%, or approximately 6.6 percent.

C Using the results from Part B, the expected equity risk premium is 2.8 percent.

Expected equity return	–	Current 10-Year government bond yield	=	Expected equity risk premium
6.6%	–	3.8%	=	2.8%

5 A Using the formula $RP_i = \sigma_i \rho_{iM} \left(\frac{RP_M}{\sigma_M} \right)$ we can solve for each expected industry risk premium. The term in brackets is the Sharpe ratio for the GIM, computed as 3.5/8.5 = 0.412.

i. $RP_{\text{Health Care}} = (12)(0.7)(0.412) = 3.46\%$

ii. $RP_{\text{Watch}} = (6)(0.8)(0.412) = 1.98\%$

iii. $RP_{\text{Consumer Products}} = (7.5)(0.8)(0.412) = 2.47\%$

B Based on the above analysis, the Swiss Health Care Industry would have the highest expected return. However, that return is expected compensation for systematic risk. We cannot conclude which industry is most attractive from a valuation standpoint.

6 A The yield curve is inverting over the time period specified. This is an implicit forecast of an economic slowdown or a recession.

B Rolling over six-month Eurodollar securities would have provided superior results to rolling over one-month securities during the stated period. Extending the duration of the bond portfolio will be profitable when the yield curve subsequently flattens or inverts.

7 A All of the measures in the table would lead an analyst to conclude that the country is currently experiencing an output gap. The economy, as measured by GDP, has been contracting in each of the past two years. Thus, the economy has produced a higher level of output in the recent past. The unemployment rate has also been increasing steadily over the past two years and is quite high at over 10 percent. Thus, there is an ample supply of labor that could be put to work to increase economic output. Further, while the capacity utilization rate has been holding quite steady near 80 percent, it has declined from the reading posted two years ago. Thus, there is spare capacity that could be used to increase economic output. Finally, the decline in inflation in the latest year confirms that there is an output gap. The decline in inflation is important because otherwise the economic slowdown could be from an extreme overheating position and might not have opened up an output gap as yet.

B Given the conclusion that the country is experiencing an output gap, an analyst would expect a further decline in the rate of inflation in the next year.

8 The changes between Quarter 1 and Quarter 2 will be observed more clearly if we convert the economic measures from currency amounts into absolute percentage changes. The results are shown in the following table.

	Percentage Change: Qtr 1 to Qtr 2	
Economic Variable	**Croatia**	**Czech Republic**
Consumer spending	7.1%	10.3%
Business capital investment	8.3	22.0
Government investment/fiscal spending	10.0	27.3
Other miscellaneous GDP factors	100.0	91.4

Aggregate economic activity (including measures such as the components of GDP) is derived from many of the same factors from country to country. However, the proportion of economic activity derived from the multiple factors varies between economic regions and within a single region over time. Other issues that must be confronted when one analyzes across countries are the varying units of currency used and the differing levels of inflation between countries, which require an adjustment of some sort to be made before direct comparisons may be accomplished. Constant or inflation-adjusted measures may be used, and absolute currency measures may also be translated to a base currency to allow for direct comparisons. Alternatively, an analyst can examine the factors contributing to economic growth in proportion to an aggregate measure of activity such as GDP, as is shown in the following table.

	Absolute Currency Amounts Translated into Percentages of GDP			
	Croatia		Czech Republic	
Economic Variable	**Qtr 1**	**Qtr 2**	**Qtr 1**	**Qtr 2**
Consumer spending	57.1%	57.7%	57.7%	58.0%
Business capital investment	24.5	25.0	33.8	37.6
Government investment/fiscal spending	20.4	21.2	18.1	21.1
Other miscellaneous GDP factors	−2.0	−3.8	−9.6	−16.7

Finally, using the information in the two previous tables allows one to analyze more clearly how meaningful the recent changes in economic output are to a specific economy. If we multiply the percentage change in GDP from Quarter 1 to Quarter 2 by the percentage of GDP that that factor represents in Quarter 2 to a particular economy, we can more clearly gauge the importance of the economic trends in the economic output data that we have collected.

For example, the 7.1 percent increase in consumer spending in Croatia in Quarter 2 versus Quarter 1 is weighted quite heavily since the table above reflects that consumer spending represents about 57.7 percent of Croatia's total GDP as of the end of Quarter 2. Multiplying 7.1 percent by the 57.7 percent weighting that consumer spending represented to the Croatian economy produces a positive 4.1 percent weighted-average percentage change to the overall Croatian economy between Quarter 1 and Quarter 2. Here, we see the combined effect of underlying changes in each component of economic output and the relative importance of each component's change to overall economic output.

Economic Variable	Percentage Change: Qtr 1 to Qtr 2 (Weighted by Each Factor's GDP Percentage)	
	Croatia	Czech Republic
Consumer spending	4.1%	6.0%
Business capital investment	2.1	8.3
Government investment/ fiscal spending	2.1	5.8
Other miscellaneous GDP factors	–3.8	–15.3
Sum of weighted percentage change: Qtr 1 to Qtr 2	4.5	4.8

Analyzing the weighted percentage changes in the economic measures reflected in the table above shows that the Czech Republic would be expected to achieve a slightly higher economic growth rate relative to Croatia over the next year if current trends are sustained. However, the large and growing drag (negative absolute values) that other miscellaneous GDP factors are placing on the Czech economy should be explored further. This drag is probably due to factors such as a large amount of imports (relative to exports) of goods and supplies required to maintain the current robust pace of the economy.

9 **A** The Taylor rule can be used to estimate the direction and magnitude of a short-term interest rate adjustment that could be made by central bank authorities. The calculation follows:

$$\begin{aligned} R_{\text{optimal}} &= R_{\text{neutral}} + \left[0.5 \times \left(\text{GDPg}_{\text{forecast}} - \text{GDPg}_{\text{trend}}\right) + 0.5 \times \left(I_{\text{forecast}} - I_{\text{target}}\right)\right] \\ &= 4.0\% + \left[0.5 \times \left(2.6\% - 3.2\%\right) + 0.5 \times \left(4.0\% - 2.0\%\right)\right] \\ &= 4.70\% \end{aligned}$$

B The Taylor rule is a simple yet useful tool that an analyst can use to determine from macroeconomic factors when it might be appropriate for central bank authorities to push down short-term interest rates in order to monetarily stimulate an economy that is functioning below potential (i.e., has an output gap). Conversely, if an economy is operating above its long-term average rate (substantial growth) and there are signs of accelerating inflation or rising inflation expectations, the Taylor rule can signal the need for central bank authorities to raise the level of short-term interest rates so that economic activity and increasing inflation expectations may be mitigated.

However, many other economic factors also affect aggregate output, inflation, and interest rates. Beyond economic factors, political and social factors come into the decision-making process when central bank authorities are setting interest rate targets. Central banks also typically take account of fiscal policies, wage behavior, asset prices, and developments in other economies. Periods of deflation would also call for more unorthodox central bank actions due to the fact that the central bank's ability to influence the economy is diminished once short-term interest rates approach zero during deflationary periods.

10 Comparing the broad economic output measures for Europe and the United States, the data show that both Europe and the United States have posted similar trends over the past few years and have had improving trends over the past year. The US economy has posted higher absolute levels of GDP health care growth, which is expected to moderate over the next year. However, overall output and health care-related output are expected to continue to increase in Europe over the next year. Advantage: Europe.

Recent consumer trends for Europe and the United States have also been quite correlated. However, the United States recently has registered higher absolute measures of overall consumer health care spending. Whereas this consumer impact is likely to be stable in the United States over the next year, Europe is expected to continue to show increased growth. Advantage: Europe.

Regarding the economic impact of businesses, the United States posted better results than Europe over the past three years. However, over the past year, improving conditions have been seen for both regions. Currently, business profits have rebounded more in the United States. Thus, absolute economic measures look stronger in the United States than in Europe in the near term. However, over the next year, business-related economic impacts should be stronger in Europe. Advantage: Europe.

Monetary authorities have been stimulative in both Europe and the United States over the past several years. However, the stimulation is expected to reverse in the United States over the next year, with short-term rates rising from 1 percent to 2.2 percent. Short-term rates are expected to rise only slightly over the next year in Europe. Thus, monetary policy will be a more neutral factor for both economies over the next year. The United States is expected to have lower overall interest rates and slightly lower inflation. Advantage: United States.

Fiscal policies for Europe and for the United States have been stimulative over the past few years but have been increasingly stimulative in the United States. Over the next year, the fiscal stimulation in the United States is expected to widen further in comparison to Europe. This trend is favorable to the United States as long as inflation is not an unexpected outcome of this fiscal stimulation and government borrowing caused by the fiscal stimulation does not crowd corporate borrowers out of the health care industry. Advantage: United States.

The higher average age of the aggregate general population in Europe relative to the United States is a positive factor for the health care industry from the perspective of Pharmavest. Advantage: Europe.

With more advantages pointing toward Europe's economies over the next year, Europe appears to be the economic region that should provide the stronger economic backdrop for the health care sector over the next year.

Matrix Summarization of Relative Advantages: Europe versus United States

	Recent Trends	Current Measures	1-Year Forecast
Broad economic measures	Similar (in Europe/US)	Similar	Advantage: Europe
Impact of consumers	Similar	Similar	Advantage: Europe
Impact of businesses	Advantage: US	Similar	Advantage: Europe
Impact of central bank	Similar	Similar	Advantage: US
Impact of government	Similar	Advantage: Europe	Advantage: US
Other/unique factors	Similar	Advantage: Europe	Advantage: Europe

11 To address the question, we first convert the data from the table into trend information (1-year, 3-year, and long-term 20-year trend information). The time periods are from the perspective of the end of 2011.

Trend Comparisons	1-Year Trend	3-Year Trend	20-Year Trend
GDP	2.5%	7.7% (2.5% compound average annual growth)	4.2%
Consumer spending	4.0	5.0 (1.6% compound average annual growth)	2.5
Business spending	2.7	11.8 (3.8% compound average annual growth)	2.6
Inflation	10.0	25.3 (7.8% compound average annual growth)	14.3
Gov't. spending (% of GDP)	–1.25	–2.5 (–0.8% compound average annual growth)	3.6

Based on the above comparisons, our conclusions about current trends witnessed over the past year for the economy of Country X relative to longer-term 3-year and 20-year trends are reflected in the table below.

Trend Analysis	1-Year Trend	3-Year Trend	20-Year Trend
GDP	2.5%	1-year trend is the same as the average annual GDP growth 3-year trend of 2.5%.	1-year trend of GDP growth is weaker than the 20-year trends.
Consumer spending	4.0	1-year trend is stronger than average annual consumer spending growth 3-year trend of 1.6%.	1-year trend is stronger than the average annual consumer spending growth 20-year trend of 2.5%.
Business spending	2.7	1-year trend is weaker than the average annual business spending growth 3-year trend of 3.8%.	1-year trend is stronger than the average annual business spending growth 20-year trend of 2.6%.
Inflation	10.0	1-year trend is weaker (higher inflation) than the average annual inflation growth 3-year trend of 7.8%.	1-year trend is stronger (lower inflation) than the average annual inflation growth 20-year trend of 14.3%.
Gov't. spending (% of GDP)	–1.25	1-year trend is weaker than the average annual govt spending growth 3-year trend of –0.8%.	1-year trend is weaker than the average annual govt spending growth 20-year trend of 3.6%.

12 A Five elements of a pro-growth government structural policy are as follows:

- Fiscal policy is sound. Fiscal policy is sometimes used to control the business cycle.
- The public sector intrudes minimally on the private sector.
- Competition within the private sector is encouraged.
- Infrastructure and human capital development are supported.
- Tax policies are sound.

B **i.** Declines in government tax receipts as a percent of GDP would be pro-growth because the equilibrium level of goods and services would increase. *Associated structural policy element: Tax policies are sound.*

ii. Declines in government tariff receipts would be pro-growth. Such declines would imply that government is fostering competition. By contrast, increases in tariff receipts would imply that government is protecting domestic businesses from international competition. *Associated structural policy element: Competition within the private sector is encouraged.*

iii. Increases in the number of publicly funded schools would be pro-growth because businesses stand to gain from a well-educated workforce. *Associated structural policy element: Infrastructure and human capital development are supported.*

iv. A negative net change in the number of state-owned businesses (that is, fewer such businesses) would be pro-growth. Such a change would increase the private sector's share of output, which would favor the efficient allocation of scarce resources. *Associated structural policy element: The public sector intrudes minimally on the private sector.*

v. A decrease in the long-term average budget deficit as a percent of GDP is pro-growth, because it would be a positive for controlling the current account deficit. *Associated structural policy element: Fiscal policy is sound.*

13 Four factors usually associated with emerging market economies are as follows:

- Emerging market economies require high rates of investment, which is usually in short supply within the emerging economy itself. This situation creates a reliance on foreign capital. Areas of needed investment usually include both physical assets (capital equipment and infrastructure) and human capital (education and skills building).
- Emerging economies typically have volatile political and social situations. Leaders usually acquire and maintain power using force and other less-than-democratic means. The social environment is usually strained by the fact that a large portion of the population possesses few assets, has little formal education, and is unable to generate income to feed/support family and neighbors.
- To alleviate the first two factors above, organizations such as the IMF and World Bank provide conduits for external sources of investment and a means to push for structural reforms—political, social, educational, pro-growth, etc. The "conditions" usually prescribed by these institutions are often felt to be draconian.
- Emerging countries typically have economies that are relatively small and undiversified. Those emerging economies that are dependent on oil imports are especially vulnerable in periods of rising energy prices and can become dependent on ongoing capital inflows.

14 The consumer-oriented aspect of Country M's economy (as measured by consumer orders) has been consistently strengthening over the past several months. The consumer measure had a negative reading in June, a slightly positive reading in July, and an even stronger August reading. From this information, we can state that the consumer-oriented aspect of Country M's economy appears to be improving.

The business-oriented aspect of Country M's economy (as measured by business capital goods orders) has remained quite flat in the period reviewed. From this information, we can state that the business-oriented aspect of the Country M's economy currently appears to be a positive contributor but is not necessarily showing signs of improvement or weakness. Thus, in recent months, the measure has been a stable but positive contributor.

The central bank-oriented aspect of Country M's economy (as measured by central bank money supply) has also steadily improved over the period being analyzed.

All of the leading indicator components have been positively contributing to the economy, and most have been contributing at an increasingly positive rate (all except business capital goods orders). These components are a sign of current economic activity and also typically create additional economic activity by their very nature. In addition, the total index of leading indicators, which includes all the components, has likewise moved upward steadily over the past few months. Thus, we can conclude from the measures in the table that Country M's economy should show continued growth over the next six to nine months.

15 Two factors that affect the yields available on inflation-indexed bonds (IIBs) are as follows:

- Overall economic growth and its corresponding impact on real interest rates bear a direct impact on IIB yields. A growing economy places upward pressure on all bond yields. Though the impact may be muted due to the nature of the IIB structure, IIBs are not immune to interest rate risk.
- Investor demand for bonds in general and for IIBs in particular has an inverse impact on IIB yields. As with non-IIBs, rising investor demand serves to drive interest rates lower and the lack of investor demand drives up the yields that issuers must pay in order to sell the bonds they need to issue.

16

Index Data (South Korea)	Current Index Measure	Index 1-Year Forecast	South Korean Equity Market Impact	Corporate Fixed-Income Market Impact
GDP	159	173	Positive	Negative
Consumer spending	432	430	Negative	Positive
Business profits	115	100	Negative	Negative
Central bank money supply	396	455	Positive	Negative
Government spending relative to tax receipts	1,385	1,600	Positive	Negative

Justification:

GDP: A large 9 percent annual increase in GDP would give rise to strong corporate profits and would represent a favorable economic environment for equity investors (positive equity impact). However, such a strong economy would be a negative for corporate bond investors in that such economic growth and aggregate demand would place upward pressure on bond yields. In addition, in time, expectations of rising inflation could also hurt corporate bond investors (negative corporate bond impact).

Consumer Spending: A slight decrease in consumer spending represents an economic drag on overall economic output. This drag serves to reduce real earnings growth (negative equity impact). A slight decrease in consumer spending will not place any upward pressure on corporate bond yields or inflation or generally impact a debt issuer's ability to pay back the bondholders (positive corporate bond impact).

Business Profits: A 13 percent decline in business profits is a negative factor for both the equity market and the corporate bond market. Equity returns ultimately depend on businesses being able to earn a profit on the capital being employed. Thus, a steep decline in corporate profitability also increases the credit risk of corporate bondholders. Falling business profits can lead to corporate bond rating downgrades or insolvency (negative corporate bond impact).

Central Bank Money Supply: A 15 percent increase in money supply represents central bank monetary stimulation. Such stimulation should foster stronger economic growth (positive equity impact). However, bond yields could be expected to increase because monetary stimulation may increase expectations for higher aggregate growth and because of the potential higher inflation that monetary stimulation can cause over time (negative corporate bond impact).

Government Spending Relative to Tax Receipts (government budget deficit spending): A large increase in government spending relative to tax receipts (fiscal budget deficit) also represents stimulation to the economy. This stimulation can create an attractive environment for increasing corporate profits (positive equity impact). However, bond yields could be expected to increase because fiscal stimulation may increase expectations for higher aggregate growth and because of the potential higher inflation that monetary stimulation can cause over time (negative corporate bond impact).

17 Four approaches to forecasting exchange rates are as follows:

- PPP (or relative inflation rates), as exchange rate movements should offset inflation differentials.
- Relative economic strength, because a strong pace of economic growth tends to attract investment.
- Capital flows, as net inflows into a country, such as foreign direct investment, increase the demand for that country's currency.
- Savings-investment imbalances, through their ultimate effect on the need for foreign savings.

18

	Country X	Country Y
Expected inflation over next year	2.0% ✓	3.0%
Real (inflation-adjusted) government 10-year bond rate	4.8%	5.1% ✓
Short-term (1-month) government rate	1.9%	5.0% ✓
Expected (forward-looking) GDP growth over next year	2.0%	3.3% ✓
New national laws have been passed that enable foreign direct investment in real estate/financial companies	Yes ✓	No
Current account surplus (deficit)	8.0% ✓	–1.0%

Note: A ✓ represents the comparatively stronger measure, where an analyst could expect to see a strengthening currency based on the factor being independently reviewed.

19 A The Swiss price index has increased by (150 – 100)/100 – 1.0 = 50%. The Fap price index has increased by (140 – 100)/100 – 1.0 = 40%. The inflation differential is therefore 10 percent. According to PPP, to offset higher Swiss inflation, the fip should appreciate against the Swiss franc by approximately the same percentage to 0.90 × (3.0 fips per 1 CHF) = 2.70 fips per 1 CHF.

B Contrasting the exchange rate of 2.7 fips per 1 CHF implied by PPP and the actual exchange rate of 2 fips per 1 CHF, we see that the fip is overvalued relative to its PPP value: At actual exchange rates, fewer fips are required to purchase 1 CHF than PPP would predict.

READING

15

Equity Market Valuation

by Peter C. Stimes, CFA, and Stephen E. Wilcox, PhD, CFA

Peter C. Stimes, CFA, is a private investor in Fallbrook, California (USA). Stephen E. Wilcox, PhD, CFA, is at Minnesota State University, Mankato (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** explain the terms of the Cobb-Douglas production function and demonstrate how the function can be used to model growth in real output under the assumption of constant returns to scale;
☐	**b.** evaluate the relative importance of growth in total factor productivity, in capital stock, and in labor input given relevant historical data;
☐	**c.** demonstrate the use of the Cobb-Douglas production function in obtaining a discounted dividend model estimate of the intrinsic value of an equity market;
☐	**d.** critique the use of discounted dividend models and macroeconomic forecasts to estimate the intrinsic value of an equity market;
☐	**e.** contrast top-down and bottom-up approaches to forecasting the earnings per share of an equity market index;
☐	**f.** discuss the strengths and limitations of relative valuation models;
☐	**g.** judge whether an equity market is under-, fairly, or over-valued using a relative equity valuation model.

INTRODUCTION

1

Economic strength or weakness affects equity prices through its effect on risk-free rates, risk premiums, and corporate earnings. These economic drivers of security prices are often considered fundamental because they will affect security returns throughout most investment horizons. It is widely accepted that equity prices are negatively related to risk-free rates and risk premiums and positively related to earnings growth.

© 2010 CFA Institute. All rights reserved.

There are, of course, other drivers of equity returns and most of these can be considered behavioral. The cognitive and emotional factors experienced by investors can create both positive and negative feedback mechanisms. Market momentum may thus result in both bull market rallies and bear market declines lasting longer than may be justified by fundamental factors. This reading does not deal specifically with such behavioral drivers. Rather, this reading illustrates the application of economic forecasts to the valuation of equity markets. While many factors interact to determine whether equity prices are currently rising or falling, economic fundamentals will ultimately dictate long-term equity market price trends.

Section 2 uses GDP forecasts for a developing country, China, to develop inputs for a discounted cash flow valuation of that country's equity market.[1] Section 3 contrasts the top-down and bottom-up valuation approaches. Section 4 explains and critiques popular earnings- and asset-based models to relative equity market valuation. Section 5 summarizes the reading, and practice problems in the CFA Institute format follow.

2 ESTIMATING A JUSTIFIED P/E RATIO

Investors commonly use the market's price-to-earnings (P/E) ratio or multiple to gauge the prospects for future equity returns. Sections 2.1 through 2.3 develop the **Cobb-Douglas production function** (also called the **Cobb-Douglas model**) for obtaining growth rates for an economy and, thus, the dividend growth rate trajectories for a corresponding equity market. This model is particularly useful in the case of developing markets such as China where the structure of the underlying economy has experienced, and may experience, fundamental changes (as compared with the relatively stable growth rates of more developed economies).

In Section 2.4 we apply a form of the dividend discount model known as the H-model to the complicated dividend growth trajectory because it is well suited to instances where near-term growth rates can diverge significantly from the ultimately sustainable dividend growth rate. We also standardize the results in justified P/E form. This facilitates inter-temporal and cross-border market value comparisons. The difference between prevailing P/Es and justified P/Es is a measure of potential investment attractiveness.

As will be shown, the Cobb-Douglas and dividend discount models may also be applied to developed economies and equity markets.

2.1 Neoclassical Approach to Growth Accounting

Growth accounting is used in economics to measure the contribution of different factors—usually broadly defined as capital and labor—to economic growth and, indirectly, to compute the rate of an economy's technological progress. The neoclassical approach to growth accounting uses the Cobb-Douglas production function.[2] This approach can be useful to financial analysts because it gives insights into the long-term potential economic growth in individual countries, in larger regions, and for the world as a whole. The Cobb-Douglas estimate of the growth of total production can help to estimate corporate profit growth and develop corporate cash flow projections for stock market composites.

1 Forecasts and opinions offered in this reading are those of the authors (or the writers cited) and are not positions of CFA Institute.
2 See Cobb and Douglas (1928).

The basic form of the Cobb-Douglas production function is set forth as Equation 1, where Y represents total real economic output, A is total factor productivity, K is capital stock, α is output elasticity of K, L is labor input, and β is the output elasticity of L. **Total factor productivity (TFP)** is a variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

$$Y = AK^{\alpha}L^{\beta} \tag{1}$$

If we assume that the production function exhibits **constant returns to scale** (i.e., a given percentage increase in capital stock and labor input results in an equal percentage increase in output), we can substitute $\beta = (1 - \alpha)$ into Equation 1.[3] Taking the natural logarithm of both sides of the equation gives

$$\ln(Y) = \ln(A) + \alpha\ln(K) + (1 - \alpha)\ln(L) \tag{2}$$

Taking first differences of Equation 2 and utilizing the fact that, for small changes in any variable x, $\ln(x + \Delta x) - \ln(x) = \ln\left(\frac{x + \Delta x}{x}\right) \approx \frac{\Delta x}{x}$, we obtain the expression:

$$\frac{\Delta Y}{Y} \approx \frac{\Delta A}{A} + \alpha\frac{\Delta K}{K} + (1 - \alpha)\frac{\Delta L}{L} \tag{3}$$

Equation 3 is the expression that we will employ in our analysis. In Equation 3, the percentage growth in real output (or gross domestic product, GDP) is shown as $\Delta Y/Y$, and it is decomposed into its components: $\Delta A/A$ is growth in TFP; $\Delta K/K$ is the growth in the capital stock; $\Delta L/L$ is the growth in the labor input; α is the output elasticity of capital; and $1 - \alpha$ is the output elasticity of labor where $0 < \alpha < 1$.

In practice, all the variables in Equation 3, with the exception of the growth in TFP, are directly observable or can be derived from national income and product accounts.[4] However, growth in TFP is determined using the other inputs as noted by Equation 3 and is commonly referred to as the **Solow residual**.[5]

TFP growth means that aggregate output (i.e., GDP) can grow at a faster rate than would be predicted simply from growth in accumulated capital stock and the labor force. Interpreting TFP as a measure of the level of technology, growth in TFP is often described as a measure of "technical progress" and linked to innovation. As examples, such technological advances as the introduction of the steam engine, electricity, the internal combustion engine, telecommunications, microchips, penicillin, and the internet are thought to have contributed to growth in TFP. However, growth in TFP, as a residual in the sense described, can be driven by factors other than improvements in technology. These factors could be particularly significant in economies that are experiencing major changes in political and/or regulatory structures. As examples, liberalization of trade policies, abolition of restrictions on the movement and ownership of capital and labor, the establishment of peace and the predictable rule of law, and even the dismantling of punitive taxation policies would be expected to contribute to growth in TFP. Finally, growth in TFP can benefit from improvements in the division of labor that arise from the growth of the economy itself. By contrast, developments such as the depletion and degradation of natural resources would detract from growth in TFP.

The robustness and simplicity of the approach we have presented can be tested against the complex and important case of valuing the equity markets in mainland China.

---

3 As a result, if both capital and labor change by a percentage x, then the total change in output is $\alpha x + (1 - \alpha)x = x$. The use of constant returns to scale is predicated on empirical results from several large economies over various time periods during the 19th and 20th centuries.

4 Capital, α, and labor, $(1 - \alpha)$, output elasticities may differ across national economies.

5 See Solow (1957). The Solow residual is thus simply: $\frac{\Delta A}{A} \approx \frac{\Delta Y}{Y} - \alpha\frac{\Delta K}{K} - (1 - \alpha)\frac{\Delta L}{L}$

2.2 The China Economic Experience

China has been widely regarded as the most influential emerging economy, and its growth performance since reform has been hailed as an economic miracle. Historical growth accounting results, as presented in Zheng, Hu, and Bigsten (2009), are reported in Exhibit 1. Note particularly the comparisons of China's growth in the capital stock, $\Delta K/K$, and growth in the labor input, $\Delta L/L$, to those of the (former) Soviet Union, United States, and European Union. The growth in capital stock stands out particularly for China and is most apparent during the period of economic liberalization that commenced in the early 1990s. According to estimates by the World Bank and other institutions, the gross effective savings in China (loosely defined as investment in plant, property, equipment, and inventories) divided by economic output have been in the neighborhood of 40 percent. This compares with 15 to 20 percent over the comparable periods for the other countries in Exhibit 1.

Exhibit 1 Historical Growth Accounting for China, the (Former) Soviet Union, United States, and European Union

Countries	Time Period	Real GDP Growth $\Delta Y/Y$ (%)	Growth in Total Factor Productivity $\Delta A/A$ (%)	Growth in Capital Stock $\Delta K/K$ (%)	Growth in Labor Input $\Delta L/L$ (%)
China	1978–1995	10.11	3.80	9.12	3.49
	1995–2007	9.25	1.45	12.81	2.78
Soviet Union	1950–1970	5.4	1.6	8.8	1.8
	1970–1985	2.7	–0.4	7.0	1.1
United States	1950–1972	3.9	1.6	2.6	1.4
	1972–1996	3.3	0.6	3.1	1.7
	1996–2004	3.6	1.5	2.6	0.7
European Union	1960–1973	5.1	3.2		4.8
	1973–2003	2.2	1.0	0.5	2.8

Source: Zheng, Hu, and Bigsten (2009). China's output elasticity for capital (α) and output elasticity for labor ($1 - \alpha$) were both estimated to be 0.5.

Concerns over the sustainability of China's growth have emerged in recent years because, as is evident from Exhibit 1, the growth in TFP has slowed. Zheng, Bigsten, and Hu (2006) studied the Chinese economy and found that reform measures had a significant positive impact on TFP, but this impact should be considered a one-time event. These authors make a case that China should now focus on achieving sustained increases in productivity.

Exhibit 1 also shows that Chinese economic growth has been largely driven by growth in the capital stock. Zheng, Bigsten, and Hu note that government policies in the mid- to late 1990s supported this extraordinary growth in investments. Key input prices were kept low through subsidies, and controlled pricing and a high savings rate allowed for the availability of cheap credit. A huge trade surplus has been another side-effect of both high investment[6] and an unsustainably low fixed exchange-rate policy designed to support exports. China's foreign reserves are currently the world's largest by a considerable amount and have recently surpassed $2 trillion.[7] Because of this,

6 In lieu of higher consumption spending, particularly on imported goods.
7 Preston (2009).

China is facing excessive growth in its money supply, and there are concerns about potential bubbles in both real estate and share prices. (Recent year-over-year growth in the broad M2 measure of the money supply has been over 25 percent.[8]) A necessary, eventual "course correction" in exchange rate and monetary policies would reduce or reverse the forces that contributed to a de facto subsidization of capital formation.

In addition to the foregoing structural factors, changes in consumer behavior are also likely to cause the Chinese savings/investment rate to moderate. Altogether, government policy changes, structural imbalances, and an increased propensity to consume all point to an eventual reduction from the double-digit growth rates of capital stock. At the same time, while the labor force of China has grown at a much more rapid pace than for European and American economies, this has been attributable both to higher population growth rates and to a rise in labor force participation rates. The Chinese population growth rate has slowed to less than 1.0 percent per year in recent years, according to the World Bank. Furthermore, major changes in labor force participation rates, largely due to more people leaving rural occupations and household/childcare activities, represent one-time changes rather than sustainable trends. In sum, these considerations suggest that Chinese economic growth will eventually moderate, which is consistent with the economic history for the Soviet Union, United States, and European Union presented in Exhibit 1.

Finally, in addition to the factors above, an investment analyst might wish to consider other, more qualitative factors in producing a long-term growth forecast (e.g., China's educational system or pollution side-effects of China's strategy of rapid capital formation). Because adjustments for such factors would typically have a large judgmental element, this reading does not address them.

EXAMPLE 1

The Neoclassical Approach to Growth

1. The savings rate for a national economy is comparatively stable. The economy faces a sharp uptick in energy prices and at the same time imposes stringent restrictions on environmental pollution. The combined impact of energy and environmental factors renders a large portion of the existing stock of manufacturing equipment and structures economically obsolescent. What is the impact on the economy according to Equation 3?
2. A country experiences a sharp demographic rise in the divorce rate and single-parent households. Using the framework of Equations 1 and 3, what is likely to happen to total national production, total per capita income, and total income per household?

Solution to 1:

The sudden, unexpected obsolescence of a significant portion of the capital stock means that the percentage growth rate in capital stock in that period will be negative, that is, $\Delta K/K < 0$. All other things being equal, this implies a one-time reduction in economic output. Assuming no change in technological innovation, savings rates, and labor force growth trends, the subsequent long-term growth rates should be relatively close to the previously prevailing growth rates, starting from the lower base value for Y.

8 Xin and Rabinovitch (2009).

Solution to 2:

The change in demographics implies an increase in the aggregate labor force as stay-at-home parents and spouses re-enter the workforce. That is, the labor force will grow, for some period of time, at a pace faster than underlying population growth until a new steady-state labor force participation rate is attained. Total economic production (and income) will thus also rise at an above-trend rate during this adjustment period. Above-trend growth in national income, holding population trends constant, means that per capita income will also grow above trend during this period of demographic adjustment. Per-household income, by contrast, will grow at a below-trend rate (and may even decline) due to an uptick in new household formation during the shift in divorce and separation rates to ultimately prevailing steady-state levels.

2.3 Quantifying China's Future Economic Growth

Now that we have covered a simple model for estimating an economy's growth rate, the next step is to apply the model using our best estimates of the model inputs. As in any forecasting exercise, the specific forecasts must be based on currently available information. Any forecast has an "as of" date associated with it. Comparing the forecasts to actual outcomes subsequently, some inputs or elements of the forecast may appear to be misjudged or dated. With that caution in mind, we can proceed to develop our economic growth projections for China.

Zheng, Hu, and Bigsten (2009) offer the GDP growth projections presented in Exhibit 2 for China, the United States, and the European Union. The forecast of an 8 percent GDP growth rate for China is consistent with the Chinese government's 8 percent GDP growth target as presented by Premier Wen Jiabao. Zheng, Hu, and Bigsten note their own projections rely heavily on two basic assumptions: 1) growth in the capital stock cannot exceed GDP growth and 2) a TFP growth rate of 2 to 3 percent will prevail for the foreseeable future. These authors believe that the potential for China to absorb new technologies from developed nations is double that for the United States and European Union. Given the history of other developing countries and the record of economic recovery of developed countries after World War II, this does not seem unreasonable.

Exhibit 2 Growth Projections (2009–2030)

Country	Real GDP Growth $\Delta Y/Y$ (%)	Growth in Total Factor Productivity $\Delta A/A$ (%)	Output Elasticity of Capital α	Growth in Capital Stock $\Delta K/K$ (%)	Output Elasticity of Labor $1 - \alpha$	Growth in Labor Input $\Delta L/L$ (%)
China	8.0	2.5	0.5	8.0	0.5	3.0
United States	2.75	1.2	0.3	4.0	0.7	0.5
European Union	2.2	1.0	0.4	3.0	0.6	0.0

Source: Zheng, Hu, and Bigsten (2009).

The neoclassical framework we have presented permits analysts to apply their own forecasts of factors of production, with particular emphasis on how such factor trajectories might change over time. Once the analyst has developed a long-term macro forecast, it can then be used in conjunction with traditional valuation models.

In applying the framework, we modify the Zheng, Hu, and Bigsten ("ZHB") projections by using a lower estimate of the growth rate in the labor force, since World Bank data indicate that population growth in China now appears to have declined to below 1.0 percent annually. At the same time, we are inclined to think that savings and investment rates will only decline gradually from over 35 percent of GDP, thereby keeping the growth rate of capital stock much higher than the 8 percent per annum assumed by ZHB. We have no disagreement with the ZHB projection of 2.5 percent per year for TFP growth. If we utilize the labor and capital elasticities from the ZHB study, a reasonable projection for economic growth would therefore be:

Total factor productivity	plus	Effect of growth in capital stock	plus	Effect of labor force growth	
2.5%	+	0.5 × 12%	+	0.5 × 1.5%	= 9.25%

This near-term rate is higher than the ZHB forecast, the official forecast of the Chinese government, and the consensus of many economic forecasters. We note, however, that there are several factors that are consistent with our higher near-term forecast. First, actual real growth has cumulatively exceeded the 8 percent Chinese official growth target of the past several years. Second, and more importantly, our forecast is to be thought of as a normalized forecast of sustainable cash flow growth potential.

While our near-term forecast for economic growth is higher than ZHB and the Chinese government, the reasoning set forth in the preceding section leads us to believe that economic growth will gradually decline to levels lower than the ZHB analysis.[9] This is because, as economies develop and as the stock of accumulated capital per person rises, savings rates tend to decline and TFP trends fall to levels closer to those of more highly developed countries. Finally, although labor force growth can exceed population growth for some time (as labor force participation rates increase), in the long run, labor force growth is constrained by population growth. China appears to be on its way towards zero population growth (much like Japan and Western Europe). With this in mind, an ultimately sustainable economic growth rate might be:

Total factor productivity	plus	Effect of growth in capital stock	plus	Effect of labor force growth	
1.25%	+	0.5 × 6%	+	0.5 × 0.0%	= 4.25%

2.4 Equity Market Valuation

In this section we translate macroeconomic forecasts into corporate cash flow forecasts and combine those corporate forecasts with an appropriate discounted cash flow model to estimate the intrinsic value of an equity market in terms of justified P/E ratios.

The growth rate of corporate earnings and dividend cash flow, adjusted for inflation, should bear a close relationship with real GDP growth over the long term. For purposes of this analysis, we assume that earnings and dividend cash flow for the underlying comprehensive stock composite grow at the same rate as the core growth rate of Chinese GDP.[10]

9 Our forecast is for a 30-year time period and was made in the summer of 2009. As noted in Exhibit 2, the ZHB forecast was for 2009–2030. We believe the choice of a longer time horizon for our forecast is also supportive of the choice of a lower terminal growth rate.

10 In principle, the sector of publicly traded companies could grow somewhat above or below the overall growth rate of GDP, because it is a subset of the overall economy. However, the approach used in the text should serve as a good approximation for analytical purposes.

In theory, we would like to be able to forecast, year by year, each of the underlying factors of production and the change in TFP. In practice, however, we recognize that a less complicated cash flow representation might be more suitable, because it lessens the possibility of compounding forecast errors. Fuller and Hsia (1984) developed a valuation model, known as the **H-model**, in which dividend *growth rates* are expected to decline in a linear fashion, over a finite horizon, towards an ultimately sustainable rate from the end of that horizon into perpetuity. It incorporates a growth rate in dividends that is expected to prevail in the initial period g_S, a period of years, N, where the dividend growth rate declines in a linear fashion, and a long-term dividend growth rate g_L that is expected to prevail to perpetuity beginning at the end of period N. With an initial annualized dividend rate at time zero of D_0 and a discount rate to perpetuity of r, the H-model estimate of value, V_0, is given by Equation 4:

$$V_0 = \frac{D_0}{r - g_L}\left[(1 + g_L) + \frac{N}{2}(g_s - g_L)\right] \tag{4}$$

The H-model provides a convenient means for modeling initially high ("supernormal") dividend growth rates that gradually transition to a lower, long-run growth at a constant mature-stage growth rate. The H-model involves an approximation to the value estimate that would result from period-by-period discounting of cash flows in the phase prior to the mature or terminal phase when a constant growth rate is assumed. The approximation is generally very good in most practical situations and the gain from using an approximation is an easy to evaluate expression.[11] In the case of valuation of mature developed equity markets, the Gordon (constant) growth dividend discount model would be more commonly used than the H-model because supernormal growth would not generally need to be modeled in such cases.

In our valuation analysis, we express the discount rate and both growth factors in real, that is, inflation-adjusted terms. A key to valuation is consistency: stating variables consistently on a nominal basis or consistently on a real basis are both feasible approaches. Economists, however, typically prefer to use real variables as they tend to be more stable and, therefore, easier to predict than their nominal counterparts.

We use our growth rate trajectory and apply the H-model to the S&P China BMI Index. This index underlies the SPDR S&P China ETF, which is an exchange-traded fund designed to track the investment performance of the mainland China and (to a much lesser extent) Hong Kong stock markets. Both the underlying stocks and the ETF itself are avenues in which both Chinese and non-Chinese investors may obtain participation in the Chinese equity markets. The index underlying the ETF and the information provided by the ETF's sponsor (State Street Global Advisors) provide up-to-date information that can enter traditional valuation models.

In evaluating the investment attractiveness of a market index, we utilize a price–earnings ratio or P/E approach. Because of the behavioral factors mentioned in the introduction, prices of equities and equity market composites tend to vary more than underlying normalized earnings and growth prospects. P/E analysis permits us to make useful inter-temporal valuation comparisons and has the additional benefit of providing intuition when making comparisons across international borders. As of 15 July 2009, the forward or prospective P/E ratio for the underlying S&P China BMI Index was 19.1 (this P/E is the level of the S&P China BMI Index divided by year-ahead expected earnings for that index). In the following analysis, we estimate what justified

11 Valuation differences between the H-Model and a period-by-period approach should be minimal so long as the differences between long-term and interim growth rates are of single-digit magnitude and the "interim" period length is not much longer than 30–40 years. In any event, the possible valuation error from adopting a simpler model is reasonable in comparison with the incremental valuation error that can arise from introducing an excessive number of valuation parameters, i.e., year-by-year cash flows.

P/E ratios should be under differing inflation-adjusted equity discount rates and for different estimates of the ultimately prevailing terminal inflation-adjusted dividend growth rate to perpetuity.

The (forward) **justified P/E** is the estimated intrinsic value divided by year-ahead expected earnings; in this case we are estimating intrinsic value using the H-model. Reflecting the meaning of *justified* here as *warranted by fundamentals*, price in the justified P/E ratio is assumed in this discussion to equal intrinsic value as estimated by the valuation model, i.e., P_0 (or P) = V_0.[12] In all instances, we assume that core inflation-adjusted growth rates decline in a linear fashion over a 30-year time horizon from the 9.25 percent per year we estimate for year one.[13] The 30-year time horizon is selected both because it is a round number and because it is not unlike other historical instances where national economies experienced fundamental changes in political and economic structure, the notable examples being post-World War II European economies and Japan both in the late 19th century and after World War II.

Exhibit 3 Justified P/E Ratios for Chinese Equity Market at Mid-Year 2009

Terminal Real Growth Rate (%)	Real Equity Discount Rate							
	6.00%	6.50%	7.00%	7.50%	8.00%	8.50%	9.00%	9.50%
3	26.8	23.0	20.1	17.9	16.1	14.6	13.4	12.4
4	37.3	29.9	24.9	21.3	18.7	16.6	14.9	13.6
5	69.0	46.0	34.5	27.6	23.0	19.7	17.2	15.3

12 Analysts and practitioners may, if desired, proceed directly to forecasting a justified market index *level* based on the H-Model, the current dividend rate, and the growth-factor inputs. (Strictly speaking, the H-Model does not directly utilize earnings per share, although, indirectly, the trajectory of dividend growth is assumed to be supported by growth in EPS.) Under our approach, the relative differences in P/E ratios in Exhibits 3 and 4 translate directly into the relative differences between observed and justified market levels.

13 The geometric average growth rate during the 30-year period is around 6.7%. Also of interest, the *average* compound growth rate for the first 20 years is not far off from the ZHB 20-year 8% annual growth rate.

Exhibit 4 Justified Chinese Equity Market Valuation Multiples

Note: Chinese Equity Markets Justified P/Es: 30-Year Transition from 9.25% Real Dividend Growth Rate to Various Terminal Growth Rates to Perpetuity.

In Exhibit 3 and Exhibit 4, we have presented justified P/E ratios. Interpolating visually, the observed 19.1 P/E ratio on 15 July 2009, assuming a terminal 4.25 percent real dividend growth rate to perpetuity, is consistent with a real equity discount rate just under 8.0 percent.

This leads immediately to the question of what the proper discount rate should be. To answer this we would like to know a little bit about both the volatility of Chinese equity prices and how such return/volatility prospects compare with other world equity markets.

In Exhibit 5, we present cumulative return data for both the S&P China BMI Index and the S&P 500. The data series commence in 2001, the point at which the China BMI Index data are first available, and a point by which mainland Chinese equity markets had become seasoned and widely accessible to non-Chinese investors.[14]

14 To check the reasonableness of the data, we computed the cumulative total returns for the Morgan Stanley Capital International (MSCI) China Index and found them in good accord with the S&P China BMI Index.

Exhibit 5 Cumulative Performance Comparison for Chinese and US Stock Markets (in RMB for China, USD for S&P 500)

Source: Standard & Poor's, Morgan Stanley.

Over the 7-year period, the cumulative return of Chinese equities far outpaced those of the United States. However, Chinese markets also experienced more of a bubble and subsequent collapse, resulting in a much higher volatility of returns. For China, the annualized return over this time frame approached an inflation-adjusted 13 percent. This outpaced the return one would have expected even from coupling a 2 to 2.5 percent dividend yield with an aggressive core dividend real growth rate of 9 percent. The cumulative return benefited from a positive shift in P/E ratios between the beginning and end of the measurement period. In fact, the P/E expansion and subsequent contraction appear to be the chief cause of the 2007 Chinese bubble and the following collapse.

By comparison, the equity markets in the United States were much less volatile, although the cumulative return, particularly net of inflation, was negative. Assuming a 6 percent inflation-adjusted discount rate for the US equity market (in line with long-term historical realized returns), the cumulative nominal return—incorporating the 2.6 percent average inflation rate—would have resulted in an ending cumulative return index value of around 1.80 in December 2008 (compared with the 2.61 achieved by the S&P China BMI Index). The explanation for the poor performance by US equities was largely attributable to a contraction from the high normalized P/E valuation relationships prevailing in 2001 to the below-average levels at the end of the period. Additional evidence is presented in Exhibit 6.

Exhibit 6 Return and Volatility Data

31 December 2001 – 31 December 2008

	S&P China BMI (%)	MSCI China (%)	S&P 500 (%)
Annualized nominal total return[1]	14.7	16.6	–1.5
Annualized standard deviation of total returns[2]	29.4	29.4	14.3
Annualized inflation rate[3]	3.7	3.7	2.6

Notes:
[1] In RMB for Chinese composites, USD for S&P 500.
[2] Based on monthly observations.
[3] Data through 2007, reflects changes in GDP deflator.
Sources: Standard & Poor's, Morgan Stanley, Bloomberg, World Bank.

In establishing a reasonable discount rate to apply to our cash flow forecasts, we should take into account the higher volatility of Chinese markets, which has arisen in part because of structural macroeconomic instabilities (discussed above) and the evolution of their legal and regulatory systems.

The higher observed volatility also has arisen from behavioral shifts in P/E relationships that are more pronounced than those usually seen in US and European markets. Such valuation-induced price volatility is not unusual for any market that is new by historical standards and has been experienced in the past by US, European, and Japanese markets in their own long paths to economic maturity. Furthermore, because the bulk of mainland equities are still 75 percent owned (directly or indirectly) by the mainland Chinese government, there is an overhanging risk of intervention or divestiture that might be occasioned by non-economic motives. However, the possibility of denationalization, such as carried out by the United Kingdom in the 1980s, might be viewed more as a market opportunity than as a risk.

The effect of higher volatility on required returns might be somewhat mitigated to the extent 1) market returns are less than perfectly correlated with other international equity markets and 2) cross-border investing and divesting of equities is freely achievable by investors both inside and outside of China.

On balance, the foregoing factors suggest that the required real equity discount rate be higher in China than, for example, in the United States. This naturally leads us to investigate both what the realized real equity discount rate has been in the United States and what real equity discount rates are predicted based on alternative theoretical models. Historical studies have been undertaken[15] which indicate that a prospective inflation-adjusted equity discount rate[16] in the area of 5–7 percent is reasonable. Work based on macroeconomic, corporate finance, and financial market equilibrium[17] suggests that a slightly higher range might be possible in equilibrium. Purely theoretical models have had mixed results. The utility function models,[18] for example, find that real discount rates in the 5–7 percent area are well above what can be justified by underlying market volatility. On the other hand, a theoretical approach[19] simply based on prospective wealth accumulation under different volatility assumptions is consistent with the results actually realized in the US historical record.

15 Ibbotson and Sinquefield (1989), Siegel (1992), Arnott and Bernstein (2002), Siegel (2005).
16 Geometrically compounded.
17 Ibbotson, Diermeier, and Siegel (1984), Stimes (2008).
18 Mehra and Prescott (1985), Mehra (2003).
19 Arnott (2004).

In the volatile economic and market conditions at the time this reading is being written (2009), the higher end of the discount rate estimates seem to be in order for the United States. If we place these at 6–7 percent, the additional relative risk considerations for the Chinese market suggest that a required discount rate for that market might be in the range of 7.5–8.5 percent. This is a necessarily judgmental adjustment but should 1) reflect an analyst's view of differential riskiness (in the context of a well-diversified international portfolio) and 2) reflect congruence with historical realized return differentials between markets that were then seasoned and those that were then developing.

Referring back to Exhibit 4 and integrating our view of the real (i.e., inflation-adjusted) equity discount rate with the sustainable dividend growth rates obtained from our macroeconomic framework, we can conclude that the currently observed 19.1 forward P/E ratio for Chinese equities is not unreasonable. As a further check, we note that a 19.1 P/E would be somewhat on the high side for seasoned US and European stock markets. However, reflecting much higher growth prospects over the next several decades, a much higher Chinese P/E ratio would be warranted (although the impact would be somewhat offset by a greater discount rate reflecting higher volatility in China) as compared with US and European markets.

Inherent in our analysis of equity composites is the difficulty of specifying precise price or P/E ratios at which a "buy" or "sell" recommendation is to be made. However, the strength of this kind of relative value approach is that, in a diversified portfolio context, investors can usually make reasonable decisions—at the margin—whether it is then appropriate to raise or lower market exposures relative to the investable universe in the aggregate. The price/value relationships prevailing at the date of the analysis were such that those investing on a fundamental basis should have a weighting in Chinese equities close to their baseline or normal-strategy allocation.[20] Stated differently, only those with a very optimistic long-term dividend growth rate forecast and/or a low required discount rate would find the Chinese market to have substantially better than average current attractiveness.

EXAMPLE 2

Equity Market Valuation Using Dividend Discount Models

1. The S&P China BMI Index on 30 September 2009 is 358. Forecasted 12-month earnings per share for the composite are 18.00 RMB, and the current annual dividend rate for the composite is 7.90 RMB. Assuming an 8.0 percent inflation-adjusted equity discount rate, a 30-year decline in dividend growth rates from an initial growth rate of 8.25 percent, and a terminal sustainable growth rate to perpetuity of 4.25 percent, compute the composite index price level implied by the H-Model (Equation 4). Next compute the justified P/E ratio implied by such price level.
2. Assuming the same annualized dividend rate of 7.90 RMB, using the Gordon growth model compute the discount rate required to reproduce the prevailing index level of 358 under different growth assumptions,

20 Which could, of course, be zero.

specifically assuming an 8 percent real growth rate of dividends to perpetuity, rather than a gradually slackening rate of growth as in Question 1. Evaluate the result.

3 Assuming the same information in Question 1, what would be the appropriate composite index price level and justified P/E ratio, if the period at which the 4.25 percent growth rate to perpetuity is reached A) at year 20, and B) at year 40?

Solution to 1:

The H-Model states that:

$$V_0 = \frac{D_0}{r - g_L}\left[(1 + g_L) + \frac{N}{2}(g_s - g_L)\right]$$

Inserting the information given, we get

$$V_0 = \frac{7.90}{0.08 - 0.0425}\left[(1 + 0.0425) + \frac{30}{2}(0.0825 - 0.0425)\right] = 346.02$$

Dividing this result by forecasted earnings of 18.00 produces a justified P/E ratio of 19.2.

Solution to 2:

The standard Gordon growth model states that:

$$V_0 = \frac{D_0(1 + g)}{r - g}$$

which can be rearranged as

$$r = \frac{D_0(1 + g)}{V_0} + g$$

Substituting in the given values, we obtain:

$$r = \frac{7.90(1 + 0.08)}{358} + 0.08 = 0.1038 \approx 10.4\%$$

This result, which assumes no slackening in core growth rates, produces an implied discount rate that appears unusually large relative to the prospects of other world equity markets. Given the ability of international portfolio reallocation, even on a constrained basis, capital market equilibrium does not seem consistent with a real equity discount to perpetuity rate almost twice that of mature equity markets. The implication is that Chinese market participants are pricing the index at a lower discount rate, consistent with other worldwide investment opportunities, but also with a more restrained long-term growth outlook relative to those growth rates expected over the next few years.

Solution to 3A:

Assuming an interim period of 20 years, Equation 4 produces:

$$V_0 = \frac{7.90}{0.08 - 0.0425}\left[(1 + 0.0425) + \frac{20}{2}(0.0825 - 0.0425)\right] = 303.89$$

and a P/E = 303.89 ÷ 18 = 16.9

Solution to 3B:

Assuming an interim period of 40 years, Equation 4 produces:

$$V_0 = \frac{7.90}{0.08 - 0.0425}\left[(1 + 0.0425) + \frac{40}{2}(0.0825 - 0.0425)\right] = 388.15$$

and a justified P/E = 388.15 ÷ 18 = 21.6

The possible criticisms of our approach should not be overlooked. From a practical perspective, there may be severe problems with the accuracy of data inputs. It is difficult enough to obtain macroeconomic data in developed countries with long-established methods and facilities. In developing markets or in economies experiencing profound governmental and structural change, such as the Eastern Bloc after the fall of the Berlin Wall, the problems of obtaining accurate and, more importantly, historically consistent, data are multiplied. The same fluidity in political and demographic fundamentals also calls into question whether companies' growth rates will track GDP growth rates. In certain instances, there can be long departures between growth rates, meaning that for long periods of time the share of corporate profits may be rising or declining relative to GDP.

The analysis in this reading has also focused on inflation-adjusted income, cash flow, and discount rates. In a global economy with reasonably robust currency exchange markets and where monetary growth is targeted to keep inflation at manageable levels, this is probably appropriate. However, hyperinflation, currency instability, and other trade disequilibria have occurred far too frequently from a historical perspective to be overlooked. In the presence of such factors, the confidence of our model's approach could be diminished.

EXAMPLE 3

Applying Valuation Methodology to a Developed Economy

In the following, assume that all growth and discount rates are stated in real terms.

1. Assume the Eurozone inflation-adjusted average growth in capital stock is 3.0 percent per annum into perpetuity. Long-term labor force growth is expected to remain stable at 0.0 percent, while TFP growth is projected to average 1.0 percent per annum over time. If the output elasticity of capital is 0.4 and the output elasticity of labor is 0.6, calculate the implied growth rate of Eurozone GDP.
2. The Dow Jones Euro Stoxx 50 Index is comprised of mature, large capital common equities domiciled in the Euro currency zone. At 30 September 2009 the index level stood at 2450. Forecasted 12-month dividends per share for the composite (net of withholding tax) are €125.00. Because of the mature nature of the economy and the particular market composite, you project that growth in both inflation-adjusted earnings and dividends will equal that of GDP. Using the Gordon constant dividend growth rate model solved for the discount rate, estimate the implied inflation-adjusted discount rate to perpetuity.

3 A Applying the Gordon growth model to value the DJ Euro Stoxx 50 Index, you assume that the appropriate discount rate to perpetuity should be 6.0 percent. If this assumption is correct, what is the fair value of the DJ Euro Stoxx 50 Index?

B As of the end of September 2009, the DJ Euro Stoxx 50 Index was trading almost 30 percent below its high of twelve months earlier. What is the likely major cause for the price decline?

Solution to 1:

In the context of Equation 1 from the text, total growth in GDP is:

$$\frac{\Delta Y}{Y} \approx \frac{\Delta A}{A} + \alpha\frac{\Delta K}{K} + (1-\alpha)\frac{\Delta L}{L}$$

Substituting the information given, the GDP growth rate is 2.2 percent, computed as follows:

$$\frac{\Delta Y}{Y} \approx 1.0\% + 0.4 \times 3.0\% + 0.6 \times 0.0\% = 2.2\%$$

Solution to 2:

The Gordon growth model can be rearranged as

$$r = \frac{D_1}{P_0} + g$$

Substituting in the given values for dividends, the index level, and our forecast for dividend growth, we obtain:

$$r = \frac{125}{2450} + 0.022 = 0.051 + 0.022 = 0.073 = 7.3\%$$

Solution to 3A:

The constant growth model gives us the following estimate of the fair value of the DJ Euro Stoxx 50:

$$V_0 = \frac{D_1}{r-g} = \frac{125}{0.06 - 0.022} = 3289$$

This estimate is more than 34 percent above the level observed at 30 September 2009.

Solution to 3B:

Given the mature nature of the underlying economic region and the companies in the composite, it is unlikely that the estimate of long-term, real dividend growth changed much, if at all. If the actual dividends paid also did not change much, the most likely major cause of the price decline is an increase in the discount rate over the period.

3 TOP-DOWN AND BOTTOM-UP FORECASTING

When it comes to predicting equity returns, analytical approaches can be divided into two major categories: top-down and bottom-up. In top-down forecasting, analysts use *macroeconomic* projections to produce return expectations for large stock market composites, such as the S&P 500, the Nikkei 225, or the FTSE 100. These can then

be further refined into return expectations for various market sectors and industry groups within the composites. At the final stage, such information can, if desired, be distilled into projected returns for individual securities.

By contrast, bottom-up forecasting begins with the *microeconomic* outlook for the fundamentals of individual companies. An analyst can use this information to develop predicted investment returns for each security. If desired, the forecasts for individual security returns can be aggregated into expected returns for industry groupings, market sectors, and for the equity market as a whole.

Exhibit 7 sets forth the manner in which top-down and bottom-up approaches are typically implemented. Top-down can be characterized as moving from the general to the specific, while bottom-up forecasting moves from the specific to the general. Depending on the investment strategy and portfolio context, one of the types of forecasting may be more suitable. In other instances, both types of forecasting may be useful. In those cases where both top-down and bottom-up are used, the additional work involved may provide valuable insights.

Exhibit 7 Comparison of Top-Down and Bottom-Up Analyses

Top-Down Analysis

- Market analysis: Examine valuations in different equity markets to identify those with superior expected returns.
  - Compare relative value measures for each equity market to their historical values to identify those markets where equities are relatively cheap or expensive.
  - Examine the trends in relative value measures for each equity market to identify market momentum.
  - Compare the expected returns for those equity markets expected to provide superior performance to the expected returns for other asset classes, such as bonds, real estate, and commodities.
- Industry analysis: Evaluate domestic and global economic cycles to determine those industries expected to be top performers in the best-performing equity markets.
  - Compare relative growth rates and expected profit margins across industries.
  - Identify those industries that will be favorably impacted by expected trends in interest rates, exchange rates, and inflation.
- Company analysis: Identify the best stocks in those industries that are expected to be top-performers in the best-performing equity markets.

Bottom-Up Analysis

- Company analysis: Identify a rationale for why certain stocks should be expected to outperform, without regard to the prevailing macroeconomic conditions.
  - Identify reasons why a company's products, technology, or services should be expected to be successful.
  - Evaluate the company's management, history, business model, and growth prospects.
  - Use discounted cash flow models to determine expected returns for individual securities.
- Industry analysis: Aggregate expected returns for stocks within an industry to identify the industries that are expected to be the best performers.
- Market analysis: Aggregate expected industry returns to identify the expected returns for every equity market.

3.1 Portfolio Suitability of Each Forecasting Type

In theory and practice, it is not necessary for either top-down or bottom-up forecasting to be carried to the final step shown for each method in Exhibit 7. For example, if a portfolio focuses primarily on tactical asset allocation among different market composites (and/or different industry groups within such composites), a top-down forecast may not need to focus all the way down to the relative merits of individual securities.

Likewise, there are instances where either the investment strategy or specific portfolio constraints dictate a focus primarily on individual security returns. In such instances, the unique factors pertaining to particular securities may render the need to study industry and market composite unnecessary. In such cases, the bottom-up method stops well short of the top. The partial application of each method is developed in the following examples.

EXAMPLE 4

Growth Model Questions

Explain whether top-down or bottom-up forecasting is more appropriate for each of the different investors.

1. The MegaCosmos Mutual Fund has a stated goal of investing in the stock market composites of developed country economies in North America, Western Europe, and Japan. Its return target is expressed in euros. The Fund may or may not hedge individual country currency returns depending on its outlook for foreign exchange rates. Furthermore, the Fund attempts to track individual country stock market composites while minimizing tracking error via the use of index baskets wherever possible.
2. EMF Advisers is a boutique firm that manages a dedicated portfolio of electric, gas, and water utility companies domiciled in the United States. The portfolio EMF oversees is, in turn, a small part of the American Pipefitters Union Pension Plan.
3. Bocage International is a hedge fund that actively bets on the relative attractiveness of stocks, interest rates, currencies, and commodities. Its investment in equities is limited to futures and options on exchange-traded equity indexes.
4. Alpha Bet Partnership is an investment vehicle featuring a US long/short overlay. Specifically, the partnership may keep short positions in US equities in an amount not to exceed 30 percent of the net value of the partnership. All short positions must be invested in US equities to maintain an overall beta of 1.0. The partnership hopes for the stocks it owns to outperform the stocks it has sold short in order to generate a respectable alpha. The partnership specifies that with the objective of minimizing tracking error, every stock sold short must be matched by a stock bought in the same industry.

Solution to 1:

MegaCosmos' ability to carry out its strategy will depend on its ability to forecast economic factors at a very "macro" scale. It would employ a top-down approach involving an examination of the economic strength of different international economies, different fiscal and tax policies among the governments involved, and international trade patterns and currency flows. MegaCosmos' desire to track underlying national markets quite closely means that its holdings will not diverge materially from the particular market composites selected. Individual

security selection will not be much of a focus, thereby minimizing the need for continuing the top-down analysis as low as individual market sectors, industry groups, or securities.

Solution to 2:

EMF Advisers' ability to carry out its strategy will depend on its ability to select among different securities within the very specific niche to which it has been assigned by the pension plan sponsor. As a result, bottom-up forecasting is most appropriate and probably no higher than the industry level in any great detail. The plan sponsor, however, will need to be concerned with top-down forecasting to determine the appropriate allocation to EMF's strategy.

Solution to 3:

Bocage's situation is very similar to that of MegaCosmos in Question 1, and top-down forecasting is thus appropriate. In Bocage's case, exposure to individual stocks is not permitted so the analysis need not be carried down to the level of industry groups or market sectors.

Solution to 4:

There are two parts to the answer for Alpha Bet. Because the underlying beta is targeted at 1.0, this portion of the strategy can be considered passive and very little or no top-down forecasting is required. In contrast, the remaining portion of the strategy, the long/short overlay, involves pure security selection on a "matched" or "paired trades" basis. Within each long/short combination, aggregate factors (global, market, industry) cancel each other out, because both long and short candidates must be matched to the same country, market, and industry. Only specific factors affecting each of the two paired companies matter. Therefore, a bottom-up forecast is necessary—and one that likely does not need to go above the level of individual securities.

3.2 Using Both Forecasting Types

When engaged in fundamental securities analysis, it can be wise to use both top-down and bottom-up forecasting. However, when we use both approaches, we often find ourselves in the situation of the person with two clocks, each displaying a different time. They may both be wrong, but they cannot both be right!

It is frequently the case that top-down and bottom-up forecasts provide significantly different results. In such instances, the analyst should investigate the underlying data, assumptions, and forecast methods before employing them as a basis for investment decisions. After all, if forecasts cannot be consistent with each other, at least one of them cannot be consistent with underlying reality.

Because we are fallible human beings, most forecasting discrepancies arise from our own limited knowledge, errors, and incomplete assumptions. Reconciling top-down and bottom-up forecasts is therefore a discipline that can help prevent us from taking inappropriate investment actions. In other words, most of the time, the aggregate market consensus will tend to be more accurate than the individual forecasts that comprise the consensus. The reconciling and revision process is therefore useful in helping us better understand the market consensus.

However, in rare and significant instances, we will find that carefully retracing the steps reveals a gap between the two forecast types that gives rise to significant market opportunities. In such instances, the process of reconciling the two types of forecasts creates instances where we differ significantly and correctly from the consensus.

Recent years have provided major examples of this. In the early 2000s, top-down forecasts provided much more subdued outlooks compared to bottom-up projections for corporate profits, both in the aggregate and for particular industries. In the tech area, both consumer and capital spending on computer equipment were below the projected sales growth that companies, and the analysts following them, were individually expecting. After all, individual companies were optimistic about their own prospects. However, in the aggregate, many of their technologies and products competed with each other. Thus, the success of some companies meant the failure of others, and this natural, competitive offsetting tendency was correctly reflected in aggregate, top-down sales growth for the industry.

Aggregating the bottom-up forecasts of individual companies, however, produced a wildly inflated forecast of both sales quantities and average prices and profit margins. Thus, the high-tech "bubble" originated from the mistaken principle that *all* the companies could be above average. For those who recognized the inconsistency of the top-down and bottom-up forecasts, and the accuracy of the top-down forecast, much of the carnage of the bubble collapse was avoided.

More recently, the collapse of equity markets in developed countries was a case where bottom-up forecasts proved their superiority over top-down approaches. In both the United States and the United Kingdom, some banking and real estate analysts perceived the excesses in residential real estate in a microeconomic sense. Those who pushed their analyses to a macro conclusion realized that certain large financial institutions were imperiled, particularly the highly levered Fannie Mae and Freddie Mac in the United States. Those who understood the pressure on these and other large financial institutions correctly foresaw that then-prevailing worldwide forecasts of economic activity and equity market returns were dramatically overstated.

3.3 Top-Down and Bottom-Up Forecasting of Market Earnings per Share

Two different methods are employed when estimating earnings for a market index, such as the S&P 500 Index. The first is to add up the individual estimates of the companies in the index. This is referred to as the bottom-up earnings estimate. The top-down estimate relies on forecasts for various macroeconomic variables and a model that fits these forecasts to past trends in aggregate earnings.

EXAMPLE 5

Comparing and Evaluating Top-Down and Bottom-Up Forecasts

Standard & Poor's July 2009 top-down and bottom-up forecasts for operating earnings per share appear in Exhibit 8. Note that the bottom-up forecasts are more optimistic than the top-down forecasts.

Exhibit 8 Standard & Poor's Forecasts: July 2009

Quarter Ending	Operating Earnings per Share (Estimates Are Bottom-Up)	Operating Earnings per Share (Estimates Are Top-Down)	Difference
31 Dec 2010	$20.39	$12.50	$7.89
30 Sep 2010	19.11	11.42	7.69
30 Jun 2010	18.00	11.18	6.82

Exhibit 8 (Continued)

Quarter Ending	Operating Earnings per Share (Estimates Are Bottom-Up)	Operating Earnings per Share (Estimates Are Top-Down)	Difference
31 Mar 2010	16.59	10.86	5.73
31 Dec 2009	16.25	11.72	4.53
30 Sep 2009	15.05	11.68	3.37
30 Jun 2009	14.06	11.05	3.01

The bottom-up projection starts from a June 2009 level of earnings that is some 27 percent above the top-down estimate. Furthermore, the annualized growth of estimated earnings over the subsequent 18 months is 28.1 percent for the bottom-up forecast and a much lower 8.6 percent for the top-down projection.

There are several possible reasons for the forecast discrepancies. First, the bottom-up estimates may be influenced by managers believing that their own company's earnings prospects are better than those for the economy as a whole.[21] This is simple human nature as confirmed by survey results, which consistently report that 85 percent of all drivers think they are better than average.

Alternatively, the bottom-up estimates may be correctly detecting signs of a cyclical economic and profit upturn. Most top-down models are of the econometric type and rely on historical relationships to be the basis for assumptions about the future. Thus, top-down models can be slow in detecting cyclical turns. This would be particularly true if the current statistical relationships between economic variables deviate significantly from their historic norms.

In short, the data indicate that we need to investigate both forecasts in greater detail. Without further analysis, we might be unable to distinguish whether the S&P 500 composite is overvalued, undervalued, or somewhere in between due to the disparity in the two earnings forecasts.

EXAMPLE 6

Earnings Forecast Revisions

The information in Exhibit 9 was collected from the Standard & Poor's website. Note that actual Q2 2008 EPS for the S&P 500 was $17.02. The percentages for the S&P 500 represent how much Q2 2009 EPS were expected to change from the Q2 2008 amount of $17.02 on a particular forecast date. For example, the estimate for Q2 2009 EPS on 30 September 2008 was that the year-over-year change would be an increase of 49.47 percent:

$$\$17.02(1 + 0.4947) \approx \$25.44$$

On 30 June 2009, the estimate for Q2 2009 EPS was that the year-over-year change would be a decrease of 17.38 percent:

$$\$17.02(1 - 0.1738) \approx \$14.06$$

21 For company EPS estimates, Darrough and Russell (2002) showed that bottom-up forecasts are systematically more optimistic than top-down forecasts. The authors contend this occurs because analysts rely heavily on management's assessment of future profitability and such estimates often are overly optimistic.

Similarly, the percentages for the various industry sectors noted in Exhibit 9 reflect how much Q2 2009 EPS were expected to change from the Q2 2008 amount on a particular forecast date. Exhibit 9 shows that earnings forecast revisions can be significant.

Exhibit 9 Revisions to Bottom-Up Estimates of Operating Earnings per Share Standard & Poor's Forecasts: July 2009

Q2 Estimates	9/30/2008	12/31/2008	3/30/2009	6/30/2009	7/7/2009
S&P 500	49.47%	17.04%	−12.82%	−17.38%	−17.42%
Consumer Discretionary	134.52%	72.02%	−40.30%	36.61%	36.61%
Consumer Staples	14.52%	12.88%	6.83%	2.96%	4.12%
Energy	16.91%	−17.06%	−43.35%	−65.11%	−65.11%
Financials	691.43%	450.48%	289.93%	297.10%	293.35%
Health Care	13.56%	10.41%	4.51%	3.06%	3.06%
Industrials	1.17%	−14.07%	−34.53%	−42.89%	−42.89%
Information Technology	24.12%	−5.04%	−28.02%	−26.31%	−26.31%
Materials	9.30%	−26.85%	−51.13%	−69.52%	−69.52%
Telecommunication Services	26.22%	6.67%	−9.77%	−5.64%	−5.44%
Utilities	14.61%	8.99%	−1.10%	−4.80%	−4.80%
S&P 500 EPS	$25.44	$19.92	$14.84	$14.06	$14.06

EXAMPLE 7

Bottom-Up and Top-Down Market EPS Forecasts

What considerations might encourage a market analyst to rely more on a top-down or bottom-up forecast of S&P 500 operating earnings?

Solution:

Bottom-up forecasts are based on consensus earnings estimates from equity research analysts covering the S&P 500 stocks. Top-down estimates are often based on econometric methods rather than fundamental analysis of the companies comprising the index.

Analysts frequently wait for information from the companies they follow to change their forecasts. Thus, bottom-up estimates may be more optimistic than top-down heading into a recession, and more pessimistic than top-down coming out. If the belief exists that companies are reacting slowly to changes in economic conditions, then a market analyst may prefer a top-down forecast.

However, top-down earnings forecasting models also have limitations. Most such models rely on the extrapolation of past trends in economic data. As a result, the impact of a significant contemporaneous change in a key economic variable or variables on the stock market may not be accurately predicted by the model. If the belief exists that the economy is on the brink of a significant change, then a market analyst may prefer the bottom-up forecast.

RELATIVE VALUE MODELS

4

Relative value investing is consistent with the popular trading maxim that investors should buy what is cheap and sell what is expensive. The relative value models presented in this section can be used to support the tactical asset allocation decision. They can help to identify times when investors would be well served switching from bonds to stocks, or vice-versa. As an investor, it is important to focus on the markets in a comparative fashion.

4.1 Earnings-Based Models

In its 22 July 1997 Humphrey-Hawkins report to Congress, the United States Federal Reserve compared 1982–1997 10-year Treasury note yields to the earnings yield of the S&P 500 and showed a very close correlation between the two. The **Fed model**, so named by Edward Yardeni of (at the time) Prudential Securities, was based primarily on the results of this report. However, use of the term "Fed model" is somewhat misleading as the model has never been formally adopted by the Federal Reserve as a policy-making tool.

The Fed model is a theory of equity valuation that hypothesizes that the yield on long-term US Treasury securities (usually defined as the 10-year T-note yield) should be equal to the S&P 500 earnings yield (usually defined as forward operating earnings divided by the index level) in equilibrium. Differences in these yields identify an overpriced or underpriced equity market. The model predicts:

- US stocks are undervalued if the forward earnings yield on the S&P 500 is greater than the yield on US Treasury bonds.
- US stocks are overvalued if the forward earnings yield on the S&P 500 is less than the yield on US Treasury bonds.

For example, if the S&P 500 forward earnings yield is 5 percent and the 10-year T-note yield is 4.5 percent, stocks would be considered undervalued according to the Fed model.

EXAMPLE 8

Fed Model with US Data

The difference between the S&P 500 earnings yield (based on forward operating earnings estimates) and the 10-year T-note yield for the time period January 1979 through December 2008 is presented in Exhibit 10.

The Fed model predicts that investors will be indifferent between investing in equities and investing in government bonds when the difference between the two yields is zero. Note that the average difference between the two yields was 0.70 percent during this time period. The positive difference between the two yields was at its greatest in December 2008. Thus, the model predicted that equities were significantly undervalued at that time, following the stock market sell-off during the second half of 2008. Similarly, the largest negative differences occurred prior to the collapse of the stock market bubbles in October 1987 and early 2000.

Exhibit 10 The Fed Model: Difference between the S&P 500 Forward Earnings Yield and Yield on 10-Year T-Note Monthly Data: January 1979–December 2008

Source: www.yardeni.com.

The key criticism of the Fed model is that it ignores the equity risk premium. (Informally, the **equity risk premium** is the compensation demanded by investors for the greater risk of investing in equities compared to investing in default-risk-free debt.) The validity of this criticism is apparent if one understands the assumptions necessary to derive the Fed model from the Gordon growth model. Equation 5 presents the Gordon growth model where V_0 is intrinsic value, D_1 is the dividend per share to be received one-year from today, r is the required return, and the constant annual dividend growth rate is g:

$$V_0 = \frac{D_1}{r - g} \tag{5}$$

Assuming markets correctly set price, P_0, equal to intrinsic value, then $P_0 = V_0$. The expected dividend, D_1, can be determined as the payout ratio, p, times expected earnings, E_1. Sustainable growth, g, can be estimated as return on equity, ROE, times the earnings retention rate, $(1 - p)$.

Substituting $D_1 = pE_1$ and $g = \text{ROE}(1 - p)$ into Equation 5 and noting that $P_0 = V_0$ we are able to derive Equation 6. Equation 6 provides a Gordon growth model estimate for the forward earnings yield, E_1/P_0:

$$\frac{E_1}{P_0} = \frac{r - \text{ROE}(1 - p)}{p} \tag{6}$$

The Fed model hypothesizes that the earnings yield, E_1/P_0, and the yield on Treasury bonds, y_T, are equal in equilibrium. One way to produce this equilibrium using Equation 6 is to assume that the required return, r, and the return on equity, ROE, are equal to the Treasury bond yield, y_T. Making these substitutions in Equation 6 shows this result:

$$\frac{E_1}{P_0} = \frac{r - \text{ROE}(1-p)}{p} = \frac{y_T - y_T(1-p)}{p} = y_T \tag{7}$$

Thus, implicit in the Fed model equilibrium are the assumptions that the required return, r, and the accounting rate of return on equity, ROE, for risky equity securities are equal to the Treasury bond yield, y_T. Historical evidence and financial theory resoundingly reject the notion that either assumption is true. For example, the long-run average return on US equities has exceeded the long-run average return on T-bonds by a significant amount.[22] Because of this, many analysts consider the Fed model flawed.

Two additional criticisms of the Fed model are that it ignores inflation and earnings growth opportunities. Asness (2003) criticized the Fed model because it compares an arguably real variable, the earnings yield, to a nominal variable, the T-bond yield. According to this argument, the earnings yield is real because it is a ratio of current period prices.[23] The T-bond yield is nominal because it is reflective of the expected rate of inflation as first noted by Fisher (1930). In the presence of inflation, investors should compare the earnings yield with a real interest rate. Asness provides evidence that the Fed model has often been a poor predictor of future equity returns.

Another criticism of the Fed model is that it ignores any earnings growth opportunities available to equity holders beyond those forecasted for the next year (as reflected by expected earnings, E_1). In the United States, long-term compound average earnings growth has been 3–4 percent nominal and 1–2 percent real.[24] Thus, the model ignores a significant portion of total equity return.[25]

In spite of the several criticisms, the Fed model still can provide some useful insights. It does suggest that equities become more attractive as an asset class when interest rates decline. This is consistent with the predictions of any discounted cash flow model and is supported by market evidence. In practice, the model typically makes use of expected earnings (a future cash flow) as an input, which is again consistent with traditional discounted cash flow analysis.

Some analysts find a comparison of the earnings yield and Treasury bond yield to be most useful when the relationship is towards the extremes of its typical range. For example, some analysts compare the current difference between the earnings yield and the Treasury bond yield with the historical average difference. Stocks are viewed as more attractive as an investment when the current period difference significantly exceeds the historical average difference.

---

22 Bodie, Kane, and Marcus (2007) show that the geometric average annual return on US large capitalization stocks was 10.23 percent over the 1926 to 2003 time period. The geometric average annual return on long-term Treasury bonds was 5.10 percent during this same time period.

23 Wilcox (2007) and Palkar and Wilcox (2009) note that accounting and debt adjustments must be made to GAAP-based reported earnings before they can be considered real.

24 Based on a dataset maintained by Professor Shiller (www.econ.yale.edu/~shiller/data.htm), the compound (geometric mean) annual earnings growth rate was 3.52% from 1872–2008. In the more recent shorter term, the growth rate has been higher: from 1990–2008, the rate was 3.55%, but stopping at 2007 (i.e., from 1990–2007), reflecting an unusually long-period of sustained growth, it was 6.89%. The long-run rate is probably most appropriate here.

25 The required return on equity for a no-growth company that pays all of its earnings out as dividends is the earnings yield (based on a constant EPS).

EXAMPLE 9

Fed Model with UK Data

The Fed model can be applied to the valuation of non-US equity markets. In early 2009, the Fed model produced a very bullish prediction for British stocks. The forecasted earnings yield on the FTSE 100 was 10.1 percent and the yield on 10-year UK government debt was 3.6 percent. The difference between these yields was much greater than the long-term average, according to Citigroup data, of 4.5 percent.

Analysts should always question the inputs to any valuation model. Reasonable questions for these results include "Can the government bond yield be expected to rise?" and "Can the forecast for earnings be expected to decline?" Most would likely agree that the latter question was of greater concern in early 2009.

EXAMPLE 10

Fed Model Questions

1. Assume the S&P 500 forward earnings yield is 5 percent and the 10-year T-note yield is 4.6 percent. Are stocks overvalued or undervalued according to the Fed model?
2. Why might the earnings yield be considered a poor measure for the true worth of equities?

Solution to 1:

According to the Fed model, stocks are undervalued because the forward S&P 500 earnings yield exceeds the 10-year T-note yield. However, recall from Example 8 that the average difference between the S&P 500 earnings yield and the 10-year T-note yield for the time period January 1979–December 2008 was 0.70 percent. In this question, the difference between the two yields is 0.40 percent. Analysts who compare the difference in yields to this average difference would contend that equities are overvalued.

Solution to 2:

The forward earnings yield measure used in the Fed model to assess the worth of equities fails to accurately capture the long-term growth opportunities available to equity investors. Although studies show that the dividend yield has been the major determinant of long-term equity returns, the impact of earnings growth has been significant and arguably should not be ignored.

The **Yardeni model** addresses some of the criticisms of the Fed model. In creating the model, Yardeni (2002) assumed investors valued earnings rather than dividends. With the assumption that markets set price equal to intrinsic value, $P_0 = V_0$, a constant growth valuation model that values earnings is presented in Equation 8. E_1 is an estimate of next year's earnings, r is the required return, and g is the earnings growth rate. Equation 8 shows that, given the assumptions of the model, the earnings yield, E_1/P_0, is equal to the required return, r, minus the growth rate, g.

$$P_0 = \frac{E_1}{r - g} \Rightarrow \frac{E_1}{P_0} = r - g \tag{8}$$

As a data input for the required return, r, Yardeni used the Moody's A-rated corporate bond yield, y_B, which allowed for risk to be incorporated into the model. The risk premium captured by the model, however, is largely a default risk premium (the credit spread between the A-rated bond, y_B, and the yield on a Treasury bond, y_T), not the unobservable equity risk premium. Thus, while an improvement over the Fed model, the Yardeni model still does not fully capture the risk of equities.

As an input for the growth rate, g, Yardeni used the consensus five-year earnings growth forecast for the S&P 500 from Thomson Financial, LTEG. Note that g is truly a perpetual or sustainable growth rate and that a five-year forecast for growth may not be sustainable.

The Yardeni model introduces an additional variable, the coefficient d. It represents a weighting factor measuring the importance the market assigns to the earnings projections. Yardeni (2000) found that the historical values for d averaged about 0.10.[26] However, depending on market conditions, d can vary considerably from its historical average. Equation 9 presents the Yardeni model stated as the justified (forward) earnings yield on equities.

$$\frac{E_1}{P_0} = y_B - d \times \text{LTEG} \tag{9}$$

A justified forward earnings yield that is below, equal to, or greater than the forward earnings yield value implied by current equity market index values (using consensus forward earnings estimates, for example) would indicate that equities are undervalued, fairly valued, or overvalued in the marketplace. A valuation judgment can also be made by using Equation 9 solved for P_0, which gives the Yardeni model expression for the fair value of the equity market: $E_1/(y_B - d \times \text{LTEG})$. The judgment would be that the equity market is undervalued, fairly valued, or overvalued if the fair value estimate is above, equal to, or below the current equity market level. Example 11 shows such an analysis.

EXAMPLE 11

The Yardeni Model (1)

Exhibit 11 presents in logarithmic ("log") scale the actual S&P 500 Index and a fair value estimate of the S&P 500 using the Yardeni model assuming $d = 0.10$. The time period is January 1985 to December 2008.

As Exhibit 12 shows, the Yardeni model predicted the S&P 500 was undervalued by 39.25 percent in December 2008. The Yardeni model also did a good job predicting the overvaluation and subsequent pullbacks of October 1987 and the early 2000s. However, the model signaled the equity market was significantly undervalued in 2007 even though US and other world equity markets collapsed dramatically in the wake of a major financial crisis.

26 Note that rearranging the terms in Equation 9 so that they produce a formula for d results in $d = \dfrac{y_B - \dfrac{E_1}{P_0}}{\text{LTEG}}$. Thus, historical values for d can be estimated from market data.

Exhibit 11 S&P 500 Index and Fair Value Estimate Using Yardeni Model with *d* = 0.10 (Log Scale) Monthly Data: January 1985–December 2008

Source: www.yardeni.com.

Exhibit 12 Overvaluation (+) and Undervaluation (–) of S&P 500 Index versus Fair Value Estimate Using Yardeni Model with *d* = 0.10 Monthly Data: January 1985–December 2008

Source: www.yardeni.com.

EXAMPLE 12

The Yardeni Model (2)

1. Assume the Moody's A-rated corporate bond yield is 6.49 percent and the forecast for long-term earnings growth is 11.95 percent. Determine the Yardeni model estimate of the fair value earnings yield assuming d = 0.05 and d = 0.10. Are equities overvalued or undervalued if the S&P 500 earnings yield is 5.5 percent?
2. Assume the Moody's A-rated corporate bond yield is 6.32 percent and the forecast for long-term earnings growth is 11.5 percent. Determine the Yardeni model estimate of the fair value price–earnings (P/E) ratio assuming d = 0.10. When would equities be undervalued? When would equities be overvalued?
3. **A** Indicate the directional relationship predicted by the Yardeni model between changes in y_B, LTEG, and d and changes in the earnings yield.
   B Indicate the directional relationship predicted by the Yardeni model between changes in y_B, LTEG, and d and changes in the P/E ratio.

Solution to 1:

For d = 0.05: 0.0649 − 0.05(0.1195) ≈ 0.0589 ≈ 5.89% is the Yardeni model estimate. Equities are overvalued as 5.5% < 5.89%.

For d = 0.10: 0.0649 − 0.10(0.1195) ≈ 0.0530 ≈ 5.30% is the Yardeni model estimate. Equities are undervalued as 5.5% > 5.30%.

Solution to 2:

P/E is the reciprocal of the earnings yield. The Yardeni estimate of the fair value P/E ratio would be 1 ÷ [0.0632 − 0.10(0.115)] or approximately 19.3. Stocks would be undervalued if the actual P/E ratio for the S&P 500 is less than 19.3. Stocks would be overvalued if the actual P/E ratio for the S&P 500 is greater than 19.3.

Solution to 3A:

Increases in y_B and decreases in d and LTEG produce higher fair value estimates of the earnings yield.

Solution to 3B:

Decreases in y_B and increases in d and LTEG produce higher fair value estimates of the P/E ratio.

Examples 11 and 12 were taken from US equity markets. To date, nearly all analysis using the Yardeni model has been limited to the US equity market. If adequate data are available, especially for forecasted earnings growth, the Yardeni model could be applied in any equity market.

Campbell and Shiller's (1998, 2005) 10-year Moving Average Price/Earnings, more commonly known as the **Cyclically Adjusted P/E Ratio (CAPE)**, has become a popular measure of market valuation. The authors defined the numerator of CAPE as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings. "Real" denotes that the stock index and earnings are adjusted for inflation using the Consumer Price Index (CPI). The purpose of the 10-year moving average of real reported earnings is to control for business cycle effects on earnings and is based on recommendations from the seminal Graham and Dodd (1934) text.

EXAMPLE 13

Determining CAPE: A Historical Exercise

For the purpose of illustrating the calculation of CAPE one can use data from any period. Exhibit 13 is a historical exercise showing the calculation of CAPE for US equities as of 1881. The real stock price index and real earnings are priced in 2009 US dollars and are determined using the January 2009 CPI value of 211.143. Note that:

$$\text{Real stock price index}_t = \text{Nominal stock price index}_t \times \text{CPI}_{2009} \div \text{CPI}_t$$
$$\text{Real earnings}_t = \text{Nominal earnings}_t \times \text{CPI}_{2009} \div \text{CPI}_{t+1}$$

$$\begin{aligned}\text{Real stock price index}_{1871} &= 4.44 \times 211.143 \div 12.464061\\ &= 75.21424358\\ \text{Real earnings}_{1871} &= 0.4 \times 211.143 \div 12.654392\\ &= 6.674141278\end{aligned}$$

The CAPE in 1881 of 18.21479737 is the real stock price index in 1881 of 138.7532563 divided by average real earnings from 1871 to 1880 of 7.617611851.

$$\begin{aligned}\text{Average real earnings}_{1871\rightarrow1880} &= (6.674141278 + \ldots + 10.9836988) \div 10\\ &= 7.617611851\end{aligned}$$

$$\begin{aligned}\text{CAPE}_{1881} &= 138.7532563 \div 7.617611851\\ &= 18.21479737\end{aligned}$$

Exhibit 13 Determining CAPE in 1881[27]

Year	Stock Price Index (January)	Earnings Accruing to Index	Consumer Price Index	Real Stock Price Index	Real Earnings	CAPE
1871	4.44	0.40	12.464061	75.21424358	6.674141278	
1872	4.86	0.43	12.654392	81.09081653	7.016448545	
1873	5.11	0.46	12.939807	83.38151643	7.852421105	
1874	4.66	0.46	12.368896	79.54843989	8.436439183	
1875	4.54	0.36	11.5126510	83.26398672	7.007878524	
1876	4.46	0.28	10.8465750	86.81982838	5.403166224	
1877	3.55	0.30	10.9417400	68.50442891	6.863396587	
1878	3.25	0.31	9.2290893	74.35346302	7.907328567	
1879	3.58	0.38	8.2776793	91.31689120	8.031199688	

27 The number of decimal places shown reflects the precision given in the Shiller dataset referenced.

Exhibit 13 (Continued)

Year	Stock Price Index (January)	Earnings Accruing to Index	Consumer Price Index	Real Stock Price Index	Real Earnings	CAPE
1880	5.11	0.49	9.9903306	107.99850110	10.983698800	
1881	6.19	0.44	9.4194198	138.75325630		18.21479737

Source: www.econ.yale.edu/~shiller/data.htm.

Real earnings in 1880 exceeded the 10-year moving average by a considerable amount, and this is a typical result. This discrepancy undoubtedly reflects the real growth in corporate earnings. If some smoothing for business cycle effects is necessary, the case can be made that it would be better to compute a moving average of the P/E ratio (current period price divided by current period earnings).

Many analysts believe that CAPE should be considered a mean-reverting series. Exhibit 14 presents CAPE from January 1881 to January 2009. The mean value of CAPE for this time period was 16.3 and the January 2009 CAPE was 15.8, suggesting the US equity market was slightly undervalued at that time. The highest value for CAPE was 42.5 in 2000, and the lowest value for CAPE was 5.3 in 1921.

Campbell and Shiller (1998, 2005) made the case that the US equity market was extremely overvalued in the late 1990s and provided evidence that future 10-year real price growth was negatively related to CAPE. Exhibit 15 updates the Campbell-Shiller results through 2009. Each plotted data point represents an annual observation for real price growth for the next 10 years and CAPE for that same year. A trend line is plotted and shows the ordinary least squares regression relationship between 10-year real price growth and CAPE.

The table in the upper right-hand corner of Exhibit 15 shows the predicted 10-year real price growth given some value for the explanatory variable CAPE. The regression results predict that 10-year real price growth will be 17.9 percent given the January 2009 CAPE of 15.8. The R-squared for the regression is 0.1488, which indicates that CAPE explains only 14.88 percent of the variation in 10-year real price growth. Furthermore, the traditional regression statistics for this regression are unreliable because of the serial correlation induced by the overlapping time periods used to compute returns.

Exhibit 14 CAPE Annual Data: 1881–2009

Source: www.econ.yale.edu/~shiller/data.htm.

With a 10-year projected real price growth of 17.9 percent, the annualized growth rate is less than 1.7 percent per year. Given a dividend yield of about 2.9 percent and assuming share repurchases effectively add 1 percent to the annual real cash flow to shareholders, the inflation-adjusted expected return would be approximately 5.6 percent, which is below the 6–7 percent compounded average inflation-adjusted return over long periods in the United States (Siegel 2005). Thus, in contrast to the Fed model and the Yardeni model, the Campbell and Shiller model implies below-average prospective returns.

The conflicting signals between and among various valuation models may provide valuable insights, especially if they cause us to rethink how the parameter estimates and the numerical inputs give rise to the different results. For example, assume that changes in accounting rules lead to significant differences in how earnings are reported over time. Thus, the CAPE at some given point in time might not be comparable with other time periods. A high or low CAPE relative to the long-term average at present could be due to differences in prior accounting rules, thereby resulting in stocks actually being more undervalued or overvalued than they currently appear.

Exhibit 15 CAPE and Predicted 10-Year Real Price Growth

Source: www.econ.yale.edu/~shiller/data.htm.

EXAMPLE 14

CAPE Questions

1 What adjustments are made to earnings in determining CAPE?

2 Assume CAPE reached an all-time high of 42.5 in 2000. Use the regression results in Exhibit 15 to determine predicted real price growth for the time period 2000–2009.

Solution to 1:

Following Graham and Dodd, Campbell and Shiller averaged earnings over a 10-year time period. Their goal was to normalize earnings by providing an estimate of what earnings would be under mid-cyclical conditions. The implicit assumption is that the typical business cycle lasts 10 years.

Campbell and Shiller also control for inflation by adjusting past earnings to current period dollars using the Consumer Price Index.

Solution to 2:

10-year Real price growth = $-0.0366 \times 42.5 + 0.7569 = -0.7986 = -79.86\%$.

4.2 Asset-Based Models

Tobin's *q* ratio, pioneered in Brainard and Tobin (1968) and Tobin (1969), is an asset-based valuation measure. Tobin's q has been used for several purposes, including decision-making concerning physical capital investment and equity market valuation. The first application is the simplest: At the company level, Tobin's q is calculated as the market value of a company (i.e., the market value of its debt and equity) divided by the replacement cost of its assets. According to economic theory, Tobin's q is approximately equal to 1 in equilibrium. If it is greater than 1 for a company, the marketplace

values the company's assets at more than their replacement costs, so additional capital investment should be profitable for the company's suppliers of financing. By contrast, a Tobin's q below 1 indicates that further capital investment is unprofitable.

Tobin's q has also been calculated at an overall market level. In that case, the denominator involves an estimate of the replacement cost of aggregate corporate assets, and the numerator involves estimates of aggregate equity and debt market values. Some analysts have used a market-level Tobin's q to judge whether an equity market is misvalued. This application involves a comparison of the current value of market-level Tobin's q with its presumed equilibrium value of 1 or with its historical mean value. Assuming that Tobin's q will revert to the comparison value, a Tobin's q below, at, or above the comparison values is interpreted as the market being undervalued, fairly valued, or overvalued. Strong economic arguments exist that both Tobin's q and equity q, discussed later, should be mean-reverting series.

The calculation of Tobin's q often poses difficulties. At the company level, it is usually possible to get a fairly accurate estimate of market value (the numerator of Tobin's q) by summing the values of the securities a company has issued, such as its stocks and bonds. It is much more difficult to obtain an accurate estimate of replacement costs of the company's assets (the denominator of Tobin's q). Liquid markets for many assets (e.g., many kinds of industrial equipment) do not exist. Moreover, such items as human capital, trade secrets, copyrights and patents, and brand equity are intangible assets that are often difficult to value. Typically, researchers who try to construct Tobin's q ignore the replacement cost of intangible assets in their calculations.

Smithers and Wright (2000) created an **equity *q*** that is the ratio of a company's equity market capitalization divided by net worth measured at replacement cost. Their measure differs from the price-to-book value ratio because net worth is based on replacement cost rather than the historic or book value of equity. Based on a market-level equity q, Smithers and Wright made the case that the US equity market was extremely overvalued in the late 1990s. The principles of that application parallel those given for Tobin's q.

To date, much of the market-level analysis using Tobin's q or equity q has been conducted in the US equity market, but analysis based on European and Asian equity markets is increasingly available.

EXAMPLE 15

Market-Level Analysis of Tobin's *q* and Equity *q*

Data from which Tobin's q and equity q can be calculated are published in the *Flow of Funds Accounts of the United States-Z.1*, published quarterly by the Federal Reserve.[28] This data source is available from 1952 onwards. Below are data for Nonfarm Nonfinancial Corporate Business for the fourth quarter of 2008 (billions of US dollars). Based on this data, determine Tobin's q and equity q.

Assets at Market Value or Replacement Cost	Liabilities	Market Value of Equities Outstanding
28,277.33	12,887.51	9,554.05

Source: www.federalreserve.gov/releases/z1/.

28 Specifically, the data currently appear in Table B.102 of that publication.

Solution:

Tobin's q = (12,887.51 + 9,554.05) ÷ 28,277.33 = 0.793623726

Equity q = 9,554.05 ÷ (28,277.33 – 12,887.51) = 0.620803232

Using this data, the long-term average for Tobin's q and equity q are both significantly below 1.0. Smithers and Wright suggest this is due to the true economic rate of depreciation being underestimated, which leads to the replacement cost of assets being overstated. Such overstatement means that the denominator in both formulations of the q ratio is too high and that the correctly measured ratios should be much higher.

Exhibit 16 presents quarterly Tobin's q data and quarterly equity q data for the US equity market over the time period 1952 to 2008. Last quarter 2008 values for these two variables relative to their respective means suggest that the US equity market was slightly undervalued at that time. However, both series had declined to significantly lower levels relative to their means in the early 1950s and early 1980s.

Exhibit 16 Equity *q* and Tobin's *q* Quarterly Data: (1952 Q1 to 2008 Q4)

Source: www.federalreserve.gov/releases/z1/.

EXAMPLE 16

Tobin's *q* and Equity *q*

1 Why should Tobin's q be expected to mean revert?

2 How does equity q differ from the price-to-book ratio?

Solution to 1:

If Tobin's q is greater than 1.0, then the market is valuing a company at more than it costs to replace its assets. Either security prices must fall or the company should continue to invest in new assets until the ratio returns to its equilibrium. If Tobin's q is below 1.0, then security prices are undervalued because new businesses cannot be created as cheaply as they can be bought in the open market. Either security prices must rise or the company should sell some of its assets until the ratio returns to its equilibrium.

Solution to 2:

Book value in the price-to-book ratio reflects the value of equity that is reported on the company's balance sheet. The denominator of equity q reflects the difference between the replacement cost of assets and the market value of liabilities. Most financial reporting standards require the use of acquisition cost as a measure of asset value. Thus, the book value of assets is typically less than their replacement cost, and this is particularly true during periods of rising prices.

A summary of the relative value models appears in Exhibit 17.

Exhibit 17 Summary of Relative Value Models

Model	Predictions of the Model	Strengths	Limitations
Fed model	The equity market is undervalued if its earnings yield exceeds the yield on government securities.	■ Easy to understand and apply. ■ Consistent with discounted cash flow models that show an inverse relationship between value and the discount rate.	■ Ignores the equity risk premium. ■ Compares a real variable to a nominal variable. ■ Ignores earnings growth.
Yardeni model	Equities are overvalued if the fair value estimate of the earnings yield provided by the model exceeds the actual earnings yield for the market index.	■ Improves on the Fed model by including the yield on risky debt and a measure of expected earnings growth as determinants of value.	■ Risk premium captured by the model is largely a default risk premium that does not accurately measure equity risk. ■ The forecast for earnings growth may not be accurate or sustainable. ■ The estimate of fair value assumes the discount factor investors apply to the earnings forecast remains constant over time.

Exhibit 17 (Continued)

Model	Predictions of the Model	Strengths	Limitations
CAPE	Future equity returns will be higher when CAPE is low.	■ Controls for inflation and business cycle effects by using a 10-year moving average of real earnings. ■ Historical data supports an inverse relationship between CAPE and future equity returns.	■ Changes in the accounting methods used to determine reported earnings may lead to comparison problems. ■ Current period or other measures of earnings may provide a better estimate for equity prices than the 10-year moving average of real earnings. ■ Evidence suggests that both low and high levels of CAPE) can persist for extended periods of time.
Tobin's q and equity q	Future equity returns will be higher when Tobin's q and equity q are low.	■ Both measures rely on a comparison of security values to asset replacement costs (minus the debt market value, in the case of equity q); economic theory suggests this relationship is mean-reverting. ■ Historical data supports an inverse relationship between both measures and future equity returns.	■ It is difficult to obtain an accurate measure of replacement cost for many assets because liquid markets for these assets do not exist and intangible assets are often difficult to value. ■ Evidence suggests that both low and high levels of Tobin's q and equity q can persist for extended periods of time.

EXAMPLE 17

Questions Regarding the Relative Value Models

1. Which of the models ignore the current level of market interest rates as determinants of equity market value?
2. Under what conditions might the Fed model and Yardeni model provide a different assessment of the value of the equity market?
3. Which of the models use some measure of earnings as an input? How might this lead to comparison issues?

Solution to 1:

In assessing equity market value, CAPE, Tobin's q, and equity q are typically compared to their long-term averages and not to market interest rates. While the Yardeni model compares the fair value earnings yield predicted by the model to the actual earnings yield, the A-rated corporate bond yield is an input to the model.

Solution to 2:

The Fed model compares the earnings yield to the Treasury bond yield. The Yardeni model uses the A-rated corporate bond yield and the consensus 5-year earnings growth forecast to determine a fair value earnings yield. One scenario in which the two models might differ in their predictions would be if the default

risk premium on the A-rated corporate bond was currently high, the Treasury bond yield was currently low, and earnings were forecasted to grow at a slow rate. Given these assumptions, the Fed model might indicate that equities are undervalued while the Yardeni model indicates equities are overvalued.

Solution to 3:

The Fed model, Yardeni model, and CAPE all use some measure of earnings as a determinant of value. Time series comparisons will be problematic if the accounting methods used to determine earnings change over time.

SUMMARY

In this reading, we have investigated several ways in which economic theory can be applied to the valuation of equity markets. Among the major points are the following:

- The growth accounting equation allows one to decompose real GDP growth, $\Delta Y/Y$, into components that can be attributed to the observable factors: the growth of the capital stock, $\Delta K/K$, the output elasticity of capital, α, the growth in the labor force, $\Delta L/L$, the output elasticity of labor, $1 - \alpha$, and a residual factor—often called the Solow residual—that is the portion of growth left unaccounted for by increases in the standard factors of production, $\Delta A/A$.

$$\frac{\Delta Y}{Y} \approx \frac{\Delta A}{A} + \alpha\frac{\Delta K}{K} + (1-\alpha)\frac{\Delta L}{L}$$

- The existence of TFP growth, $\Delta A/A$, means that total output can grow at a faster rate than would be predicted simply from growth in accumulated capital stock and the labor force. TFP is typically linked to innovation and technical progress. However, changes in work organization, government regulation, and the literacy and skills of the workforce, as well as many other factors, also affect TFP.
- The inputs for the H-model include the initial growth rate, g_S, a period of years, N, where the dividend growth rate declines in a linear fashion, and a long-term dividend growth rate, g_L, that is expected to prevail to perpetuity beginning at the end of period N. With an initial annualized dividend rate D_0 and a discount rate to perpetuity of r, the formula for intrinsic value, V_0, according to the H-model is:

$$V_0 = \frac{D_0}{r - g_L}\left[(1 + g_L) + \frac{N}{2}(g_S - g_L)\right]$$

- In top-down forecasting, analysts use macroeconomic forecasts to develop market forecasts and then make industry and security forecasts consistent with the market forecasts. In bottom-up forecasting, individual company forecasts are aggregated to industry forecasts, which in turn are aggregated to produce a market forecast.
- Bottom-up forecasts tend to be more optimistic than top-down forecasts. Top-down models can be slow in detecting cyclical turns if the current statistical relationships between economic variables deviate significantly from their historic norms.

- The Fed model is a theory of equity valuation that hypothesizes that the yield on long-term US Treasury securities (usually defined as the 10-year T-note yield) should be equal to the S&P 500 earnings yield (usually defined as forward operating earnings divided by the index level) in equilibrium.
- A common criticism of the Fed model equilibrium is that it fails to incorporate the equity risk premium. The earnings yield can also be a poor measure of the true value of equities if significant growth opportunities exist. Some authors have also argued that the Fed model comparison is flawed because the earnings yield is real while the Treasury yield is nominal.
- The Yardeni model addresses some of the criticisms of the Fed model. As inputs, Yardeni used the Moody's A-rated corporate bond yield, y_B, the consensus five-year earnings growth forecast for the S&P 500 from Thomson Financial, LTEG, and the coefficient d, which represents a weighting factor measuring the importance the market assigns to the earnings projections. Yardeni found that the historical values for d averaged about 0.10. The formula for the Yardeni model is:

$$\frac{E_1}{P_0} = y_B - d \times \text{LTEG}$$

- Limitations of the Yardeni model include that the risk premium captured by the model is largely a default risk premium and not the future equity risk premium, which is unobservable. Also, the consensus five-year earnings growth forecast for the S&P 500 from Thomson Financial may not be sustainable, and evidence suggests that the weighting factor varies significantly over time.
- Campbell and Shiller's CAPE has become a popular measure of market valuation. The numerator of CAPE is the real S&P 500 and the denominator is the moving average of the preceding 10 years of real reported earnings. "Real" denotes that the stock index and earnings are adjusted for inflation using the Consumer Price Index (CPI). The purpose of the 10-year moving average of real reported earnings is to control for business cycle effects on earnings and is based on recommendations from the seminal work of Graham and Dodd.
- Tobin's q is calculated at the individual company level as the market value of a company divided by the replacement cost of its assets. Smithers and Wright created an equity q that is the ratio of a company's market capitalization divided by net worth measured at replacement cost. Market-level measures may be computed for Tobin's q and equity q by a process of aggregation; these market-level measures may be used to form a valuation judgment about an equity market. Assuming that Tobin's q will revert to the comparison value, a Tobin's q below, at, or above the comparison value is interpreted as the market being under-, fairly, or overvalued. Strong economic arguments exist that both Tobin's q and equity q should be mean-reverting series.
- In practice, estimating replacement cost can be problematic due to the lack of liquid markets for many assets. Moreover, such items as human capital, trade secrets, copyrights and patents, and brand equity are intangible assets that are difficult to value.

REFERENCES

Arnott, Robert D. 2004. "The Meaning of a Slender Risk Premium." *Financial Analysts Journal*, vol. 60, no. 2:6–8.

Arnott, Robert D., and Peter L. Bernstein. 2002. "What Risk Premium is 'Normal'?" *Financial Analysts Journal*, vol. 58, no. 2:64–85.

Asness, Clifford S. 2003. "Fight the Fed Model." *Journal of Portfolio Management*, vol. 30, no. 1:11–24.

Bodie, Zvi, Alex Kane, and Alan Marcus. 2007. *Essentials of Investments*, 6th Edition. New York: McGraw-Hill Irwin.

Brainard, William C., and James Tobin. 1968. "Pitfalls in Financial Model Building." *American Economic Review*, vol. 58, no. 2:99–122.

Campbell, John Y., and Robert J. Shiller. 1998. "Valuation Ratios and the Long-Run Stock Market Outlook." *Journal of Portfolio Management*, vol. 24, no. 2:11–26.

Campbell, John Y., and Robert J. Shiller. 2005. "Valuation Ratios and the Long-Run Stock Market Outlook: An Update." *Behavioral Finance II*. Edited by R. Thaler. New York: Russell Sage Foundation.

Cobb, C.W., and Paul H. Douglas. 1928. "A Theory of Production." *American Economic Review*, vol. 18, no. Supplement:139–165.

Darrough, Masako N., and Thomas Russell. 2002. "A Positive Model of Earnings Forecasts: Top Down versus Bottom Up." *Journal of Business*, vol. 75, no. 1:127–152.

Fisher, Irving. 1930. *The Theory of Interest: As Determined by Impatience to Spend Income and Opportunity to Invest It*. New York: Macmillan Company.

Fuller, Russell J., and Chi-Cheng Hsia. 1984. "A Simplified Common Stock Valuation Model." *Financial Analysts Journal*, vol. 40, no. 5:49–56.

Graham, Benjamin, and David L. Dodd. 1934. *Security Analysis*. New York: McGraw-Hill.

Ibbotson, Roger G., and Rex A. Sinquefield. 1989. *Stocks, Bonds, Bills, and Inflation: Historical Returns (1926–1987)*. Chicago: Dow-Jones Irwin.

Ibbotson, Roger G., Jeffrey J. Diermeier, and Laurence B. Siegel. 1984. "The Demand for Capital Market Returns: A New Equilibrium Theory." *Financial Analysts Journal*, vol. 40, no. 1:22–33.

Mehra, Rajnish. 2003. "The Equity Premium: Why Is It a Puzzle?" *Financial Analysts Journal*, vol. 59, no. 1:54–69.

Mehra, Rajnish, and Edward C. Prescott. 1985. "The Equity Risk Premium: A Puzzle." *Journal of Monetary Economics*, vol. 15, no. 2:145–162.

Palkar, Darshana, and Stephen E. Wilcox. 2009. "Adjusted Earnings Yields and Real Rates of Return." *Financial Analysts Journal*, vol. 65, no. 5:66–79.

Preston, R. 2009. "China's Foreign Reserves Top $2tn." *BBC News*, 15 July 2009.

Siegel, Jeremy J. 1992. "The Equity Premium: Stock and Bond Returns Since 1802." *Financial Analysts Journal*, vol. 48, no. 1:28–38.

Siegel, Jeremy J. 2005. "Perspectives on the Equity Risk Premium." *Financial Analysts Journal*, vol. 61, no. 6:61–73.

Smithers, Andrew, and Stephen Wright. 2000. *Valuing Wall Street*. New York: McGraw-Hill.

Solow, Robert. 1957. "Technical Change and the Aggregate Production Function." *The Review of Economics and Statistics*, vol. 39:312–320.

Stimes, Peter C. 2008. *Equity Valuation, Risk, and Investment: A Practitioner's Roadmap*. Hoboken, NJ: John Wiley & Sons.

Tobin, James. 1969. "A General Equilibrium Approach to Monetary Theory." *Journal of Money, Credit and Banking*, vol. 1, no. 1:15–29.

Wilcox, Stephen E. 2007. "The Adjusted Earnings Yield." *Financial Analysts Journal*, vol. 63, no. 5:54–68.

Xin, Z., and S. Rabinovitch. 2009. "China Central Bank Taps on Brakes as Money, Supply Surges." *Reuters*, 15 July 2009.

Yardeni, Edward E. 2000. "How to Value Earnings Growth." *Topical Study #49* (Deutsche Banc Alex Brown).

Yardeni, Edward E. 2002. "Stock Valuation Models," Prudential Financial Research, *Topical Study #56* (August 8).

Zheng, Jinghai, Arne Bigsten, and Anagang Hu. 2006. "Can China's Growth be Sustained? A Productivity Perspective." *Working Papers in Economics* 236, Göteborg University, Department of Economics.

Zheng, Jinghai, Angan Hu, and Arne Bigsten. 2009. "Potential Output in a Rapidly Developing Economy: The Case of China and a Comparison with the United States and the European Union." *Federal Reserve Bank of St. Louis Review*, vol. 91, no. 4:317–348.

PRACTICE PROBLEMS

1 Elizabeth Villeneuve is a senior economist at Proplus Financial Economics Consulting (Proplus). She is responsible for the valuation of equity markets in developing countries and is reviewing the preliminary report on Emerge Country prepared by one of her analysts, Danielle DeLaroche. Emerge Country is now experiencing stronger economic growth than most developed countries.

DeLaroche summarized in Exhibit 1 some of the assumptions made in the report. In modeling the growth in the country's real output, she used the Cobb-Douglas production function under the assumption of constant returns to scale and, in valuing the equity market, she used the standard Gordon growth model with constant dividend growth rate.

Exhibit 1 Assumptions about the Equity Market Index of Emerge Country

Annual dividend per share in 2014	450 CU*
Forecasted earnings per share in 2015	750 CU*
Forecasted annual growth in TFP	1.5%
Expected real growth rate of dividends to perpetuity	5.5%
Required real discount rate to perpetuity	7.5%

*CU = currency unit of Emerge Country

A Based on the information in Exhibit 1, calculate the equity index price level of Emerge Country implied by the Gordon growth model, as of 31 December 2014.

Villeneuve is familiar with the Gordon growth model but not the H-model.

B Identify *two* variables that are needed in the H-model but not needed in the Gordon growth model.

As an illustration of a relative value approach that can be used to support tactical asset allocation, DeLaroche estimated that the forward operating earnings yield of the equity market index in Emerge Country is 6 percent and that the medium-term government bond yield is 7 percent. She then applied the Fed model to the situation in Emerge Country.

C Based on the Fed model, determine whether the equity market is undervalued or overvalued and identify three criticisms of the Fed model.

2 Don Murray, an economist, is president of the investment committee of a large US pension plan. He is reviewing the plan's recent investment returns and finds that non-US equity returns were much higher than US equity returns. Before making any changes to the plan's asset allocation, he asks to meet with Susan McLean, CFA, who is responsible for the equity portion of the pension plan assets. Murray wants to discuss with McLean the current valuation levels of various equity markets.

© 2011 CFA Institute. All rights reserved.

Murray develops his own growth projections for the US and for a hypothetical country (Hyp Country) that has a well-developed economy but whose population is aging. These projections are shown in Exhibit 2. In addition, Murray projects that output elasticity of capital equals 0.3 and 0.5 for the United States and Hyp Country, respectively.

Exhibit 2 Growth Projections (2015–2034)

Country	Growth in Total Factor Productivity (%)	Growth in Capital Stock (%)	Growth in Labor Input (%)
United States	0.6	3.5	0.4
Hyp Country	1.0	3.3	0.1

A Based on the information in Exhibit 2, calculate the projected GDP growth for the United States for the period 2015–2034. Use the Cobb-Douglas production function and assume constant returns to scale.

Murray identifies two possible actions that the government of Hyp Country could take, and he wants to know how these actions would affect projected GDP growth for Hyp Country.

Action 1: Lower the retirement age from 65 to 63, gradually over the next four-year period.

Action 2: Reduce subsidies to higher education over the next five years.

B For each of the government actions identified by Murray in Exhibit 2, indicate which growth factor is *most* affected. Justify your answers.

Murray is surprised that the bottom-up forecasts produced by McLean for the United States in the last five years were consistently more optimistic than her top-down forecasts. As a result, he expresses doubt about the validity of either approach.

C State *one* justification for using both top-down and bottom-up models even when these models produce different forecasts, and state *one* justification for using the bottom-up approach by itself.

Murray suggests replacing earnings-based models with asset-based models in valuing equity markets. In response, McLean recommends using Tobin's q ratio and equity q ratio, although both are subject to estimation errors when applied to valuing a particular company.

D Identify *two* problems that McLean may have in estimating the Tobin's q ratio and the equity q ratio for the pension plan assets that she manages.

The following information relates to Questions 3–10

Claudia Atkinson, CFA, is chief economist of an investment management firm. In analyzing equity markets, the firm has always used a bottom-up approach, but now Atkinson is in the process of implementing a top-down approach. She is discussing this topic with her assistant, Nicholas Ryan.

At Atkinson's request, Ryan has prepared a memo comparing the top-down approach and the bottom-up approach. Ryan presents three conclusions:

Conclusion 1 The top-down approach is less optimistic when the economy is heading into a recession than the bottom-up approach.

Conclusion 2 The top-down approach is more often based on consensus earnings estimates from equity analysts than the bottom-up approach.

Conclusion 3 The top-down approach is often more accurate in predicting the effect on the stock market of a contemporaneous change in a key economic variable than is the bottom-up approach.

Atkinson explains to Ryan how the Cobb-Douglas function can be used to model GDP growth under assumptions of constant returns to scale. For illustrative purposes, she uses the data shown in Exhibit 1.

Exhibit 1 Hypothetical Data for a Developing Country

Time Period	Growth in Total Factor Productivity (%)	Output Elasticity of Capital	Growth in Capital Stock (%)	Growth in Labor Input (%)
1970–1989	2.5	0.4	4.8	3.0
1990–2014	2.8	0.4	4.4	4.6

Atkinson wants to use the data shown in Exhibit 1 as an input for estimating justified P/E ratios. Ryan expresses some criticisms about the use of historical data:

- "In a context of hyperinflation, the approach may not be appropriate."
- "Corporate growth rates may not match GDP growth for long periods."
- "Government-implemented measures may not be taken into account in any of the growth factors."

Atkinson intends to use relative value models in order to support the firm's asset allocation recommendation. The earnings-based approach that she studies is the Fed model. She asks Ryan to write a summary of the advantages of that model. Ryan's report makes the following assertions about the Fed model:

- "The model can be used for non-US equity markets."
- "The model captures the net present value of growth investment opportunities available to investors."
- "The model is most informative when the excess of the earnings yield over the Treasury bond yield is close to the historical average."

Atkinson thinks that the Yardeni model might address some of the criticisms of the Fed model and bring certain improvements. She will use that model as an alternate approach.

Because different results from various equity market valuation models may provide relevant information, Atkinson will present a third earnings-based approach, namely the CAPE model. Ryan identifies many positive features in that model, including the following:

- "The model controls for inflation."
- "The model is independent of changes in accounting rules."
- "The model controls for business cycle effects on earnings."

When evaluating the equity market in developed markets, Atkinson uses the following asset-based models: Tobin's q ratio and equity q ratio. She calculates the equity q ratio of the corporate sector for a particular developed market based on the data shown in Exhibit 2:

Exhibit 2 Corporate Sector for Fourth Quarter of 2014 (Billions of US Dollars)

Assets at market value or replacement cost	27.3
Assets at book value	23.4
Liabilities	13.3
Equities at market value	9.0

Atkinson notes that the Tobin's q ratio derived from Exhibit 2 is less than 1. She asks Ryan what conclusion could be drawn from such a low ratio if it had been obtained for a specific company.

3 Which conclusion presented by Ryan about the top-down approach and the bottom-up approach is *most likely* correct?

A Conclusion 1.

B Conclusion 2.

C Conclusion 3.

4 Based on Exhibit 1, which of the components of economic growth has contributed *most* to GDP growth during the 1970–1989 time period?

A Labor input.

B Capital stock.

C Total factor productivity.

5 Which of the following criticisms expressed by Ryan about the use of historical data is the *least* valid?

A In a context of hyperinflation, the approach may not be appropriate.

B Corporate growth rates may not match GDP growth for long periods.

C Government-implemented measures may not be taken into account in any of the growth factors.

6 Which of the following advantages listed by Ryan with respect to the earnings-based approach studied by Atkinson is *most likely* correct? The model:

A can be used for non-US equity markets.

B captures the net present value of growth investment opportunities available to investors.

C is most informative when the excess of the earnings yield over the Treasury bond yield is close to the historical average.

7 The *most likely* improvement from using the Yardeni model instead of the Fed model is that the Yardeni model captures:

A a pure equity risk premium.

B a pure default risk premium.

C the effect of long-term earnings growth on equity market values.

8 Which of the following features of the CAPE model as stated by Ryan is *least likely* to be correct? The model:

A controls for inflation.

B is independent of changes in accounting rules.

C controls for business cycle effects on earnings.

9 Based on the data shown in Exhibit 2, the equity q ratio is closest to:

A 0.6429.

B 0.8168.

C 0.8911.

10 The *best* conclusion that Ryan can provide to Atkinson regarding the calculated value for Tobin's q ratio is that, based on comparing it to an equilibrium value of 1:

A the replacement cost of the company's assets is understated.

B the company appears to be overvalued in the marketplace.

C the company appears to be undervalued in the marketplace.

The following information relates to Questions 11–16

Egon Carmichael, CFA, is a senior analyst at Supranational Investment Management (Supranational), a firm specializing in global investment analysis. He is meeting with Nicolas Schmidt, a potential client representing a life insurance company, to discuss a report prepared by Supranational on the US equity market. The report contains valuations of the US equity market based on two approaches: the justified P/E model and the Fed model.

When Carmichael informs Schmidt that Supranational applies the neoclassical approach to growth accounting, Schmidt makes the following statements about what he considers to be some limitations of that approach:

Statement 1 The growth in total factor productivity is not directly observable.

Statement 2 The growth factors must be stated in nominal (i.e., not inflation-adjusted) terms.

Statement 3 The total output may not grow at a rate faster than predicted by the growth in capital stock and in labor force.

For use in estimating the justified P/E based on the Gordon constant growth model, Carmichael develops the assumptions displayed in Exhibit 1.

Exhibit 1 Justified P/E Ratio for the US Equity Market: Assumptions

Required real rate of return	5.0%
Inflation-adjusted dividend growth rate	2.5%

Using the assumptions in Exhibit 1, Carmichael's estimate of the justified P/E ratio for the US equity market is 13.2. Schmidt asks Carmichael, "All else equal, what would cause the justified P/E for the US equity market to fall?"

Supranational's report concludes that the US equity market is currently undervalued, based on the Fed model. Schmidt asks Carmichael, "Which of the following scenarios would result in the Fed model most likely indicating that the US equity market is overvalued?"

Scenario 1 The S&P 500 forward earnings yield is 4.5 percent, and the 10-year T-note yield is 4.75 percent.

Scenario 2 The S&P 500 forward earnings yield is 4.5 percent, the 10-year T-note yield is 4.0 percent, and the average difference between the S&P 500 forward earnings yield and the 10-year T-note over the last 20 years has been 0.25 percent.

Scenario 3 The long-term inflation rate is expected to be 2 percent, and the long-term average earnings growth is expected to be 1 percent real.

Schmidt points out that the Fed model has been the subject of criticism and recommends that Carmichael use the Yardeni model to value the US equity market. Before employing the Yardeni model, Carmichael asks Schmidt to identify criticisms of the Fed model that are addressed by the Yardeni model.

Finally, Carmichael presents a third earnings-based approach, the CAPE model, and describes many positive features of that model.

Schmidt mentions that the international life insurance company that he represents might be interested in the equity forecasts produced by Supranational. He says that his company's objective is to accumulate sufficient assets to fulfill the firm's obligations under its long-term insurance and annuity contracts. For competitive reasons, the company wants to quickly detect significant cyclical turns in equity markets and to minimize tracking errors with respect to the equity index. Schmidt asks Carmichael to identify the forecasting approach that is most appropriate.

11 Which of the statements expressed by Schmidt about the neoclassical approach to growth accounting is correct?

A Statement 1.

B Statement 2.

C Statement 3.

12 Carmichael's *most appropriate* response to Schmidt's question about the justified P/E ratio is:

A lower volatility of the US equity market.

B higher inflation-adjusted dividend growth rate.

C higher correlation of US equity market with international equity markets.

13 Carmichael's *most appropriate* response to Schmidt's question about the Fed model is:

A Scenario 1.

B Scenario 2.

C Scenario 3.

14 In response to Carmichael's question about which criticisms of the Fed model are addressed by the Yardeni model, Schmidt's *most appropriate* response is that the Yardeni model does take account of the criticism that the Fed model:

A assumes that investors value earnings rather than dividends.

B ignores long-term earnings growth opportunities available to shareholders.

C assumes that the required rate of return on equity equals the Treasury bill rate.

15 Which of the following features is *least* applicable to the third earnings-based approach presented by Carmichael? The model:

A controls for inflation.

B is independent of changes in accounting rules.

C controls for business cycle effects on earnings.

16 Carmichael's *best* answer to Schmidt's question about a recommended forecasting approach is to use:

A a top-down approach.

B a bottom-up approach.

C both top-down and bottom-up approaches.

SOLUTIONS

1 A Using the Gordon growth model we have:

$$V_0 = \frac{D_0(1+g)}{r-g}$$

Here:

$$D_0 = 450$$
$$g = 5.5\%$$
$$r = 7.5\%$$

so that:

$$V_0 = \frac{450(1+0.055)}{0.075-0.055}$$
$$= 23{,}738$$

B One variable present in the H-model but not the Gordon growth model is the initial growth rate of the dividend, and a second is the number of years during which the dividend growth rate declines from its initial value to the long-term sustainable growth rate. In the Gordon growth model, a single dividend growth rate is assumed.

C The Fed model predicts that stocks are overvalued if the forward earnings yield on the equity index (here 6 percent) is less than the yield on Treasury bonds (here 7 percent). Therefore, in Emerge Country, stocks are overvalued.

The Fed model has three important limitations. It:

- ignores the equity risk premium;
- ignores earnings growth; and
- compares a real variable to a nominal variable.

2 A Using Equation 3, we have:

Percentage growth in GDP = Growth in total factor productivity

+ (Output of elasticity of capital) × (Growth in capital stock)

+ (1 − Output of elasticity of capital) × (Growth in labor input)

= 0.6% + (0.3 × 3.5%) + (0.7 × 0.4%)

= 1.93%

B The growth factors most affected for each government action are as follows:

Action 1: Lowering the retirement age will reduce the growth in labor participation and therefore the growth in labor input until a new steady-state labor force participation rate is attained. Subsequent growth in labor input should then track underlying population growth.

Action 2: Lowering the subsidies to higher education will most likely reduce future technical innovation and therefore reduce growth in total factor productivity. The effect may be slow at the beginning, but will increase gradually for a period that will extend well beyond the five years of reduction in subsidies.

C Top-down and bottom-up forecasts frequently differ from each other. In these cases, the reconciling and revision process of the forecasts can:

- help the analyst better understand the market consensus, and
- reveal a gap that gives rise to significant market opportunities.

In spite of the optimistic bias observed by Murray, the bottom-up approach a) may provide the opportunity to identify attractively priced securities irrespective of the attractiveness of the sectors and b) may be a better fit for the investors who focus on a market niche.

D The denominators of the Tobin's q ratio and of the equity q ratio include the replacement cost of company assets. It is difficult to obtain those replacement costs for two reasons: a) there may be no liquid markets for the assets, and b) intangible assets are often difficult to value.

3 A is correct. It has been shown that bottom-up forecasts are often more optimistic than top-down forecasts (not the other way around). This may be because analysts rely on management's assessment of future profitability.

4 C is correct. The contributions from total factor productivity are 2.5 percent and 2.8 percent, respectively, for the periods 1970–1989 and 1990–2014. The corresponding contributions from labor input are 1.8% (= 0.6 × 3.0%) and 2.76% (= 0.6 × 4.6%), and the corresponding contributions from capital stock are 1.92% (= 0.4 × 4.8%) and 1.76% (= 0.4 × 4.4%).

5 C is correct. Government-implemented measures are among the inputs that have an impact on the economy and therefore on the historical data that the analyst uses. It rests upon the analyst to establish whether these measures will continue in the future when he projects economic growth.

6 A is correct. The Fed model, although developed in the United States, can be applied to the valuation of non-US equity markets.

7 C is correct. The Yardeni model incorporates the effect on equity market value of long-term earnings growth.

8 B is correct. The CAPE model is dependent of changes in accounting rules because it averages earnings over 10 years. Therefore, the feature is not applicable to the model.

9 A is correct. The equity q ratio is equal to

Market value of equities/(Replacement cost of assets – Liabilities)

= 9.0/(27.3 – 13.3)

= 0.6429

10 C is correct. A Tobin's q value of less than 1, when 1 is used as a comparison point, indicates that the company is undervalued in the marketplace because it indicates an opportunity to buy assets at a price below their replacement cost.

11 A is correct. It is true that the growth in total productivity is not directly observable. That growth is obtained by using the following data: growth in real output, growth in capital stock, and growth in labor input.

12 C is correct. A higher correlation of the US equity market with international equity markets would increase the risk of the US equity market and thus increase the required return (r) on that market. Increasing r would reduce the justified P/E ratio:

$$\frac{P_0}{E_1} = \frac{D_0(1+g)/E_1}{r-g}$$

13 A is correct. It would be true that the Fed model predicts that US stocks are overvalued if the forward earnings yield on the S&P 500 (4.5 percent in this scenario 1) is less than the yield on US Treasury bonds (4.75 percent in this scenario 1).

14 B is correct. A criticism of the Fed model that the Yardeni model does address is that the Fed model does not take account of long-term earnings growth. The Yardeni model includes a long-term earnings growth variable.

15 B is correct. The CAPE model is dependent of changes in accounting rules because it averages earnings over 10 years. Therefore, the feature is not applicable to the model.

16 C is correct. On the one hand, because the insurance company wants to minimize tracking errors with respect to the equity indexes, Carmichael should recommend the top-down approach because the forecast does not need to focus on individual security selection. On the other hand, because the insurance company wants to detect quickly any significant turn in equity markets, Carmichael should recommend the bottom-up approach because the bottom-up approach can be effective in anticipating cyclical turning points.

PORTFOLIO MANAGEMENT
STUDY SESSION

8

Asset Allocation and Related Decisions in Portfolio Management (1)

Often considered the most important activity in the investment process, the strategic asset allocation decision takes place after the formation of capital market expectations. The portfolio's long-term asset class, or factor, exposures and the best means to achieve these exposures are determined only after considering the investor's unique financial situation and objectives, risk–return tradeoffs, and other key inputs.

This study session provides a conceptual framework for understanding asset allocation considerations and key implementation approaches. The importance of a sound investment governance process is highlighted. Consideration of an investor's overall financial context using an economic balance sheet to incorporate all relevant investor assets and liabilities is presented. Three major approaches to asset allocation are described: asset only, liability relative, and goals based. Concepts underlying active and passive implementation and strategic rebalancing are also introduced. The session then circles back to explain and illustrate the three approaches in greater depth.

READING ASSIGNMENTS

Reading 16	Introduction to Asset Allocation by William W. Jennings, CFA, and Eugene L. Podkaminer, CFA
Reading 17	Principles of Asset Allocation by Jean L.P. Brunel, CFA, Thomas M. Idzorek, CFA, and John M. Mulvey, PhD

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

16

Introduction to Asset Allocation

by William W. Jennings, CFA, and Eugene L. Podkaminer, CFA

William W. Jennings, CFA, is at the US Air Force Academy (USA). Eugene L. Podkaminer, CFA, is at Callan Associates (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe elements of effective investment governance and investment governance considerations in asset allocation;
☐	**b.** prepare an economic balance sheet for a client and interpret its implications for asset allocation;
☐	**c.** compare the investment objectives of asset-only, liability-relative, and goals-based asset allocation approaches;
☐	**d.** contrast concepts of risk relevant to asset-only, liability-relative, and goals-based asset allocation approaches;
☐	**e.** explain how asset classes are used to represent exposures to systematic risk and discuss criteria for asset class specification;
☐	**f.** explain the use of risk factors in asset allocation and their relation to traditional asset class–based approaches;
☐	**g.** select and justify an asset allocation based on an investor's objectives and constraints;
☐	**h.** describe the use of the global market portfolio as a baseline portfolio in asset allocation;
☐	**i.** discuss strategic implementation choices in asset allocation, including passive/active choices and vehicles for implementing passive and active mandates;
☐	**j.** discuss strategic considerations in rebalancing asset allocations.

INTRODUCTION

1

Asset owners are concerned with accumulating and maintaining the wealth needed to meet their needs and aspirations. In that endeavor, investment portfolios—including individuals' portfolios and institutional funds—play important roles. Asset allocation

© 2017 CFA Institute. All rights reserved.

is a strategic—and often a first or early—decision in portfolio construction. Because it holds that position, it is widely accepted as important and meriting careful attention. Among the questions addressed in this reading are the following:

- What is a sound governance context for making asset allocation decisions?
- How broad a picture should an adviser have of an asset owner's assets and liabilities in recommending an asset allocation?
- How can an asset owner's objectives and sensitivities to risk be represented in asset allocation?
- What are the broad approaches available in developing an asset allocation recommendation, and when might one approach be more or less appropriate than another?
- What are the top-level decisions that need to be made in implementing a chosen asset allocation?
- How may asset allocations be rebalanced as asset prices change?

This is the first reading in several sequences of readings that address, respectively, asset allocation and portfolio management of equities, fixed income, and alternative investments. Asset allocation is also linked to other facets of portfolio management, including risk management and behavioral finance. As coverage of asset allocation progresses in the sequence of readings, various connections to these topics, covered in detail in other areas of the curriculum, will be made.[1]

This reading serves as the introduction to asset allocation. It organizes a top-level view of asset allocation and offers definitions that will provide a coordinated treatment of many later topics in portfolio management. In the asset allocation sequence, the role of this reading is the "big picture." The second reading—Asset Allocation in Practice—provides the basic "how" of developing an asset allocation, and the third reading explores various common, real-world complexities in developing an asset allocation.

This reading is organized as follows: Section 2 reviews the place of asset allocation in portfolio management and explains the sequence of topics that follows. Section 3 concerns the investment governance context in which asset allocation decisions are made. Section 4 explains the modern interest in considering asset allocation from a comprehensive perspective of the asset owner's financial condition. Section 5 distinguishes three broad approaches to asset allocation and explains how they differ in investment objective and concepts of risk. In Section 6, these three approaches are discussed at a high level in relation to three cases. Section 7 provides a top-level orientation to how a chosen asset allocation may be implemented, providing a set of definitions that underlie subsequent readings. As a result of movements in market prices, allocations to assets typically drift away from target allocations. Section 8 discusses rebalancing, and Section 9 provides a summary of the reading.

2 ASSET ALLOCATION: IMPORTANCE IN INVESTMENT MANAGEMENT

Exhibit 1 places asset allocation in a stylized model of the investment management process viewed as an integrated set of activities aimed at attaining investor objectives.

1 Among these readings, see Blanchett, Cordell, Finke, and Idzorek (2016) concerning human capital and longevity and other risks and Pompian (2011a and 2011b) and Pompian, McLean, and Byrne (2011) concerning behavioral finance.

Exhibit 1 The Portfolio Construction, Monitoring, and Revision Process

Exhibit 1 shows that an investment process that is in the asset owner's best interest rests on a foundation of good investment governance, which includes the assignment of decision-making responsibilities to qualified individuals and oversight of processes. The balance at the top of the chart suggests that the portfolio management process must reconcile (balance) investor objectives (on the left) with the possibilities offered by the investment opportunity set (on the right).

The investment process shows a sequence of activities that begins with understanding the asset owner's entire circumstance; objectives, including any constraints; and preferences. These factors, in conjunction with capital market inputs,[2] form the basis for asset allocation as a first step in portfolio construction and give a structure within which other decisions—such as the decision to invest passively or actively—take place. In the flow chart, thick lines show initial flows (or relations of logic) and thin lines show feedback flows.

Asset allocation is widely considered to be the most important decision in the investment process. The strategic asset allocation decision completely determines return levels[3] in which allocations are invested passively and also in the aggregate of all investors, irrespective of the degree of active management.

In providing an overview of asset allocation, this reading's focus is the alignment of asset allocation with the asset owner's investment objectives, constraints, and overall financial condition. The presentation begins with an introduction to the investment governance context of asset allocation. It then moves to present the economic balance sheet as the financial context for asset allocation itself.

3 THE INVESTMENT GOVERNANCE BACKGROUND TO ASSET ALLOCATION

Investment governance—including the organization of decision-making responsibilities and oversight activities—is the structure that is expected to ensure that assets are invested to achieve the asset owner's investment objectives within the asset owner's risk tolerance and constraints and in compliance with all applicable laws and regulations. Effective investment governance ensures that decisions are made by individuals or groups with the necessary skills and capacity.

Studies have linked good governance to good investment performance. Ambachtsheer (2007) estimates that organizations with better investment governance outperformed their peers by an average of 100–200 bps annually. The value of establishing a strong governance framework is widely accepted.

Investment performance depends on asset allocation *and* its implementation. Sound investment governance practices seek to align asset allocation and implementation to achieve the asset owner's stated goals.

Investment governance structures are relevant to both institutional and individual investors. Because such structures are often formalized and articulated in detail for defined benefit pension plans, we will build our discussion using a pension plan governance framework. There are elements of pension plan governance that are not directly related to the management of plan assets—plan design, funding policy, and communications to participants—so we will not focus on them here, preferring instead to highlight those aspects of governance that directly affect the asset allocation decision.

3.1 Governance Structures

Governance and management are two separate but related functions. Both are directed toward achieving the same end. But governance focuses on clarifying the mission, creating a plan, and reviewing progress toward achieving long- and short-term objectives,

2 The set of potential inputs to portfolio construction shown in Exhibit 1 is not exhaustive. For example, for investors delegating asset management, investment managers' performance records are relevant.

3 See Ibbotson and Kaplan (2000, p.30) and Xiong, Ibbotson, Idzorek, and Chen (2010). The conclusion for the aggregate follows from the premise that active management is a zero-sum game overall (Sharpe 1991).

whereas management efforts are geared to outcomes—the execution of the plan to achieve the agreed-on goals and objectives. A common governance structure in an institutional investor context will have three levels within the governance hierarchy:

- governing investment committee
- investment staff
- third-party resources

The investment committee may be a committee of the board of directors, or the board of directors may have delegated its oversight responsibilities to an internal investment committee made up of staff. Investment staff may be large, with full in-house asset management capabilities, or small—for example, two to five investment staff responsible for overseeing external investment managers and consultants. It may even be part time—a treasurer or chief financial officer with many other, competing responsibilities. The term "third-party resources" is used to describe a range of professional resources—investment managers, investment consultants, custodians, and actuaries, for example.

Although there are many governance models in use, most effective models share six common elements. Effective governance models perform the following tasks:

1. Articulate the long- and short-term objectives of the investment program.
2. Allocate decision rights and responsibilities among the functional units in the governance hierarchy effectively, taking account of their knowledge, capacity, time, and position in the governance hierarchy.
3. Specify processes for developing and approving the investment policy statement that will govern the day-to-day operations of the investment program.
4. Specify processes for developing and approving the program's strategic asset allocation.
5. Establish a reporting framework to monitor the program's progress toward the agreed-on goals and objectives.
6. Periodically undertake a governance audit.

In the sections that follow, we will discuss selected elements from this list.

3.2 Articulating Investment Objectives

Articulating long- and short-term objectives for an investor first requires an understanding of purpose—that is, what the investor is trying to achieve. Below are examples of simple investment objective statements that can be clearly tied to purposes:

- *Defined benefit pension fund.* The investment objective of the fund is to ensure that plan assets are sufficient to meet current and future pension liabilities.
- *Endowment fund.* The investment objective of the endowment is to earn a rate of return in excess of the return required to fund, after accounting for inflation, ongoing distributions consistent with the endowment's mission.
- *Individual investor.* The investment objective is to provide for retirement at the investor's desired retirement age, family needs, and bequests, subject to stated risk tolerance and investment constraints.

A return requirement is often considered the essence of an investment objective statement, but for that portion of the objective statement to be properly understood requires additional context, including the obligations the assets are expected to fund, the nature of cash flows into and out of the fund, and the asset owner's willingness

and ability to withstand interim changes in portfolio value. The ultimate goal is to find the best risk/return trade-off consistent with the asset owner's resource constraints and risk tolerance.

As an example of how the overall context can affect decision making, the pension fund may be an active plan, with new participants added as they are hired, or it may be "frozen" (no additional benefits are being accrued by participants in the plan). The status of the plan, considered in conjunction with its funded ratio (the ratio of pension assets to pension liabilities), has a bearing on future contributions and benefit payments. The company offering the pension benefit may operate in a highly cyclical industry, where revenues ebb and flow over the course of the economic cycle. In this case, the plan sponsor may prefer a more conservative asset allocation to minimize the year-to-year fluctuations in its pension contribution.

The nature of inflows and outflows for an endowment fund can be quite different from those of a pension fund. An endowment fund may be used to support scholarships, capital improvements, or university operating expenses. The fund sponsor has some degree of control over the outflows from the fund but very little control over the timing and amounts of contributions to the fund because the contributions are typically coming from external donors.

These cash inflow and outflow characteristics must be considered when establishing the goals and objectives of the fund.

A third, inter-related aspect of defining the sponsor's goals and objectives is determining and communicating risk tolerance. There are multiple dimensions of risk to be considered: liquidity risk, volatility, risk of loss, and risk of abandoning a chosen course of action at the wrong time.

Effective investment governance requires consideration of the liquidity needs of the fund and the liquidity characteristics of the fund's investments. For example, too large an allocation to relatively illiquid assets, such as real estate or private equity, might impair the ability to make payouts in times of market stress.

A high risk/high expected return asset allocation is likely to lead to wider swings in interim valuations. Any minimum thresholds for funded status that, if breached, would trigger an adverse event, such as higher pension insurance premiums, must be considered in the asset allocation decision.

For individual investors, the risk of substantial losses may be unacceptable for a variety of financial and psychological reasons. When such losses occur after retirement, lost capital cannot be replaced with future earnings.

Asset owners have their own unique return requirements and risk sensitivities. Managing an investment program without a clear understanding of long- and short-term objectives is similar to navigating without a map: Arriving at the correct destination on time and intact is not compatible with leaving much to chance.

3.3 Allocation of Rights and Responsibilities

The rights and responsibilities necessary to execute the investment program are generally determined at the highest level of investment governance. The allocation of those rights and responsibilities among the governance units is likely to vary depending on the size of the investment program; the knowledge, skills, and abilities of the internal staff; and the amount of time staff can devote to the investment program if they have other, competing responsibilities. Above all, good governance requires that decisions be delegated to those best qualified to make an informed decision.

The resources available to an organization will affect the scope and complexity of the investment program and the allocation of rights and responsibilities. A small investment program may result in having a narrower opportunity set because of either asset size (too small to diversify across the range of asset classes and investment managers) or staffing constraints (insufficient asset size to justify a dedicated internal

staff). Complex strategies may be beyond the reach of entities that have chosen not to develop investment expertise internally or whose oversight committee lacks individuals with sufficient investment understanding. Organizations willing to invest in attracting, developing, and retaining staff resources and in developing strong internal control processes, including risk management systems, are better able to adopt more complex investment programs. The largest investors, however, may find their size creates governance issues: Manager capacity constraints might lead to so many managers that it challenges the investor's oversight capacity.

Allocation of rights and responsibilities across the governance hierarchy is a key element in the success of an investment program. Effective governance requires that the individuals charged with any given decision have the required *knowledge* and expertise to thoroughly evaluate the alternative courses of action and the *capacity* to take on the ongoing responsibility of those decisions, and they must be able to execute those decisions in a timely fashion. (Individual investors engaging a private wealth manager are delegating these expertise, capacity, and execution responsibilities.)

Exhibit 2 presents a systematic way of allocating among governance units the primary duties and responsibilities of running an investment program.

Exhibit 2 Allocation of Rights and Responsibilities

Investment Activity	Investment Committee	Investment Staff	Third-Party Resource
Mission	Craft and approve	n/a	n/a
Investment policy statement	Approve	Draft	Consultants provide input
Asset allocation policy	Approve with input from staff and consultants	Draft with input from consultants	Consultants provide input
Investment manager and other service provider selection	Delegate to investment staff; approval authority retained for certain service providers	Research, evaluation, and selection of investment managers and service providers	Consultants provide input
Portfolio construction (individual asset selection)	Delegate to outside managers, or to staff if sufficient internal resources	Execution if assets are managed in-house	Execution by independent investment manager
Monitoring asset prices & portfolio rebalancing	Delegate to staff within confines of the investment policy statement	Assure that the sum of all sub-portfolios equals the desired overall portfolio positioning; approve and execute rebalancing	Consultants and custodian provide input
Risk management	Approve principles and conduct oversight	Create risk management infrastructure and design reporting	Investment manager manages portfolio within established risk guidelines; consultants may provide input and support
Investment manager monitoring	Oversight	Ongoing assessment of managers	Consultants and custodian provide input
Performance evaluation and reporting	Oversight	Evaluate manager's continued suitability for assigned role; analyze sources of portfolio return	Consultants and custodian provide input
Governance audit	Commission and assess	Responds and corrects	Investment Committee contracts with an independent third party for the audit

The available knowledge and expertise at each level of the hierarchy, the resource capacity of the decision makers, and the ability to act on a timely basis all influence the allocation of these rights and responsibilities.

3.4 Investment Policy Statement

The investment policy statement (IPS) is the foundation of an effective investment program. A well-crafted IPS can serve as a blueprint for ongoing fund management and assures stakeholders that program assets are managed with the appropriate care and diligence. An IPS will typically have the following features:

- *An introduction that describes the purpose and scope of the document itself and describes the asset owner.* The description of the asset owner should allow the reader of the IPS to understand the context within which the investment program exists.[4] It may address such factors as the business environment in which the asset owner operates (so the reader can understand the economic forces that affect the investment program) and the sources and uses of program assets. This section of the IPS can reference laws and regulations that govern the investment program and may outline fundamental beliefs relevant to the investment program. These beliefs may encompass such issues as the potential value added from active management in a given asset class. The purpose and scope section of the IPS should provide a link between the goals and objectives of the asset owner and the execution of the investment program.
- *A statement of investment objectives, which describes the asset owner's philosophy with respect to pursuing investment returns and the extent of its willingness to endure interim volatility along the way to achieving those investment objectives.*
- *A section discussing the investment constraints within which the investment program must operate.* Constraints typically addressed in the IPS that directly affect the asset allocation decision include liquidity requirements (needs to withdraw funds from the portfolio), time horizons (time periods associated with investment objectives), tax concerns, legal and regulatory factors, and unique circumstances (any client-related constraint not covered elsewhere that affects investing, such as environmental, social, and governmental [ESG] concerns).
- *A statement of duties and responsibilities outlining the allocation of decision rights and responsibilities among the investment committee, investment staff, and any third-party service providers.*
- *An explanation of the investment guidelines to be followed in implementation (e.g., on the permissible use of leverage and derivatives) and on specific types of assets excluded from investment, if any.*
- *A section specifying the frequency and nature of reporting to the investment committee and to the board of directors.*

More recently, investment policies have begun to include specific directives with respect to risk management of the investment pool. The risk management framework is likely to specify the overall level of risk that is acceptable and provide guidance in the allocation of that risk budget among asset classes.

Often, the IPS itself will be a foundation document that is revised slowly over time, whereas information relating to more variable aspects of the program—the asset allocation policy and guidelines for individual investment managers—will be contained in a more easily modified appendix.

4 Other parties, such as the fiduciary, may also be described in the IPS.

3.5 Asset Allocation and Rebalancing Policy

Because of its strategic importance, the investment committee, at the highest level of the governance hierarchy, typically retains approval of the strategic asset allocation decision. A proposal is often developed only after a formal asset allocation study that incorporates obligations, objectives, and constraints; simulates possible investment outcomes over an agreed-on investment horizon; and evaluates the risk and return characteristics of the possible allocation strategies.

Governance considerations inform not only the overall strategic asset allocation decision but also rebalancing decisions. The IPS should contain at least general orienting information relevant to rebalancing. In an institutional setting, rebalancing policy might be the responsibility of the investment committee, organizational staff, or the external consultant. Likewise, individual investors might specify that they have delegated rebalancing authority to their investment adviser. Specification of rebalancing responsibilities is good governance.

3.6 Reporting Framework

The reporting framework in a well-run investment program should be designed in a manner that enables the overseers to evaluate quickly and clearly how well the investment program is progressing toward the agreed-on goals and objectives. The reporting should be clear and concise, accurately answering the following three questions:

- Where are we now?
- Where are we relative to the goals and objectives?
- What value has been added or subtracted by management decisions?

Key elements of a reporting framework should address performance evaluation, compliance with investment guidelines, and progress toward achieving the stated goals and objectives.

- Benchmarking is necessary for performance measurement, attribution, and evaluation. Effective benchmarking allows the investment committee to evaluate staff and external managers. Two separate levels of benchmarks are appropriate: one that measures the success of the investment managers relative to the purpose for which they were hired and another to measure the gap between the policy portfolio and the portfolio as actually implemented.
- Management reporting, typically prepared by staff with input from consultants and custodians, provides responsible parties with the information necessary to understand which parts of the portfolio are performing ahead of or behind the plan and why, as well as whether assets are being managed in accordance with investment guidelines.
- Governance reporting, which addresses strengths and weaknesses in program execution, should be structured in such a way that regular committee meetings can efficiently address any concerns. Although a crisis might necessitate calling an extraordinary meeting, good governance structures minimize this need.

3.7 The Governance Audit

The purpose of the governance audit is to ensure that the established policies, procedures, and governance structures are effective. The audit should be performed by an independent third party. The governance auditor examines the fund's governing

documents, assesses the capacity of the organization to execute effectively within the confines of those governing documents, and evaluates the existing portfolio for its "efficiency" given the governance constraints.

Effective investment governance ensures the durability or survivability of the investment program. An investment program must be able to survive unexpected market turmoil, and good investment governance makes certain that the consequences of such turmoil are considered before it is experienced. Good governance seeks to avoid **decision-reversal risk**—the risk of reversing a chosen course of action at exactly the wrong time, the point of maximum loss. Good investment governance also considers the effect of investment committee member and staff turnover on the durability of the investment program. Orientation sessions for new committee members and proper documentation of investment beliefs, policies, and decisions enhance the likelihood that the chosen course of action will be given sufficient time to succeed. New staff or investment committee members should be able to perceive easily the design and intent of the investment program and be able to continue to execute it. Similarly, good investment governance prevents key person risk—overreliance on any one staff member or long-term, illiquid investments dependent on a staff member.

Good governance works to assure accountability. O'Barr and Conley (1992, p.21), who studied investment management organizations using anthropological techniques, found that blame avoidance (not accepting personal responsibility when appropriate to do so) is a common feature of institutional investors. Good governance works to prevent such behavior.

EXAMPLE 1

Investment Governance: Hypothetical Case 1

In January 2016, the Cafastan Office Workers Union Pension (COWUP) made the following announcement:

> "COWUP will fully exit all hedge funds and funds of funds. Assets currently amounting to 15% of its investment program are involved. Although hedge funds are a viable strategy for some, when judged against their complexity and cost, hedge fund investment is no longer warranted for COWUP."

One week later, a financial news service reported the following:

> "The COWUP decision on hedge funds was precipitated by an allegation of wrongdoing by a senior executive with hedge fund selection responsibilities in COWUP's alternative investments strategy group."

1. Considering only the first statement, state what facts would be relevant in evaluating whether the decision to exit hedge funds was consistent with effective investment governance.
2. In light of both statements, identify deficiencies in COWUP's investment governance.

Solution to 1:

The knowledge, capacity, and time available within COWUP to have an effective hedge fund investment program would need to be assessed against the stated concern for complexity and cost. The investment purpose served by hedge funds in COWUP's investment program before it exited them needs to be analyzed.

Solution to 2:

The second statement raises these concerns about the decision described in the first statement:

- Hiring and oversight of COWUP executives may have been inadequate.
- The initial COWUP information release was incomplete and possibly misleading. Public communications appear not to have received adequate oversight.
- Divesting hedge funds may be a reaction to the personnel issue rather than being based on investment considerations.

EXAMPLE 2

Investment Governance: Hypothetical Case 2

The imaginary country of Cafastan has a sovereign wealth fund with assets of CAF$40 billion. A governance audit includes the following:

> "The professional chief investment officer (CIO) reports to a nine-member appointed investment committee board of directors headed by an executive director. Investment staff members draft asset allocation policy in conjunction with consultants and make recommendation to the investment committee; the investment committee reviews and approves policy and any changes in policy, including the strategic asset allocation. The investment committee makes manager structure, conducts manager analysis, and makes manager selection decisions. The CIO has built a staff organization, which includes heads for each major asset class. In examining decisions over the last five years, we have noted several instances in which political or non-economic considerations appear to have influenced the investment program, including the selection of local private equity investments. Generally, the board spends much of its time debating individual manager strategies for inclusion in the portfolio and in evaluating investment managers' performance with comparatively little time devoted to asset allocation or risk management."

Based on this information and that in Exhibit 2, identify sound and questionable governance practices in the management of the Cafastan sovereign wealth fund.

Solution:

Sound practices:

The allocation of responsibilities for asset allocation between investment staff and the investment committee is sound practice. Staff investment expertise should be reflected in the process of asset allocation policy and analysis. The investment committee assumes final responsibility for choices and decisions, which is appropriate given its position in receiving information from all parts of the organization and from all interested parties.

Questionable practices:

The investment committee's level of involvement in individual manager selection and evaluation is probably too deep. Exhibit 2 indicates that these functions more effectively reside with staff. Individual manager selection is an implementation

and execution decision designed to achieve strategic decisions made by the investment committee and is typically not a strategic decision itself. Manager evaluation has substantial data analysis and technical elements that can be efficiently provided by staff experts and consultants. The finding about political/non-economic influences indicates multiple problems. It confirms that the investment manager analysis and selection processes were misplaced. It also suggests that the investment committee has an inadequate set of governance principles or checks and balances as relates to the investment committee itself.

4 THE ECONOMIC BALANCE SHEET AND ASSET ALLOCATION

An accounting balance sheet reflects a point-in-time snapshot of an organization's financial condition and shows the assets, liabilities, and owners' equity recognized by accountants. An **economic balance sheet** includes conventional assets and liabilities (called "financial assets" and "financial liabilities" in this reading) as well as additional assets and liabilities—known as **extended portfolio assets and liabilities**—that are relevant in making asset allocation decisions but do not appear on conventional balance sheets.

For individual investors, extended portfolio assets include human capital (the present value of future earnings), the present value of pension income, and the present value of expected inheritances. Likewise, the present value of future consumption is an extended portfolio liability.

For an institutional investor, extended portfolio assets might include underground mineral resources or the present value of future intellectual property royalties. Extended portfolio liabilities might include the present value of prospective payouts for foundations, whereas grants payable would appear as conventional liabilities.

Theory and, increasingly, practice suggest that asset allocation should consider the full range of assets and liabilities—both the financial portfolio and extended portfolio assets and liabilities—to arrive at an appropriate asset allocation choice. For example, an asset allocation process that considers the extended balance sheet, including the sensitivity of an individual investor's earnings to equity market risk (and that of the industry in which the individual is working), may result in a more appropriate allocation to equities than one that does not.

Life-cycle balanced funds (also known as target date funds) are examples of investments that seek to coordinate asset allocation with human capital. A 2040 life-cycle balanced fund that seeks to provide a retirement investment vehicle appropriate for many individuals retiring in 2040. Exhibit 3 illustrates a typical path for the composition of an individual's economic balance sheet from age 25 through age 65.

Exhibit 3 Human Capital (HC) and Financial Capital (FC) relative to Total Wealth

At age 25, with most of the individual's working life ahead of him, human capital dominates the economic balance sheet. As the individual progresses through life, the present value of human capital declines as human capital is transformed into earnings. Earnings saved and invested build financial capital balances. By a retirement age of 65, the conversion of human capital to earnings and financial capital is assumed to be complete.

Life-cycle balanced funds reflect these extended portfolio assets. Research indicates that, on average, human capital is roughly 30% equity-like and 70% bond-like, with significant variation among industries.[5] Making the simplifying assumption that investors have approximately constant risk tolerance through life, their asset allocation for total overall wealth (including human capital and financial capital) should be, in theory, constant over time. In this case, the asset allocation chosen for financial capital should reflect an increasing allocation to bonds as human capital declines to age 65, holding all else constant. Exhibit 4 shows the glide path for the equity/bond allocation chosen by one US mutual fund family. The increasing allocation to bonds is consistent with the view that human capital has preponderant bond-like characteristics.

Exhibit 4 Glide Path of Target Date Investment Funds in One Family

Assumed Age	Equity Allocation	Bond Allocation
25	85%	15%
35	82	18
45	77	23

(continued)

5 See Blanchett and Straehl (2016), Table 3, and Blanchett and Straehl (2015), Table 5.

Exhibit 4 (Continued)

Assumed Age	Equity Allocation	Bond Allocation
55	63	37
65	49	51%

Note: Allocations as of 31 December 2009.
Source: Based on data in Idzorek, Stempien, and Voris (2013).

Although estimating human capital is quite complex, including human capital and other extended portfolio assets and economic liabilities in asset allocation decisions is good practice.[6]

EXAMPLE 3

The Economic Balance Sheet of Auldberg University Endowment

- *Name*: Auldberg University Endowment (AUE)
- *Narrative*: AUE was established in 1852 in Cafastan and largely serves the tiny province of Auldberg. AUE supports about one-sixth of Auldberg University's CAF$60 million operating budget; real estate income and provincial subsidies provide the remainder and have been relatively stable. The endowment has historically had a portfolio limited to domestic equities, bonds, and real estate holdings; that policy is under current review. Auldberg University itself (not the endowment) has a CAF$350 million investment in domestic commercial real estate assets, including office buildings and industrial parks, much of it near the campus. AUE employs a well-qualified staff with substantial diverse experience in equities, fixed income, and real estate.
- *Assets*: Endowment assets include CAF$100 million in domestic equities, CAF$60 million in domestic government debt, and CAF$40 million in Class B office real estate. The present value of expected future contributions (from real estate and provincial subsidies) is estimated to be CAF$400 million.
- *Liabilities*: These include CAF$10 million in short-term borrowings and CAF$35 million in mortgage debt related to real estate investments. Although it has no specific legal requirement, AUE has a policy to distribute to the university 5% of 36-month moving average net assets.

6 Human capital is non-tradable, cannot be hedged, is subject to unspecified future taxes, and is a function of an individual's mortality. Human capital is technically defined as the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age (see Ibbotson, Milevsky, Chen, and Zhu 2007). Thus, the present value of future earnings and pensions should be valued with mortality-weighted probabilities of receiving future cash flows, not the present value over life expectancy. There is meaningful extra value from the low-odds event of extreme longevity, which has an important portfolio implication in that individual investors can outlive their financial portfolios but not lifetime annuity payments.

In effect, the endowment supports $10 million of Auldberg University's annual operating budget. The present value of expected future support is CAF$450 million.

1 Prepare an economic balance sheet for AUE.
2 Describe elements in Auldberg University's investments that might affect AUE's asset allocation choices.

Solution to 1:

The economic balance sheet for the endowment (given in the following table) does not include the real estate owned by Auldberg University. The economic net worth is found as a plug item (600 – 10 – 35 – 450 = 105).

AUE Economic Balance Sheet (in CAF$ millions) 31 December 20x6

Assets		Liabilities and Net Worth	
Financial assets		*Financial liabilities*	
Domestic equities	100	Short-term borrowing	10
Domestic fixed income	60	Mortgage debt	35
Class B office real estate	40		
Extended Assets		*Extended Liabilities*	
Present value of expected future contributions to AUE	400	Present value of expected future support	450
		Net Worth	
		Economic net worth (Economic assets – Economic liabilities)	105
Total	600		600

Solution to 2:

AUE's Class B real estate investments' value and income are likely to be stressed during the same economic circumstances as the university's own real estate investments. In such periods, the university may look to the endowment for increased operating support and AUE may not be well positioned to meet that need. Thus, the AUE's real estate investment is actually less diversifying than it may appear and the allocation to it may need to be re-examined. Similar considerations apply to AUE's holdings in equities in relation to Auldberg University's.

APPROACHES TO ASSET ALLOCATION

5

We can identify three broad approaches to asset allocation: (1) **asset-only**, (2) **liability-relative**, and (3) **goals-based**. These are decision-making frameworks that take account of or emphasize different aspects of the investment problem.

Asset-only approaches to asset allocation focus solely on the asset side of the investor's balance sheet. Liabilities are not explicitly modeled. Mean–variance optimization (MVO) is the most familiar and deeply studied asset-only approach. MVO considers only the expected returns, risks, and correlations of the asset classes in the opportunity set. In contrast, liability-relative and goals-based approaches explicitly account for the liabilities side of the economic balance sheet, dedicating assets to meet, respectively, legal liabilities and quasi-liabilities (other needs that are not strictly liabilities but are treated as such) or goals.

Liability-relative approaches to asset allocation choose an asset allocation in relation to the objective of funding liabilities. The phrase "funding of liabilities" means to provide for the money to pay liabilities when they come due. An example is surplus optimization: mean–variance optimization applied to surplus (defined as the value of the investor's assets minus the present value of the investor's liabilities). In modeling, liabilities might be represented by a short position in a bond or series of bonds matched to the present value and duration of the liabilities. Another approach involves constructing a liability-hedging portfolio focused on funding liabilities and, for any remaining balance of assets, a risky-asset portfolio (so called because it is risky or riskier in relation to liabilities—often also called a "return-seeking portfolio" because it explicitly seeks return above and beyond the liability benchmark). **Liability-driven investing** (LDI) is an investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities. Related fixed-income techniques are covered in the fixed-income sequence under liability-based mandates.

All approaches to asset allocation can be said to address goals. In investment practice and literature, however, the term "goals based" has come be widely associated with a particular type of approach to asset allocation and investing.

Goals-based approaches to asset allocation, as discussed here, are used primarily for individuals and families, involve specifying asset allocations for sub-portfolios, each of which is aligned to specified goals ranging from supporting lifestyle needs to aspirational. Each goal is associated with regular, irregular, or bulleted cash flows; a distinct time horizon; and a risk tolerance level expressed as a required probability of achieving the goal.[7] For example, a middle-aged individual might specify a goal of maintaining his current lifestyle and require a high level of confidence that this goal will be attained. That same individual might express a goal of leaving a bequest to his alma mater. This would be a very long-term goal and might have a low required probability. Each goal is assigned to its own sub-portfolio, and an asset allocation strategy specific to that sub-portfolio is derived. The sum of all sub-portfolio asset allocations results in an overall strategic asset allocation for the total portfolio. **Goals-based investing** (GBI) is an investment industry term that encompasses the asset allocation focused on addressing an investor's goals.

Institutions and Goals-Based Asset Allocation

Asset segmentation as practiced by some life insurers has some similarities to goals-based investing. Asset segmentation involves notionally or actually segmenting general account assets into sub-portfolios associated with specific lines of business or blocks of liabilities. On one hand, such an approach may be distinguished from goals-based asset allocation for individual investors in being motivated by competitive concerns (to facilitate offering competitive crediting rates on groups of contracts) rather than behavioral ones. On the other hand, Fraser and Jennings (2006) described a behaviorally motivated goals-based approach to asset allocation for foundations and endowments.

7 See Shefrin and Statman (2000) and Brunel (2015).

Following their approach, components of an overall appropriate mean–variance optimal portfolio are allocated to time-based sub-portfolios such that uncomfortably novel or risky positions for the entity's governing body are made acceptable by being placed in longer-term sub-portfolios.

Although any asset allocation approach that considers the liabilities side of the economic balance sheet might be termed "liability relative," there are several important distinctions between liabilities for an institutional investor and goals for an individual investor. These distinctions have meaningful implications for asset allocation:[8]

- Liabilities of institutional investors are legal obligations or debts, whereas goals, such as meeting lifestyle or aspirational objectives, are not. Failing to meet them does not trigger similar consequences.
- Whereas institutional liabilities, such as life insurer obligations or pension benefit obligations, are uniform in nature (all of a single type), an individual's goals may be many and varied.
- Liabilities of institutional investors of a given type (e.g., the pension benefits owed to retirees) are often numerous and so, through averaging, may often be forecast with confidence. In contrast, individual goals are not subject to the law of large numbers and averaging. Contrast an estimate of expected death benefits payable for a group of life insurance policies against an individual's uncertainty about the resources needed in retirement: For a 65-year-old individual, the number of remaining years of life is very uncertain, but insurers can estimate the average for a group of 65-year-olds with some precision.

Liability-Relative and Goals-Based Approaches to Investing

Various perspectives exist concerning the relationship between liability-relative and goals-based approaches to investing. Professor Lionel Martellini summarizes one perspective in the following three statements:[9]

1. Goals-based investing is related to a new paradigm that advocates more granular and investor-centric investment solutions.
2. This new investment solutions paradigm translates into goals-based investing (GBI) approaches in individual money management, in which investors' problems can be summarized in terms of their goals, and it translates into liability-driven investing (LDI) approaches in institutional money management, where the investors' liability is treated as a proxy for their goal.
3. GBI and LDI are therefore related, but each of these approaches has its own specific characteristics. For example, GBI implies the capacity to help individual investors identify a hierarchical list of goals, with a distinction between different types of goals (affordable versus non affordable, essential versus aspirational, etc.) for which no exact counterpart exists in institutional money management.

8 See Rudd and Siegel (2013), which recognizes goals-based planning as a distinct approach. This discussion draws on Brunel (2015).
9 Communication of 3 June 2016, used with permission.

5.1 Relevant Objectives

All three of the asset allocation approaches listed here seek to make optimal use of the amount of risk that the asset owner is comfortable bearing to achieve stated investment objectives, although they generally define risk differently. Exhibit 5 summarizes typical objectives.

Exhibit 5 Asset Allocation Approaches: Investment Objective

Asset Allocation Approach	Relation to Economic Balance Sheet	Typical Objective	Typical Uses and Asset Owner Types
Asset only	Does not explicitly model liabilities or goals	Maximize Sharpe ratio for acceptable level of volatility	Liabilities or goals not defined and/or simplicity is important ■ Some foundations, endowments ■ Sovereign wealth funds ■ Individual investors
Liability relative	Models legal and quasi-liabilities	Fund liabilities and invest excess assets for growth	Penalty for not meeting liabilities high ■ Banks ■ Defined benefit pensions ■ Insurers
Goals based	Models goals	Achieve goals with specified required probabilities of success	Individual investors

In a mean–variance asset-only approach, the objective is to maximize expected portfolio return per unit of portfolio volatility over some time horizon, consistent with the investor's tolerance for risk and consistent with any constraints stated in the IPS. A portfolio's Sharpe ratio is a characteristic metric for evaluating portfolios in an asset-only mean–variance approach.

The basic objective of a liability-relative asset allocation approach is to ensure payment of liabilities when they are due.

A goals-based approach is similar to a liability-relative approach in that it also seeks to ensure that there are sufficient assets to meet the desired payouts. In goals-based approaches, however, goals are generally associated with individual sub-portfolios, and an asset allocation is designed for each sub-portfolio that reflects the time horizon and required probability of success such that the sum of the sub-portfolios addresses the totality of goals satisfactorily.

5.2 Relevant Risk Concepts

Asset-only approaches focus on asset class risk and effective combinations of asset classes. The baseline asset-only approach, mean–variance optimization, uses volatility (standard deviation) of portfolio return as a primary measure of risk, which is a function of component asset class volatilities and the correlations of asset class returns. A mean–variance asset allocation can also incorporate other risk sensitivities, including risk relative to benchmarks and downside risk. Risk relative to benchmarks is usually

measured by tracking risk (tracking error). Downside risk can be represented in various ways, including semi-variance, peak-to-trough maximum drawdown, and measures that focus on the extreme (tail) segment of the downside, such as value at risk.

Mean–variance results, although often the starting point for understanding portfolio risk, are regularly augmented by Monte Carlo simulation. By providing information about how an asset allocation performs when one or more variables are changed—for example, to values representing conditions of financial market stress—simulation helps complete the picture of risk, including downside and tail risk. Insights from simulation can then be incorporated as refinements to the asset allocation.

Liability-relative approaches focus on the risk of having insufficient assets to pay obligations when due, which is a kind of shortfall risk. Other risk concerns include the volatility of contributions needed to fund liabilities. Risk in a liability-relative context is generally underpinned by the differences between asset and liability characteristics (e.g., their relative size, their interest rate sensitivity, their sensitivity to inflation).

Goals-based approaches are concerned with the risk of failing to achieve goals.[10] The risk limits can be quantified as the maximum acceptable probability of not achieving a goal.[11] The plural in "liabilities" and "goals" underscores that these risks are generally related to multiple future points in time. Overall portfolio risk is thus the weighted sum of the risks associated with each goal.

Generally, a given statistical risk measure may be relevant in any of the three approaches. For example, standard deviation can be used to assess overall portfolio volatility in asset-only approaches, and it may be used to measure surplus volatility (the volatility of the difference between the values of assets and liabilities) or the volatility of the funded ratio (the ratio of the values of assets and liabilities) in liability-relative asset allocation.

5.3 Modeling Asset Class Risk

Asset classes are one of the most widely used investment concepts but are often interpreted in distinct ways. Greer (1997) defines an asset class as "a set of assets that bear some fundamental economic similarities to each other, and that have characteristics that make them distinct from other assets that are not part of that class." He specifies three "super classes" of assets:

- *Capital assets.* An ongoing source of something of value (such as interest or dividends); capital assets can be valued by net present value.
- *Consumable/transformable assets.* Assets, such as commodities, that can be consumed or transformed, as part of the production process, into something else of economic value, but which do not yield an ongoing stream of value.
- *Store of value assets.* Neither income generating nor valuable as a consumable or an economic input; examples include currencies and art, whose economic value is realized through sale or exchange.

EXAMPLE 4

Asset Classes (1)

Classify the following investments based on Greer's (1997) framework, or explain how they *do not* fit in the framework:

1 Precious metals

10 See Das, Markowitz, Scheid, and Statman (2010), who call goals "mental accounts."
11 See Brunel (2015).

2 Petroleum
3 Hedge funds
4 Timberland
5 Inflation-linked fixed-income securities
6 Volatility

Solutions:

1 Precious metals are a store of value asset except in certain industrial applications (e.g., palladium and platinum in the manufacture of catalytic converters).
2 Petroleum is a consumable/transformable asset; it can be consumed to generate power or provide fuel for transport.
3 Hedge funds do not fit into Greer's (1997) super class framework; a hedge fund strategy invests in underlying asset classes.
4 Timberland is a capital asset or consumable/transformable asset. It is a capital asset in the sense that timber can be harvested and replanted cyclically to generate a stream of cash flows; it is a consumable asset in that timber can be used to produce building materials/ packaging or paper.
5 Inflation-linked fixed-income securities is a capital asset because cash flows can be determined based on the characteristics of the security.
6 Volatility does not fit; it is a measurable investment characteristic. Because equity volatility is the underlying for various derivative contracts and an investable risk premium may be associated with it, it is mentioned by some as an asset.

Greer (1997) approaches the classification of asset classes in an abstract or generic sense. The next question is how to specify asset classes to support the purposes of strategic asset allocation.[12] For example, if a manager lumps together very different investments, such as distressed credit and Treasury securities, into an asset class called "fixed income," asset allocation becomes less effective in diversifying and controlling risk. Furthermore, the investor needs a logical framework for distinguishing an asset class from an investment strategy. The following are five criteria that will help in effectively *specifying asset classes for the purpose of asset allocation*:[13]

1 *Assets within an asset class should be relatively homogeneous.* Assets within an asset class should have similar attributes. In the example just given, defining equities to include both real estate and common stock would result in a non-homogeneous asset class.
2 *Asset classes should be mutually exclusive.* Overlapping asset classes will reduce the effectiveness of strategic asset allocation in controlling risk and could introduce problems in developing asset class return expectations. For example, if one asset class for a US investor is domestic common equities, then world equities ex-US is more appropriate as another asset class rather than global equities, which include US equities.

12 See Kritzman (1999).
13 As opposed to criteria for asset class definition in an absolute sense.

3 *Asset classes should be diversifying.* For risk control purposes, an included asset class should not have extremely high expected correlations with other asset classes or with a linear combination of other asset classes. Otherwise, the included asset class will be effectively redundant in a portfolio because it will duplicate risk exposures already present. In general, a pairwise correlation above 0.95 is undesirable (given a sufficient number of observations to have confidence in the correlation estimate).

4 *The asset classes as a group should make up a preponderance of world investable wealth.* From the perspective of portfolio theory, selecting an asset allocation from a group of asset classes satisfying this criterion should tend to increase expected return for a given level of risk. Furthermore, the inclusion of more markets expands the opportunities for applying active investment strategies, assuming the decision to invest actively has been made. However, such factors as regulatory restrictions on investments and government-imposed limitations on investment by foreigners may limit the asset classes an investor can invest in.

5 *Asset classes selected for investment should have the capacity to absorb a meaningful proportion of an investor's portfolio.* Liquidity and transaction costs are both significant considerations. If liquidity and expected transaction costs for an investment of a size meaningful for an investor are unfavorable, an asset class may not be practically suitable for investment.

Note that Criteria 1 through 3 strictly focus on assets themselves, while Criterion 5, and to some extent Criterion 4, involve potential investor-specific considerations.

Asset Classes Should Be Diversifying

Pairwise asset class correlations are often useful information and are readily obtained. However, in evaluating an investment's value as a diversifier at the portfolio level, it is important to consider an asset in relation to all other assets as a group rather than in a one-by-one (pairwise) fashion. It is possible to reach limited or incorrect conclusions by solely considering pairwise correlations. To give an example, denote the returns to three assets by X, Y, and Z, respectively. Suppose that $Z = aX + bY$; a and b are constants, not both equal to zero. Asset Z is an exact weighted combination of X and Y and so has no value as a diversifier added to a portfolio consisting of assets X and Y. Yet, if the correlation between X and Y is -0.5, it can be shown that Z has a correlation of just 0.5 with X as well as with Y.

Examining return series' correlations during times of financial market stress can provide practically valuable insight into potential diversification benefits beyond typical correlations that average all market conditions.

In current professional practice, the listing of asset classes often includes the following:

- *Global public equity*—composed of developed, emerging, and sometimes frontier markets and large-, mid-, and small-cap asset classes; sometimes treated as several sub-asset classes (e.g., domestic and non-domestic).
- *Global private equity*—includes venture capital, growth capital, and leveraged buyouts (investment in special situations and distressed securities often occurs within private equity structures too).

- *Global fixed income*—composed of developed and emerging market debt and further divided into sovereign, investment-grade, and high-yield sub-asset classes, and sometimes inflation-linked bonds (unless included in real assets; see the following bullet). Cash and short-duration securities can be included here.
- *Real assets*—includes assets that provide sensitivity to inflation, such as private real estate equity, private infrastructure, and commodities. Sometimes, global inflation-linked bonds are included as a real asset rather than fixed income because of their sensitivity to inflation.

Emerging Market Equities and Fixed Income

Investment practice distinguishes between developed and emerging market equities and fixed income within global equities. The distinction is based on practical differences in investment characteristics, which can be related to typical market differences including the following:

- diversification potential, which is related to the degree to which investment factors driving market returns in developed and emerging markets are not identical (a topic known as "market integration");
- perceived level of informational efficiency; and
- corporate governance, regulation, taxation, and currency convertibility.

As of mid-2016, emerging markets represent approximately 10% of world equity value based on MSCI indices.[14] In fixed income, investment opportunities have expanded as governments and corporations domiciled in emerging markets have increasingly issued debt in their own currency. Markets in local currency inflation-indexed emerging market sovereign debt have become more common.[15]

"Asset classes" are, by definition, groupings of assets. Investment vehicles, such as hedge funds, that apply strategies to asset classes and/or individual investments with the objective of earning a return to investment skill or providing attractive risk characteristics may be treated as a category called "strategies" or "diversifying strategies." When that is the case, this category is assigned a percentage allocation of assets, similar to a true asset class. Economically, asset classes contrast with "strategies" by offering, in general, an inherent, non-skill-based *ex ante* expected return premium.[16]

Effective portfolio optimization and construction may be hindered by excessive asset class granularity. Consider Exhibit 6.

14 MSCI uses three broad definitions to sort countries into developed, emerging, and frontier: 1) economic development, 2) size and liquidity requirements, and 3) market accessibility criteria (see the MSCI Market Classification Framework at www.msci.com/market-classification).

15 For a discussion of their potential benefits, see Burger, Warnock, and Warnock (2012), Perry (2011), and Swinkels (2012). Kozhemiakin (2011) discusses how emerging market bonds can facilitate broader representation than an equity-only portfolio because some countries (e.g., Argentina) have small equity markets but larger bond markets.

16 See Idzorek and Kowara (2013), p.20.

Exhibit 6 Examples of Asset Classes and Sub-Asset Classes

As more and more sub-asset classes are defined, they become less distinctive. In particular, the sources of risk for more broadly defined asset classes are generally better distinguished than those for narrowly defined subgroups. For example, the overlap in the sources of risk of US large-cap equity and US small-cap equity would be greater than the overlap between US and non-US equity. Using broadly defined asset classes with fewer risk source overlaps in optimization is consistent with achieving a diversified portfolio. Additionally, historical data for broadly defined asset classes may be more readily available or more reliable. The question of how much to allocate to equity versus fixed income versus other assets is far more important in strategic asset allocation than *precisely* how much to allocate to the various sub-classes of equity and fixed income. However, when the investor moves from the strategic asset allocation phase to policy implementation, sub-asset class choices become relevant.

EXAMPLE 5

Asset Classes (2)

Discuss a specification of asset classes that distinguishes between "domestic intermediate-duration fixed income" and "domestic long-duration fixed income." Contrast potential relevance in asset-only and liability-relative contexts.

Solution:

These two groups share key risk factors, such as interest rate and credit risk. For achieving diversification in asset risk—for example, in an asset-only context—asset allocation using domestic fixed income, which includes intermediate and long duration, should be effective and simple. Subsequently, allocation within domestic fixed income could address other considerations, such as interest rate views. When investing in relation to liabilities, distinctions by duration could be of first-order importance and the specification could be relevant.

Any asset allocation, by whatever means arrived at, is expressed ultimately in terms of money allocations to assets. Traditionally—and still in common practice—asset allocation uses asset classes as the unit of analysis. Thus, mean–variance optimization based on four asset classes (e.g., global public equity, global private equity, global fixed income, and real assets) would be based on expected return, return volatility, and return correlation estimates for these asset classes. (The development of such capital market assumptions is the subject of another reading.) Factor-based approaches, discussed in more detail later, do not use asset classes as the basis for portfolio construction.

Technically, the set of achievable investment outcomes cannot be enlarged simply by developing an asset allocation by a different means (for instance, using asset classes as the unit of analysis), all else being equal, such as constraints against short selling (non-negativity constraints).[17] Put another way, adopting a factor-based asset allocation approach does not, by default, lead to superior investment outcomes.

There are allocation methods that focus on assigning investments to the investor's desired exposures to specified risk factors. These methods are premised on the observation that asset classes often exhibit some overlaps in sources of risk, as illustrated in Exhibit 7.[18]

Exhibit 7 Common Factor Exposures across Asset Classes

The overlaps seen in Exhibit 7 help explain the correlation of equity and credit assets. Modeling using asset classes as the unit of analysis tends to obscure the portfolio's sensitivity to overlapping risk factors, such as inflation risk in this example. As a result, controlling risk exposures may be problematic. Multifactor risk models, which have a history of use in individual asset selection, have been brought to bear on the issue of controlling systematic risk exposures in asset allocation.

In broad terms, when using factors as the units of analysis, we begin with specifying risk factors and the desired exposure to each factor. Asset classes can be described with respect to their sensitivities to each of the factors. Factors, however, are not directly investable. On that basis, asset class portfolios that isolate exposure to the risk factor are constructed; these factor portfolios involve both long and short positions. A choice of risk exposures in factor space can be mapped back to asset class space for implementation. Uses of multifactor risk models in asset allocation have been labeled "factor-based asset allocation" in contrast to "asset class-based asset allocation," which uses asset classes directly as the unit of analysis.

Factor Representation

Although risk factors can be thought of as the basic building blocks of investments, most are not directly investable. In this context, risk factors are associated with expected return premiums. Long and short positions in assets (spread positions) may be needed

17 Stated more formally and demonstrated in Idzorek and Kowara (2013).
18 See Podkaminer (2013).

to isolate the respective risks and associated expected return premiums. Other risk factors may be accessed through derivatives. The following are a few examples of how risk factor exposures can be achieved.

- *Inflation*. Going long nominal Treasuries and short inflation-linked bonds isolates the inflation component.
- *Real interest rates*. Inflation-linked bonds provide a proxy for real interest rates.
- *US volatility*. VIX (Chicago Board Options Exchange Volatility Index) futures provide a proxy for implied volatility.
- *Credit spread*. Going long high-quality credit and short Treasuries/government bonds isolates credit exposure.
- *Duration*. Going long 10+ year Treasuries and short 1–3 year Treasuries isolates the duration exposure being targeted.

Factor Models in Asset Allocation

The interest in using factors for asset allocation stems from a number of considerations, including the following:

- The desire to shape the asset allocation based on goals and objectives that cannot be expressed by asset classes (such as matching liability characteristics in a liability-relative approach).
- An intense focus on portfolio risk in all of its various dimensions, helped along by availability of commercial factor-based risk measurement and management tools.
- The acknowledgment that many highly correlated so-called asset classes are better defined as parts of the same high-level asset class. For example, domestic and foreign equity may be better seen as sub-classes of global public equity.
- The realization that equity risk can be the dominant risk exposure even in a seemingly well-diversified portfolio.

STRATEGIC ASSET ALLOCATION 6

An asset allocation that arises in long-term investment planning is often called the "strategic asset allocation" or "policy portfolio": It is an asset allocation that is expected to be effective in achieving an asset owner's investment objectives, given his or her investment constraints and risk tolerance, as documented in the investment policy statement.

A theoretical underpinning for quantitative approaches to asset allocation is utility theory, which uses a utility function as a mathematical representation of preferences that incorporates the investor's risk aversion. According to utility theory, the optimal asset allocation is the one that is expected to provide the highest utility to the investor at the investor's investment time horizon. The optimization program, in broad terms, is

$$\underset{\text{by choice of asset class weights } w_i}{\text{Maximize}} \quad E\left[U\left(W_T\right)\right] = f\left(W_0, w_i, \text{asset class return distributions}, \text{degree of risk aversion}\right)$$

$$\text{subject to} \sum_{i=1}^{n} w_i = 1 \text{ and any other constraints on } w_i$$

The first line is the objective function, and the second line consists of constraints on asset class weights; other constraints besides those on weights can also be incorporated (for example, specified levels of bond duration or portfolio yield may be targeted). With W_0 and W_T (the values of wealth today and at time horizon T, respectively) the investor's problem is to select the asset allocation that maximizes the expected utility of ending wealth, $E[U(W_T)]$, subject to the constraints that asset class weights sum to 1 and that weights observe any limits the investor places on them. Beginning wealth, asset class weights, and asset class returns imply a distribution of values for ending wealth, and the utility function assigns a value to each of them; by weighting these values by their probability of occurrence, an expected utility for the asset allocation is determined.

An expected utility framework underlies many, but not all, quantitative approaches to asset allocation. A widely used group in asset allocation consists of power utility functions,[19] which exhibit the analytically convenient characteristic that risk aversion does not depend on the level of wealth. Power utility can be approximated by mean–variance utility, which underlies mean–variance optimization.

Optimal Choice in the Simplest Case

The simplest asset allocation decision problem involves one risky asset and one risk-free asset. Let λ, μ, r_f, and σ^2 represent, respectively, the investor's degree of risk aversion, the risk asset's expected return, the risk-free interest rate, and the variance of return. With mean–variance utility, the optimal allocation to the risky asset, w^*, can be shown to equal

$$w^* = \frac{1}{\lambda}\left(\frac{\mu - r_f}{\sigma^2}\right)$$

The allocation to the risky asset is inversely proportional to the investor's risk aversion and directly proportional to the risk asset's expected return per unit of risk (represented by return variance).[20]

Selection of a strategic asset allocation generally involves the following steps:[21]

1. Determine and quantify the investor's objectives. What is the pool of assets meant for (e.g., paying future benefit payments, contributing to a university's budget, securing ample assets for retirement)? What is the investor trying to achieve? What liabilities or needs or goals need to be recognized (explicitly or implicitly)? How should objectives be modeled?
2. Determine the investor's risk tolerance and how risk should be expressed and measured. What is the investor's overall tolerance for risk and specific risk sensitivities? How should these be quantified in the process of developing an appropriate asset allocation (risk measures, factor models)?
3. Determine the investment horizon(s). What are the appropriate planning horizons to use for asset allocation; that is, over what horizon(s) should the objectives and risk tolerance be evaluated?

19 Power utility has the form $U = \frac{w_T^{1-\lambda}}{1-\lambda}$, where $\lambda > 0$ is the parameter of risk aversion (if $\lambda \to 0$, the investor is risk neutral).

20 See Ang (2014), Chapter 4, for further analysis.

21 Arjan Berkelaar, CFA, contributed to this formulation of steps.

4 Determine other constraints and the requirements they impose on asset allocation choices. What is the tax status of the investor? Should assets be managed with consideration given to ESG issues? Are there any legal and regulatory factors that need to be considered? Are any political sensitivities relevant? Are there any other constraints that the investor has imposed in the IPS and other communications?

5 Determine the approach to asset allocation that is most suitable for the investor.

6 Specify asset classes, and develop a set of capital market expectations for the specified asset classes.

7 Develop a range of potential asset allocation choices for consideration. These choices are often developed through optimization exercises. Specifics depend on the approach taken to asset allocation.

8 Test the robustness of the potential choices. This testing often involves conducting simulations to evaluate potential results in relation to investment objectives and risk tolerance over appropriate planning horizon(s) for the different asset allocations developed in Step 7. The sensitivity of the outcomes to changes in capital market expectations is also tested.

9 Iterate back to Step 7 until an appropriate and agreed-on asset allocation is constructed.

Subsequent readings on asset allocation in practice will address the "how." The following sections give an indication of thematic considerations. We use investors with specific characteristics to illustrate the several approaches distinguished: sovereign wealth fund for asset-only allocation; a frozen corporate DB plan for liability-relative allocation; and an ultra-high-net-worth family for goals-based allocation. In practice, any type of investor could approach asset allocation with varying degrees of focus on modeling and integrating liabilities-side balance sheet considerations. How these cases are analyzed in this reading should not be viewed as specifying normative limits of application for various asset allocation approaches. For example, a liability-relative perspective has wide potential relevance for institutional investors because it has the potential to incorporate all information on the economic balance sheet. Investment advisers to high-net-worth investors may choose to use any of the approaches.

6.1 Asset Only

Asset-only allocation is based on the principle of selecting portfolios that make efficient use of asset risk. The focus here is mean–variance optimization, the mainstay among such approaches. Given a set of asset classes and assumptions concerning their expected returns, volatilities, and correlations, this approach traces out an efficient frontier that consists of portfolios that are expected to offer the greatest return at each level of portfolio return volatility. The Sharpe ratio is a key descriptor of an asset allocation: If a portfolio is efficient, it has the highest Sharpe ratio among portfolios with the same volatility of return.

An example of an investor that might use an asset-only approach is the (hypothetical) Government Petroleum Fund of Cafastan (GPFC) introduced next.

Investor Case Facts: GPFC, A Sovereign Wealth Fund

- *Name*: Government Petroleum Fund of Cafastan (GPFC)

- *Narrative*: The emerging country of Cafastan has established a sovereign wealth fund to capture revenue from its abundant petroleum reserves. The government's goal in setting up the fund is to promote a fair sharing of the benefits between current and future generations (intergenerational equity) from the export of the country's petroleum resources. Cafastan's equity market represents 0.50% of global equity market capitalization. Economists estimate that distributions in the interest of intergenerational equity may need to begin in 20 years. Future distribution policy is undetermined.
- *Tax status*: Non-taxable.
- *Financial assets and financial liabilities*: Financial assets are CAF$40 billion at market value, making GPFC among the largest investors in Cafastan. GPFC has no borrowings.
- *Extended assets and liabilities*: Cash inflows from petroleum exports are assumed to grow at inflation + 1% for the next 15 years and may change depending on reserves and global commodity demand. The present value of expected future income from state-owned reserves is estimated to be CAF$60 billion. Future spending needs are positively correlated with consumer inflation and population growth. In Exhibit 8, the amount for the present value (PV) of future spending, which GPFC has not yet determined, is merely a placeholder to balance assets and liabilities; as a result, no equity is shown.

Exhibit 8 GPFC Economic Balance Sheet (in CAF$ billions) 31 December 20x6

Assets		Liabilities and Net Worth	
Financial assets		*Financial liabilities*	
Investments (includes cash, equities, fixed income, and other investments)	40		
Extended assets		*Extended liabilities*	
PV of expected future income	60	PV of future spending	100
		Net worth	
		Economic net worth	0
Total	100		100

For GPFC, the amount and timing of funds needed for future distributions to Cafastan citizens are, as yet, unclear. GPFC can currently focus on asset risk and its efficient use to grow assets within the limits of the fund's risk tolerance. In addition to considering expected return in relation to volatility in selecting an asset allocation, GPFC might include such considerations as the following:

- diversification across global asset classes (possibly quantified as a constraint on the proportion allocated to any given asset classes);
- correlations with the petroleum sources of income to GPFC;
- the potential positive correlation of future spending with inflation and population growth in Cafastan;

- long investment horizon (as a long-term investor, GPFC may be well positioned to earn any return premium that may be associated with the relatively illiquid asset classes); and
- return outcomes in severe financial market downturns.

Suppose GPFC quantifies its risk tolerance in traditional mean–variance terms as willingness to bear portfolio volatility of up to 17% per year. This risk tolerance is partly based on GPFC's unwillingness to allow the fund to fall below 90% funded. GPFC's current strategic asset allocation, along with several alternatives that have been developed by its staff during an asset allocation review, are shown in Exhibit 9. The category "Diversifying strategies" consists of a diversified allocation to hedge funds.

Exhibit 9 GPFC Strategic Asset Allocation Decision[22]

	Asset Allocation			
		Proposed		
	Current	A	B	C
Investment				
Equities				
Domestic	50%	40%	45%	30%
Global ex-domestic		10%	20%	25%
Bonds				
Nominal	30%	30%	20%	10%
Inflation linked				10%
Real estate	20%	10%	15%	10%
Diversifying strategies		10%		15%
Portfolio statistics				
Expected arithmetic return	8.50%	8.25%	8.88%	8.20%
Volatility (standard deviation)	15.57%	14.24%	16.63%	14.06%
Sharpe ratio	0.353	0.369	0.353	0.370
One-year 5% VaR	–17.11%	–15.18%	–18.48%	–14.93%

Notes: The government bond rate is 3%. The acceptable level of volatility is ≤ 17% per year. The value at risk (VaR) is stated as a percent of the initial portfolio value over one year (e.g., –16% means a decline of 16%).

GPFC decides it is willing to tolerate a 5% chance of losing 22% or more of portfolio value in a given year. This risk is evaluated by examining the one-year 5% VaR of potential asset allocations.

22 The assumed expected returns and return volatilities are (given in that order in parentheses and expressed as decimals, rather than percentages): domestic equities (0.11, 0.25), non-domestic equities (0.09, 0.18), nominal bonds (0.05, 0.10), inflation-linked bonds (0.035, 0.06), real estate (0.075, 0.16), and diversifying strategies (0.07, 0.09). A correlation matrix with hypothetical values and a hypothetical relationship between the allocations and VaR also lies behind the exhibit. Because the purpose here is to illustrate concepts rather than mechanics, inputs are not discussed although they are very important in asset allocation.

Let us examine GPFC's decision. The current asset allocation and the alternatives developed by staff all satisfy the GPFC's tolerance for volatility and VaR limit. The staff's alternatives appear to represent incremental, rather than large-scale, changes from the current strategic asset allocation. We do not know whether capital market assumptions have changed since the current strategic asset allocation was approved.

Mix A, compared with the current asset allocation, diversifies the equity allocation to include non-domestic (global ex-domestic) equities and spreads the current allocation to real estate over real estate and diversifying strategies. Given GPFC's long investment horizon and absence of liquidity needs, an allocation to diversifying strategies at 10% should not present liquidity concerns. Because diversifying strategies are more liquid than private real estate, the overall liquidity profile of the fund improves. It is important to note that given the illiquid nature of real estate, it could take considerable time to reallocate from real estate to diversifying strategies. Mix A has a lower volatility (by 133 bps) than the current allocation and slightly lower tail risk (the 5% VaR for Mix A is −15%, whereas the 5% VaR for the current asset mix is −17%). Mix A's Sharpe ratio is slightly higher. On the basis of the facts given, Mix A appears to be an incremental improvement on the current asset allocation.

Compared with Mix A and the current asset allocation, Mix B increases the allocation to equities by 15 percentage points and pulls back from the allocation to bonds and, in relation to Mix A, diversifying strategies. Although Mix B has a higher expected return and its VaR is within GPFC's tolerance of 22%, Mix B's lower Sharpe ratio indicates that it makes inefficient use of its additional risk. Mix B does not appear to deserve additional consideration.

Compared with the current asset allocation and Mix A, Mix C's total allocation to equities, at 55%, is higher and the mix is more diversified considering the allocation of 25% non-domestic equities. Mix C's allocation to fixed income is 20% compared with 30% for Mix A and the current asset mix. The remaining fixed-income allocation has been diversified with an exposure to both nominal and inflation-linked bonds. The diversifying strategies allocation is funded by a combination of the reduced weights to fixed income and real estate. The following observations may be made:

- Mix C's increase in equity exposure (compared with the equity exposure of Mix A and the current mix) has merit because more equity-like choices in the asset allocation could be expected to give GPFC more exposure to such a factor as a GDP growth factor (see Exhibit 8); population growth is one driver of GDP.
- Within fixed income, Mix C's allocation to inflation-linked bonds could be expected to hedge the inflation risk inherent in future distributions.
- Mix C has the lowest volatility and the lowest VaR among the asset allocations, although the differences compared with Mix A are very small. Mix C's Sharpe ratio is comparable to (insignificantly higher than) Mix A's.

Based on the facts given, Mix A and Mix C appear to be improvements over the current mix. Mix C may have the edge over Mix A based on the discussion. As a further step in the evaluation process, GPFC may examine the robustness of the forecasted results by changing the capital market assumptions and simulating shocks to such variables as inflation. The discussion of Mix C shows that there are means for potential liability concerns (the probable sensitivity of spending to inflation and population growth) to enter decision making even from a mean–variance optimization perspective.

EXAMPLE 6

Asset-Only Asset Allocation

1. Describe how the Sharpe ratio, considered in isolation, would rank the asset allocation in Exhibit 9.
2. State a limitation of basing a decision only on the Sharpe ratio addressed in Question 1.
3. An assertion is heard in an investment committee discussion that because the Sharpe ratio of diversifying strategies (0.55) is higher than real estate's (0.50), any potential allocation to real estate would be better used in diversifying strategies. Describe why the argument is incomplete.

Solution to 1:

The ranking by Sharpe ratios in isolation is C (3.70), A (3.69), and current and B (both 3.53). Using only the Sharpe ratio, Mix C appears superior to the other choices, but such an approach ignores several important considerations.

Solution to 2:

The Sharpe ratio, while providing a means to rank choices on the basis of return per unit of volatility, does not capture other characteristics that are likely to be important to the asset owner, such as VaR and funded ratio. Furthermore, the Sharpe ratio by itself cannot confirm that the absolute level of portfolio risk is within the investor's specified range.

Solution to 3:

It is true that the higher the Sharpe ratio of an investment, the greater its contribution to the Sharpe ratio of the overall portfolio, *holding all other things equal*. However, that condition is not usually true. Diversification potential in a portfolio (quantified by correlations) may differ. For example, including both diversifying strategies and real estate in an allocation may ultimately decrease portfolio-level risk through favorable correlation characteristics. Also, as in the solution to Question 2, other risk considerations besides volatility may be relevant.

Financial theory suggests that investors should consider the global market-value weighted portfolio as a baseline asset allocation. This portfolio, which sums all investable assets (global stocks, bonds, real estate, and so forth) held by investors, reflects the balancing of supply and demand across world markets. In financial theory, it is the portfolio that minimizes non-diversifiable risk, which in principle is uncompensated. Because of that characteristic, theory indicates that the global market portfolio should be the available portfolio that makes the most efficient use of the risk budget.[23] Other arguments for using it as a baseline include its position as a reference point for a highly diversified portfolio and the discipline it provides in relation to mitigating any investment biases, such as home-country bias (discussed below).

At a minimum, the global market portfolio serves as a starting point for discussion and ensures that the investor articulates a clear justification for moving away from global capitalization market weights. The global market portfolio is expressed in two phases. The first phase allocates assets in proportion to the global portfolio of stocks, bonds, and real assets. The second phase disaggregates each of these broad asset

23 According to the two-fund separation theorem, all investors optimally hold a combination of a risk-free asset and an optimal portfolio of all risky assets. This optimal portfolio is the global market value portfolio.

classes into regional, country, and security weights using capitalization weights. The second phase is typically used within a global equity portfolio where an asset owner will examine the global capitalization market weights and either accept them or alter them. Common tilts (biases) include overweighting the home-country market, value, size (small cap), and emerging markets. For many investors, allocations to foreign fixed income have been adopted more slowly than allocations to foreign equity. Most investors have at least some amount in non-home-country equity.

Home-Country Bias

A given for GPFC was that Cafastan's equity markets represent only 0.50% of the value of world equity markets. However, in all asset allocations in Exhibit 9, the share of domestic equity ranged from 50% for the current asset allocation to 30% for Mix C. The favouring of domestic over non-domestic investment relative to global market value weights is called **home-country bias** and is very common. Even relatively small economies feature pension plans, endowments, and other funds, which are disproportionately tilted toward the equity and fixed-income offerings in the domestic market. The same tendency is true for very large markets, such as the United States and the eurozone. By biasing toward the home market, asset owners may not be optimally aligning regional weights with the global market portfolio and are implicitly implementing a market view. Investment explanations for the bias, such as offsetting liabilities that are denominated in the home currency, may be relevant in some cases, however.

For reference, the MSCI All Country World Portfolio (ACWI), a proxy for the public equities portion of the global equity market portfolio, contains the following capitalization weights as of 31 December 2015:

- Developed Europe and the Middle East: 22.8%
- Developed Pacific: 11.7%
- North America: 55.9%
- Emerging markets: 9.6%

Investing in a global market portfolio faces several implementation hurdles. First, estimating the size of each asset class on a global basis is an imprecise exercise given the uneven availability of information on non-publicly traded assets. Second, the practicality of investing proportionately in residential real estate, much of which is held in individual homeowners' hands, has been questioned. Third, private commercial real estate and global private equity assets are not easily carved into pieces of a size that is accessible to most investors. Practically, proxies for the global market portfolio are often based only on traded assets, such as portfolios of exchange-traded funds (ETFs). Furthermore, some investors have implemented alternative weighting schemes, such as GDP weight or equal weight. However, it is a useful discipline to articulate a justification for any deviation from the capitalization-weighted global market portfolio.

6.2 Liability Relative

To illustrate the liability-relative approach, we take the defined benefit (DB) pension plan of (hypothetical) GPLE Corporation, with case facts given below.

A Frozen DB Plan, GPLE Corporation Pension

- *Name*: GPLE Corporation Pension
- *Narrative*: GPLE is a machine tool manufacturer with a market value of $2 billion. GPLE is the sponsor of a $1.25 billion legacy DB plan, which is now frozen (i.e., no new plan participants and no new benefits accruing for existing plan participants). GPLE Pension has a funded ratio (the ratio of pension assets to liabilities) of 1.15. Thus, the plan is slightly overfunded. Responsibility for the plan's management rests with the firm's treasury department (which also has responsibility for GPLE Corporation treasury operations).
- *Tax status*: Non-taxable.
- *Financial assets and financial liabilities*: Assets amount to $1.25 billion at market values. Given a funded ratio of 1.15, that amount implies that liabilities are valued at about $1.087 billion. Projected distributions to pension beneficiaries have a present value of $1.087 billion at market value.

GPLE does not reflect any extended assets or liabilities; thus, economic net worth is identical to traditional accounting net worth.

Exhibit 10 GPLE Pension Economic Balance Sheet (in US$ billions) 31 December 20x6

Assets		Liabilities and Net Worth	
Financial assets		*Financial liabilities*	
Pension assets	1.250	PV of pension liability	1.087
		Net worth	
		Economic net worth	0.163
Total	1.250		1.250

GPLE, the plan sponsor, receives two asset allocation recommendations. Recommendation A does not explicitly consider GPLE's pension's liabilities but is instead based on an asset-only perspective: the mean–variance efficient frontier given a set of capital market assumptions. A second recommendation, "Recommendation B," does explicitly consider liabilities, incorporating a liability-hedging portfolio based on an analysis of GPLE pension liabilities and a return-seeking portfolio.

In evaluating asset allocation choices, consider the pensioners' and the plan sponsor's interests. Pensioners want to receive the stream of promised benefits with as little risk, or chance of interruption, as possible. Risk increases as the funded ratio declines. When the funded ratio is 1.0, pension assets just cover pension liabilities with no safety buffer. When the funded ratio is less than 1.0, the plan sponsor generally needs to make up the deficit in pension assets by contributions to the plan. For example, with a 10-year investment time horizon and a choice between two asset allocations, the allocation with the lower expected present value of cumulative contributions to Year 10 would generally be preferred by the sponsor, all else being equal. In practice, all else is usually not equal. For example, the alternative with the lower *expected* present value of contributions may involve more risk to the level of contributions in adverse

market conditions. For example, the 5% of *worst outcomes* for the present value of cumulative contributions may be more severe for the lower expected contribution alternative. Thus, possible asset allocations generally involve risk trade-offs.[24] Now consider the recommendations.

Recommendation A, based on asset-only analysis, involves a 65% allocation to global equities and a 35% allocation to global fixed income. Assume that this asset allocation is mean–variance efficient and has the highest Sharpe ratio among portfolios that meet the pension's assumed tolerance for asset return volatility. Capital market assumptions indicate that equities have a significantly higher expected return and volatility than fixed income.

Recommendation B, based on a liability-relative approach to asset allocation, involves an allocation of $1.125 billion to a fixed-income portfolio that is very closely matched in interest rate sensitivity to the present value of plan liabilities (and to any other liability factor risk exposures)—the liability hedging portfolio—and a $0.125 allocation to equities (the return-seeking portfolio). This is a proportional allocation of 10% to equities and 90% to fixed income. The equities allocation is believed to provide potential for increasing the size of the buffer between pension assets and liabilities with negligible risk to funded status. Recommendation B lies below the asset-only efficient frontier with a considerably lower expected return vis-à-vis Recommendation A.

What are the arguments for and against each of these recommendations? Recommendation A is expected, given capital market assumptions, to increase the size of the buffer between pension assets and liabilities. But the sponsor does not benefit from increases in the buffer if the current buffer is adequate.[25] However, with a 0.65 × $1.25 billion = $0.8125 allocation to equities and a current buffer of assets of $1.25 billion – $1.087 billion = $0.163 billion, a decline of that amount or more in equity values (a 20% decline) would put the plan into underfunded status (assuming no commensurate changes in the liability). Thus, Recommendation A creates contribution risk for the plan sponsor without a potential upside clearly benefiting either the sponsor or beneficiaries.

For Recommendation B, because the risk characteristics of the $1.125 billion fixed-income portfolio are closely matched with those of the $1.087 billion of pension liabilities with a buffer, the plan sponsor should not face any meaningful risk of needing to make further contributions to the pension. Pensioners expect the plan to be fully funded on an ongoing basis without any reliance on the sponsor's ability to make additional contributions. This is an excellent outcome for both. The pension liabilities are covered (defeased). Consider next Recommendation A.

The example is highly stylized—the case facts were developed to make points cleanly—but does point to the potential value of managing risk in asset allocation explicitly in relation to liabilities. A typical use of fixed-income assets in liability-relative asset allocation should be noted: Liability-relative approaches to asset allocation tend to give fixed income a larger role than asset-only approaches in such cases as the one examined here because interest rates are a major financial market driver of both liability and bond values. Thus, bonds can be important in hedging liabilities, but equities can be relevant for liability hedging too. With richer case facts, as when liabilities accrue with inflation (not the case in the frozen DB example), equities may have a long-term role in matching the characteristics of liabilities. In underfunded plans, the potential upside of equities would often have greater value for the plan sponsor than in the fully funded case examined.

24 Collie and Gannon (2009) explore the contribution risk trade-off considered here in more detail.

25 Real-world complexities, such as DB plan termination to capture a positive surplus or pension risk transfer (annuitization), are beyond the scope of this reading; generally, there are restrictions and penalties involved in such actions, and the point made here is valid.

Liability Glide Paths

If GPLE were underfunded, it might consider establishing a liability glide path. A **liability glide path** is a technique in which the plan sponsor specifies in advance the desired proportion of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made. The technique is particularly relevant to underfunded pensions. The idea reflects the fact that the optimal asset allocation in general is sensitive to changes in the funded status of the plan. The objective is to increase the funded status by reducing surplus risk over time. Although a higher contribution rate may be necessary to align assets with liabilities, the volatility of contributions should decrease, providing more certainty for cash flow planning purposes and decreasing risk to plan participants. Eventually, GPLE would hope to achieve and maintain a sufficiently high funded ratio so that there would be minimal risk of requiring additional contributions or transferring pension risk to an annuity provider.

The importance of such characteristics as interest rate sensitivity (duration), inflation, and credit risk in constructing a liability-hedging asset portfolio suggests the relevance of risk-factor modeling in liability-relative approaches. A risk factor approach can be extended to the return-seeking portfolio in order to minimize unintentional overlap among common factors across both portfolios—for example, credit. Exploring these topics is outside the scope of the current reading.

The next section addresses an approach to asset allocation related to liability relative in its focus on funding needs.

6.3 Goals Based

We use the hypothetical Lee family to present some thematic elements of a goals-based approach.

Investor Case Facts: The Lee Family

- *Name*: Ivy and Charles Lee
- *Narrative*: Ivy is a 54-year-old life sciences entrepreneur. Charles is 55 years old and employed as an orthopedic surgeon. They have two unmarried children aged 25 (Deborah) and 18 (David). Deborah has a daughter with physical limitations.
- *Financial assets and financial liabilities*: Portfolio of $25 million with $1 million in margin debt as well as residential real estate of $3 million with $1 million in mortgage debt.
- *Other assets and liabilities*:
  - Pre-retirement earnings are expected to total $16 million in present value terms (human capital).
  - David will soon begin studying at a four-year private university; the present value of the expected parental contribution is $250,000.
  - The Lees desire to give a gift to a local art museum in five years. In present value terms, the gift is valued at $750,000.
  - The Lees want to establish a trust for their granddaughter with a present value of $3 million to be funded at the death of Charles.
  - The present value of future consumption expenditures is estimated at $20 million.

Exhibit 11 Lee Family Economic Balance Sheet (in US$ millions) 31 December 20x6

Assets		Liabilities and Net Worth	
Financial assets		*Financial liabilities*	
Investment portfolio	25	Margin debt	1
Real estate	3	Mortgage	1
Extended assets		*Extended liabilities*	
Human capital	16	David's education	0.25
		Museum gift	0.75
		Special needs trust	3
		PV of future consumption	20
		Net worth	
		Economic net worth (economic assets less economic liabilities)	18
Total	44		44

The financial liabilities shown are legal liabilities. The extended liabilities include funding needs that the Lees want to meet. The balance sheet includes an estimate of the present value of future consumption, which is sometimes called the "consumption liability." The amount shown reflects expected values over their life expectancy given their ages. If they live longer, consumption needs will exceed the $20 million in the case facts and erode the $18 million in equity. If their life span is shorter, $18 million plus whatever they do not consume of the $20 million in PV of future consumption becomes part of their estate. Note that for the Lees, the value of assets exceeds the value of liabilities, resulting in a positive economic net worth (a positive difference between economic assets and economic liabilities); this is analogous to a positive owners' equity on a company's financial balance sheet.

From Exhibit 11, we can identify four goals totaling $24 million in present value terms: a lifestyle goal (assessed as a need for $20 million in present value terms), an education goal ($0.25 million), a charitable goal ($0.75 million), and the special needs trust ($3 million).

The present value of expected future earnings (human capital) at $16 million is less than the lifestyle present value of $20 million, which means that some part of the investment portfolio must fund the Lees' standard of living. It is important to note that although the Lee family has $18 million of economic net worth, most of this comes from the $16 million extended asset of human capital. Specific investment portfolio assets have not yet been dedicated to specific goals.

Goals-based asset allocation builds on several insights from behavioral finance. The approach's characteristic use of sub-portfolios is grounded in the behavioral finance insight that investors tend to ignore money's fungibility[26] and assign specific dollars to specific uses—a phenomenon known as mental accounting. Goals-based asset allocation, as described here, systemizes the fruitful use of mental accounts. This approach may help investors embrace more-optimal portfolios (as defined in an asset-only or

26 "Fungibility" is the property of an asset that a quantity of it may be replaced by another equal quantity in the satisfaction of an obligation. Thus, any 5,000 Japanese yen note can be used to pay a yen obligation of that amount, and the notes can be said to be fungible.

asset–liability framework) by adding higher risk assets—that, without context, might frighten the investor—to longer-term, aspirational sub-portfolios while adopting a more conservative allocation for sub-portfolios that address lifestyle preservation.

In Exhibit 12, the Lees' lifestyle goal is split into three components: a component called "lifestyle—minimum" intended to provide protection for the Lees' lifestyle in a disaster scenario, a component called "lifestyle—baseline" to address needs outside of worst cases, and a component called "lifestyle—aspirational" that reflects a desire for a chance at a markedly higher lifestyle. These sum to the present value of future consumption shown in the preceding Exhibit 11. Exhibit 12 describes these qualitatively; a numerical characterization could be very relevant for some advisers, however. By eliciting information on the Lees' perception of the goals' importance, the investment adviser might calibrate the required probabilities of achieving the goals quantitatively. For example, the three lifestyle goals might have 99%, 90%, and 50% assigned probabilities of success, respectively.

Exhibit 12 Lee Family: Required Probability of Meeting Goals and Goal Time Horizons

Goal	Required Probability of Achieving	Time Horizon
Lifestyle—minimum	Extremely high	Short to distant
Lifestyle—baseline	Very high	Short to distant
Lifestyle—aspirational	Moderate	Distant
Education	Very high	Short
Trust	High	Long
Charitable	Moderate	Short

Because the Lees might delay or forego making a gift to the museum if it would affect the trust goal, the trust goal is more urgent for the Lees. Also note that although parts of the Lees' lifestyle goals run the full time horizon spectrum from short to distant, they also have significant current earnings and human capital (which transforms into earnings as time passes). This fact puts the investment portfolio's role in funding the lifestyle goal further into the future.

Goals-based approaches generally set the strategic asset allocation in a bottom-up fashion. The Lees' lifestyle goal might be addressed with three sub-portfolios, with the longest horizon sub-portfolio being less liquid and accepting more risk than the others. Although for the GPLE pension, no risk distinction was made among different parts of the pension liability vis-à-vis asset allocation, such distinctions are made in goals-based asset allocation.

What about the Lees' other goals? Separate sub-portfolios could be assigned to the special needs and charitable goals with asset allocations that reflect the associated time horizons and required probabilities of not attaining these goals. A later reading on asset allocation in practice addresses implementation processes in detail.

Types of Goals

As goals-based asset allocation has advanced, various classification systems for goals have been proposed. Two of those classification systems are as follows.

Brunel (2012):

- *Personal goals*—to meet current lifestyle requirements and unanticipated financial needs
- *Dynastic goals*—to meet descendants' needs
- *Philanthropic goals*

Chhabra (2005):

- *Personal risk bucket*—to provide protection from a dramatic decrease in lifestyle (i.e., safe-haven investments)
- *Market risk bucket*—to ensure the current lifestyle can be maintained (allocations for average risk-adjusted market returns)
- *Aspirational risk bucket*—to increase wealth substantially (greater than average risk is accepted)

EXAMPLE 7

Goals-Based Asset Allocation

The Lees are presented with the following optimized asset allocations:

Asset Allocation	Cash	Global Bonds	Global Equities	Diversifying Strategies
A	40%	50%	10%	0%
B	10%	30%	45%	15%

Assume that a portfolio of 70% global equities and 30% bonds reflects an appropriate balance of expected return and risk for the Lees with respect to a 10-year time horizon for most moderately important goals. Based on the information given:

1 What goal(s) may be addressed by Allocation A?

2 What goal(s) may be addressed by Allocation B?

Because of her industry connections in the life sciences, Ivy Lee is given the opportunity to be an early-stage venture capital investor in what she assesses is a very promising technology.

3 What insights does goals-based asset allocation offer on this opportunity?

Solution to 1:

Allocation A stresses liquidity and stability. It may be appropriate to meet short-term lifestyle and education goals.

Solution to 2:

Allocation B has a greater growth emphasis, although it is somewhat conservative in relation to a 70/30 equity/bond baseline. It may be appropriate for funding the trust because of the goal's long time horizon and the Lees' desire for a high probability of achieving it.

Solution to 3:

Early-stage venture capital investments are both risky and illiquid; therefore, they belong in the longer-term and more risk-tolerant sub-portfolios. Ivy's decision about how much money she can commit should relate to how much excess capital remains after addressing goals that have a higher priority associated with them. Note that economic balance sheet thinking would stress that the life sciences opportunity is not particularly diversifying to her human capital.

Discount Rates and Longevity Risk

Although calculation of assets needed for sub-portfolios is outside the scope of this reading, certain themes can be indicated. Consider a retiree with a life expectancy of 20 years. The retiree has two goals:

- To maintain his current lifestyle upon retirement. This goal has a high required probability of achievement that is evaluated at 95%.
- To gift $1 million to a university in five years. This is viewed as a "desire" rather than a "need" and has a required probability evaluated at 75%.

Suppose that the investor's adviser specifies sub-portfolios as follows:

- for the first decade of lifestyle spending, a 3% expected return;
- for the second decade of lifestyle spending, a 4.6% expected return; and
- for the planned gift to the university, a 5.4% expected return.

Based on an estimate of annual consumption needs and the amount of the gift and given expected returns for the assigned sub-portfolios, the assets to be assigned to each sub-portfolio could be calculated by discounting amounts back to the present using their expected returns. However, this approach does not reflect the asset owner's required probability of achieving a goal. The higher the probability requirement for a future cash need, the greater the amount of assets needed in relation to it. Because of the inverse relation between present value and the discount rate, to reflect a 95% required probability, for example, the discount rates could be set at a lower level so that more assets are assigned to the sub-portfolio, increasing the probability of achieving the goal to the required level of 95% level.

Another consideration in determining the amount needed for future consumption is longevity risk. Life expectancies are median (50th percentile) outcomes. The retiree may outlive his life expectancy. To address longevity risk, the calculation of the present value of liabilities might use a longer life expectancy, such as a 35-year life expectancy instead of his actuarial 20-year expectation. Another approach is to transfer the risk to an insurer by purchasing an annuity that begins in 20 years and makes payments to the retiree for as long as he lives. Longevity risk and this kind of deferred annuity (sometimes called a "longevity annuity") are discussed in another curriculum reading on risk management.[27]

There are some drawbacks to the goals-based approach to asset allocation. One is that the sub-portfolios add complexity. Another is that goals may be ambiguous or may change over time. Goals-based approaches to asset allocation raise the question

27 See Blanchett et al. (2016) for the management of longevity risk. Milevsky (2016) is a further reference.

of how sub-portfolios coordinate to constitute an efficient whole. The subject will be taken up in a later reading, but the general finding is that the amount of sub-optimality is small.[28]

7 IMPLEMENTATION CHOICES

Having established the strategic asset allocation policy, the asset owner must address additional strategic considerations before moving to implementation. One of these is the passive/active choice.

There are two dimensions of passive/active choices. One dimension relates to the management of the strategic asset allocation itself—for example, whether to deviate from it tactically or not. The second dimension relates to passive and active implementation choices in investing the allocation to a given asset class. The first dimension is covered in Section 7.1. The second dimension is the subject of Section 7.2.

In an advisory role, asset managers have an unequivocal responsibility to make implementation and asset selection choices that are initially, and on an ongoing basis, suitable for the client.[29] Monitoring the portfolio and ongoing client needs to ensure that the asset allocation remains appropriate, although not discussed here, is an integral part of portfolio management, as diagrammed in Exhibit 1.

7.1 Passive/Active Management of Asset Class Weights

Tactical asset allocation (TAA) involves deliberate short-term deviations from the strategic asset allocation. Whereas the strategic asset allocation incorporates an investor's long-term, equilibrium market expectations, tactical asset allocation involves short-term tilts away from the strategic asset mix that reflect short-term views—for example, to exploit perceived deviations from equilibrium.

Tactical asset allocation is active management at the asset class level because it involves intentional deviations from the strategic asset mix to exploit perceived opportunities in capital markets to improve the portfolio's risk–return trade-off. TAA mandates are often specified to keep deviations from the strategic asset allocation within rebalancing ranges or within risk budgets. Tactical asset allocation decisions might be responsive to price momentum, perceived asset class valuation, or the particular stage of the business cycle. A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views is sometimes distinguished as **dynamic asset allocation** (DAA).

Tactical asset allocation may be limited to tactical changes in domestic stock–bond or stock–bond–cash allocations or may be a more comprehensive multi-asset approach, as in a global tactical asset allocation (GTAA) model. Tactical asset allocation inherently involves market timing as it involves buying and selling in anticipation of short-term changes in market direction; however, TAA usually involves smaller allocation tilts than an invested-or-not-invested market timing strategy.

Tactical asset allocation is a source of risk when calibrated against the strategic asset mix. An informed approach to tactical asset allocation recognizes the trade-off of any potential outperformance against this tracking error. Key barriers to successful tactical asset allocation are monitoring and trading costs. For some investors, higher short-term capital gains taxes will prove a significant obstacle because taxes are an

28 This is addressed technically in Das et al. (2010). See also Brunel (2015).
29 See Standard III (C) in the Standards of Practice Handbook (CFA Institute 2014).

additional trading cost. A program of tactical asset allocation must be evaluated through a cost–benefit lens. The relevant cost comparisons include the expected costs of simply following a rebalancing policy (without deliberate tactical deviations).

7.2 Passive/Active Management of Allocations to Asset Classes

In addition to active and passive decisions about the asset class mix, there are active and passive decisions about how to implement the individual allocations within asset classes. An allocation can be managed passively or actively or incorporate both active and passive sub-allocations. For investors who delegate asset management to external firms, these decisions would come under the heading of manager structure,[30] which includes decisions about how capital and active risk are allocated to points on the passive/active spectrum and to individual external managers selected to manage the investor's assets.[31] (Risk budgeting is described more fully in Section 7.3.)

With a **passive management** approach, portfolio composition does not react to changes in the investor's capital market expectations or to information on or insights into individual investments. (The word *passive* means *not reacting*.) For example, a portfolio constructed to track the returns of an index of European equities might add or drop a holding in response to a change in the index composition but not in response to changes in the manager's expectations concerning the security's investment value; the market's expectations reflected in market values and index weights are taken as is. Indexing is a common passive approach to investing. (Another example would be buying and holding a fixed portfolio of bonds to maturity.)

In contrast, a portfolio manager for an active management strategy will respond to changing capital market expectations or to investment insights resulting in changes to portfolio composition. The objective of active management is to achieve, after expenses, positive excess risk-adjusted returns relative to a passive benchmark.

The range of implementation choices can be practically viewed as falling along a passive/active spectrum because some strategies use both passive and active elements. In financial theory, the pure model of a passive approach is indexing to a broad market-cap-weighted index of risky assets—in particular, the global market portfolio discussed in Section 6.1. This portfolio sums all investments in index components and is macro-consistent in the sense that all investors could hold it, and it is furthermore self-rebalancing to the extent it is based on market-value-weighted indices. A buy-and-hold investment as a proxy for the global market portfolio would represent a theoretical endpoint on the passive/active spectrum. However, consider an investor who indexes an equity allocation to a broad-based value equity style index. The investment could be said to reflect an active decision in tilting an allocation toward value but be passive in implementation because it involves indexing. An even more active approach would be investing the equity allocation with managers who have a value investing approach and attempt to enhance returns through security selection. Those managers would show positive tracking risk relative to the value index in general. Unconstrained active investment would be one that is "go anywhere" or not managed with consideration of any traditional asset class benchmark (i.e., "benchmark agnostic"). The degree of active management has traditionally been quantified by tracking risk and, more recently and from a different perspective, by active share.

Indexing is generally the lowest-cost approach to investing. Indexing involves some level of transaction costs because, as securities move in and out of the index, the portfolio holdings must adjust to remain in alignment with the index. Although indexing

30 Manager structure is defined by the number of managers, types of managers, as well as which managers are selected.

31 See, for example, Waring, Whitney, Pirone, and Castille (2000).

to a market-cap-weighted index is self-rebalancing, tracking an index based on other weighting schemes requires ongoing transactions to ensure the portfolio remains in alignment with index weights. An example is tracking an equally weighted index: As changes in market prices affect the relative weights of securities in the portfolio over time, the portfolio will need to be rebalanced to restore equal weights. Portfolios tracking fixed-income indices also incur ongoing transaction costs as holdings mature, default, or are called away by their issuers.

Exhibit 13 diagrams the passive/active choice as a continuum rather than binary (0 or 1) characteristic. Tracking risk and active share are widely known quantitative measures of the degree of active management that capture different aspects of it. Each measure is shown as tending to increase from left to right on the spectrum; however, they do not increase (or decrease) in lockstep with each other, in general.

Exhibit 13 Passive/Active Spectrum

Asset class allocations may be managed with different approaches on the spectrum. For example, developed market equities might be implemented purely passively, whereas emerging market bonds might be invested with an unconstrained, index-agnostic approach.

Factors that influence asset owners' decisions on where to invest on the passive/active spectrum include the following:

- *Available investments.* For example, the availability of an investable and representative index as the basis for indexing.
- *Scalability of active strategies being considered.* The prospective value added by an active strategy may begin to decline at some level of invested assets. In addition, participation in it may not be available below some asset level, a consideration for small investors.
- *The feasibility of investing passively while incorporating client-specific constraints.* For example, an investor's particular ESG investing criteria may not align with existing index products.
- *Beliefs concerning market informational efficiency.* A strong belief in market efficiency for the asset class(es) under consideration would orient the investor away from active management.
- *The trade-off of expected incremental benefits relative to incremental costs and risks of active choices.* Costs of active management include investment management costs, trading costs, and turnover-induced taxes; such costs would have to be judged relative to the lower costs of index alternatives, which vary by asset class.
- *Tax status.* Holding other variables constant, taxable investors would tend to have higher hurdles to profitable active management than tax-exempt investors.[32] For taxable investors who want to hold both passive and active investments, active investments would be held, in general, in available tax-advantaged accounts.

32 See Jeffrey and Arnott (1993).

The curriculum readings on equity, fixed-income, and alternative investments will explore many strategies and the nature of any active decisions involved. Investors do need to understand the nature of the active decisions involved in implementing their strategic asset allocations and their appropriateness given the factors described. Exhibit 14 shows qualitatively (rather than precisely) some choices that investors may consider for equity and fixed-income allocations. In the exhibit, non-cap-weighted indexing includes such approaches as equal weighting and quantitative rules-based indexing approaches (discussed further in the equity readings).[33]

Exhibit 14 Placement on the Passive/Active Spectrum: Examples of Possible Choices

EXAMPLE 8

Implementation Choices (1)

1. Describe two kinds of passive/active choices faced by investors related to asset allocation.
2. An equity index is described as "a rules-based, transparent index designed to provide investors with an efficient way to gain exposure to large-cap and small-cap stocks with low total return variability." Compared with the market-cap weighting of the parent index (with the same component securities), the weights in the low-volatility index are proportional to the inverse of return volatility, so that the highest-volatility security receives the lowest weight. Describe the active and passive aspects of a decision to invest an allocation to equities in ETFs tracking such indices.
3. Describe how investing in a GDP-weighted global bond index involves both active and passive choices.

Solution to 1:

One choice relates to whether to allow active deviations from the strategic asset allocation. Tactical asset allocation and dynamic asset allocation are examples of active management of asset allocations. A second set of choices relates to where to invest allocations to asset classes along the passive/active spectrum.

33 Podkaminer (2015) provides a survey.

Solution to 2:

The active element is the decision, relative to the parent index, to overweight securities with low volatility and underweight securities with high volatility. This management of risk is distinct from reducing portfolio volatility by combining a market-cap-weighted index with a risk-free asset proxy because it implies a belief in some risk–return advantage to favoring low-volatility equities on an individual security basis. The passive element is a transparent rules-based implementation of the weighting scheme based on inverse volatilities.

Solution to 3:

The passive choice is represented by the overall selection of the universe of global bonds; however, the active choice is represented by the weighting scheme, which is to use GDP rather than capital market weights. This is a tilt toward the real economy and away from fixed-income market values.

EXAMPLE 9

Implementation Choices (2)

Describe characteristic(s) of each of the following investors that are likely to influence the decision to invest passively or actively. See Exhibit 5 for Questions 1–3 and Example 3 for Question 4.

1. Cafastan sovereign wealth fund
2. GPLE corporate pension
3. The Lee family
4. Auldberg University Endowment

Solution:

1. For a large investor like the Cafastan sovereign wealth fund (CAF$40 billion), the scalability of active strategies that it may wish to employ may be a consideration. If only a small percentage of portfolio assets can be invested effectively in an active strategy, for example, the potential value added for the overall portfolio may not justify the inherent costs and management time. Although the equities and fixed-income allocations could be invested using passive approaches, investments in the diversifying strategies category are commonly active.
2. The executives responsible for the GPLE corporate pension also have other, non-investment responsibilities. This is a factor favoring a more passive approach; however, choosing an outsourced chief investment officer or delegated fiduciary consultant to manage active manager selection could facilitate greater use of active investment.
3. The fact that the Lees are taxable investors is a factor generally in favor of passive management for assets not held in tax-advantaged accounts. Active management involves turnover, which gives rise to taxes.
4. According to the vignette in Example 3, the Auldberg University Endowment has substantial staff resources in equities, fixed income, and real estate. This fact suggests that passive/active decisions are relatively

unconstrained by internal resources. By itself, it does not favor passive or active, but it is a factor that allows active choices to be given full consideration.

7.3 Risk Budgeting Perspectives in Asset Allocation and Implementation

Risk budgeting addresses the questions of which types of risks to take and how much of each to take. Risk budgeting provides another view of asset allocation—through a risk lens. Depending on the focus, the risk may be quantified in various ways. For example, a concern for volatility can be quantified as variance or standard deviation of returns, and a concern for tail risk can be quantified as VaR or drawdown. Risk budgets (budgets for risk taking) can be stated in absolute or in relative terms and in money or percent terms. For example, it is possible to state an overall risk budget for a portfolio in terms of volatility of returns, which would be an example of an absolute risk budget stated in percent terms (for example, 20% for portfolio return volatility). Risk budgeting is a tool that may be useful in a variety of contexts and asset allocation approaches.

Some investors may approach asset allocation with an exclusive focus on risk. A risk budgeting approach to asset allocation has been defined as an approach in which the investor specifies how risk (quantified by some measure, such as volatility) is to be distributed across assets in the portfolio, without consideration of the assets' expected returns.[34] An example is aiming for equal expected risk contributions to overall portfolio volatility from all included asset classes as an approach to diversification, which is a risk parity (or equal risk contribution) approach. A subsequent reading in asset allocation addresses this in greater detail.

More directly related to the choice of passive/active implementation are active risk budgets and active risk budgeting. **Active risk budgeting** addresses the question of how much benchmark-relative risk an investor is willing to take in seeking to outperform a benchmark. This approach is risk budgeting stated in benchmark-relative terms. In parallel to the two dimensions of the passive/active decision outlined previously are two levels of active risk budgeting, which can be distinguished as follows:

- At the level of the overall asset allocation, active risk can be defined relative to the strategic asset allocation benchmark. This benchmark may be the strategic asset allocation weights applied to specified (often, broad-based market-cap-weighted) indices.
- At the level of individual asset classes, active risk can be defined relative to the asset class benchmark.

Active risk budgeting at the level of overall asset allocation would be relevant to tactical asset allocation. Active risk budgeting at the level of each asset class is relevant to how the allocation to those asset classes is invested. For example, it can take the form of expected-alpha versus tracking-error optimization in a manner similar to classic mean–variance optimization. If investment factor risks are the investor's focus, risk budgeting can be adapted to have a focus on allocating factor risk exposures instead. Later readings revisit risk budgeting in investing in further detail.

34 See Roncalli (2013).

8 REBALANCING: STRATEGIC CONSIDERATIONS

Rebalancing is the discipline of adjusting portfolio weights to more closely align with the strategic asset allocation. Rebalancing is a key part of the monitoring and feedback step of the portfolio construction, monitoring, and revision process. An investor's rebalancing policy is generally documented in the IPS.

Even in the absence of changing investor circumstances, a revised economic outlook, or tactical asset allocation views, normal changes in asset prices cause the portfolio asset mix to deviate from target weights. Industry practice defines "rebalancing" as portfolio adjustments triggered by such price changes. Other portfolio adjustments, even systematic ones, are not rebalancing.

Ordinary price changes cause the assets with a high forecast return to grow faster than the portfolio as a whole. Because high-return assets are typically also higher risk, in the absence of rebalancing, overall portfolio risk rises. The mix of risks within the portfolio becomes more concentrated as well. Systematic rebalancing maintains the original strategic risk exposures. The discipline of rebalancing serves to control portfolio risks that have become different from what the investor originally intended.

Consider the example from the internet bubble (1995–2001) in Exhibit 15. The example assumes a 60/40 stock/bond portfolio, in which stocks are represented by the large-cap US growth stocks that characterized the internet bubble. In Panel B, the left-hand scale and upper two lines show month-by-month total portfolio *values* with and without monthly rebalancing ("wealth rebalanced" and "wealth unrebalanced," respectively). The right-hand scale and lower two lines show month-by-month portfolio *risk* as represented by the 5th percentile drawdown (in a VaR model) with and without monthly rebalancing ("risk rebalanced" and "risk unrebalanced," respectively).

Exhibit 15 Rebalancing

Panel A. Asset Mix

Exhibit 15 (Continued)

Panel B. Portfolio Value and Risk

Note: The data are a 60/40 mix of the S&P 500 Growth Index and the Barclays Capital Aggregate Bond Index.

Panel A shows that, without rebalancing, the asset mix deviates dramatically from the target. Panel B shows that although the portfolios' values ended similarly (the upper two lines), disciplined rebalancing meant more-stable risks (illustrated by the lower two lines).

This risk perspective is important. Taken to the extreme, *never rebalancing* allows the high-return (and presumably higher-risk) assets to grow and dominate the portfolio. Portfolio risk rises and concentrates. Taken even further, such a philosophy of never rebalancing may suggest it would have been simpler to have invested only in the highest-expected-return asset class back when the asset mix decision was made. Not rebalancing could negate an intended level of diversification.

Because rebalancing is countercyclical, it is fundamentally a contrarian investment approach.[35] Behavioral finance tells us that such contrarianism will be uncomfortable; no one likes to sell the most recently best-performing part of the portfolio to buy the worst. Thus, rebalancing is a *discipline* of adjusting the portfolio to better align with the strategic asset allocation in both connotations of discipline—the sense of a typical practice and the sense of a strengthening regime.

8.1 A Framework for Rebalancing

The actual mechanics of rebalancing are more complex than they first appear. A number of questions arise: How often should the portfolio be rebalanced? What levels of imbalance are worth tolerating? Should the portfolio be rebalanced to the edge of the policy range or to some other point? These non-trivial questions represent the key strategic decisions in rebalancing.

35 A quantitative interpretation of rebalancing, given by Ang (2014), is that the return to rebalancing is selling out of the money puts and calls.

The simplest approach to rebalancing is **calendar rebalancing**, which involves rebalancing a portfolio to target weights on a periodic basis—for example, monthly, quarterly, semiannually, or annually. The choice of rebalancing frequency may be linked to the schedule of portfolio reviews. Although simple, rebalancing points are arbitrary and have other disadvantages.

Percent-range rebalancing permits tighter control of the asset mix compared with calendar rebalancing. Percent-range approach involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values. For example, if the target allocation to an asset class is 50% of portfolio value, **trigger points** at 45% and 55% of portfolio value define a 10 percentage point **rebalancing range** (or corridor) for the value of that asset class. The rebalancing range creates a no-trade region. The portfolio is rebalanced when an asset class's weight first passes through one of its trigger points. Focusing on percent-range rebalancing, the following questions are relevant:

- Who is responsible for rebalancing?
- How frequently is the portfolio valued?
- What size deviation triggers rebalancing?
- Is the deviation from the target allocation fully or partially corrected?

Orientation to the first question was provided in section on investment governance, so the discussion begins with the second question.

How frequently is the portfolio valued? The percent-range discipline requires monitoring portfolio values for breaches of a trigger point at an agreed-on frequency; the more frequent the monitoring, the greater the precision in implementation. Such monitoring may be scheduled daily, weekly, monthly, quarterly, or annually. A number of considerations—including governance resources and asset custodian resources—can affect valuation frequency. For many investors, monthly or quarterly evaluation efficiently balances the costs and benefits of rebalancing.

What size deviation triggers rebalancing? Trigger points take into account such factors as traditional practice, transaction costs, asset class volatility, volatility of the balance of the portfolio, correlation of the asset class with the balance of the portfolio, and risk tolerance.[36]

Before the rise of modern multi-asset portfolios, the stock/bond split broadly characterized the asset allocation and a traditional $\pm x\%$ rebalancing band was common. These fixed ranges would apply no matter the size or volatility of the allocation target. For example, both a 40% domestic equity allocation and a 15% real asset allocation might have ±5% rebalancing ranges. Alternatively, proportional bands reflect the size of the target weight. For example, a 60% target asset class might have a ±6% band, whereas a 5% allocation would have a ±0.5% band. Proportional bands might also be set to reflect the relative volatility of the asset classes. A final approach is the use of cost–benefit analysis to set ranges.

Is the deviation from the target allocation fully or partially corrected? Once the portfolio is evaluated and an unacceptably large deviation found, the investor must determine rebalancing trade size, as well as the timeline for implementing the rebalancing. In practice, three main approaches are used: rebalance back to target weights, rebalance to range edge, or rebalance halfway between the range-edge trigger point and the target weight.

36 See Masters (2003) for details on these factors apart from traditional factors.

8.2 Strategic Considerations in Rebalancing

The four-part rebalancing framework just described highlights important questions to address in setting rebalancing policy. Strategic considerations generally include the following, all else being equal:

- Higher transaction costs for an asset class imply wider rebalancing ranges.
- More risk-averse investors will have tighter rebalancing ranges.
- Less correlated assets also have tighter rebalancing ranges.
- Beliefs in momentum favor wider rebalancing ranges, whereas mean reversion encourages tighter ranges.
- Illiquid investments complicate rebalancing.
- Derivatives create the possibility of synthetic rebalancing.
- Taxes, which are a cost, discourage rebalancing and encourage asymmetric and wider rebalancing ranges.

Asset class volatility is also a consideration in the size of rebalancing ranges.[37]

A cost–benefit approach to rebalancing sets ranges, taking transaction costs, risk aversion, asset class risks, and asset class correlations into consideration. For example, an asset that is more highly correlated with the rest of the portfolio than another would merit a wider rebalancing range, all else equal, because it would be closer to being a substitute for the balance of the portfolio; thus, larger deviations would have less impact on portfolio risk.

EXAMPLE 10

Different Rebalancing Ranges

The table shows a simple four-asset strategic mix along with rebalancing ranges created under different approaches.

Explain why the international equity range is wider than the domestic equity range under proportional ranges using the cost–benefit approach.[38]

Asset Class	Strategic Target	Fixed Width Ranges	Proportional Ranges (±1,000 bps)	Cost–Benefit Ranges
Domestic equity	40%	35%–45%	36%–44%	35%–45%
International equity	25%	20%–30%	22½%–27½%	19%–31%
Emerging markets	15%	10%–20%	13½%–16½%	12%–18%
Fixed income	20%	15%–25%	18%–22%	19%–21%

Solution:

Higher transaction costs for international equity compared with domestic equity could explain the wider range for international equity compared with domestic equity under the cost–benefit approach. Another potential explanation relates to the possibility that international equity has a higher correlation with the balance of the portfolio (i.e., the portfolio excluding international equity)

37 The effect of an asset's volatility on its appropriate rebalancing range involves a trade-off between transaction costs and risk control. This complex issue is discussed further in the curriculum reading "Asset Allocation in Practice."

38 The cost-benefit approach calculations are based on Masters (2003).

than does domestic equity (i.e., with the portfolio excluding domestic equity). If that is the case then, all else being equal, a wider band would be justified for international equity.

Investors' perspectives on capital markets can affect their approach to rebalancing. A belief in momentum and trend following, for example, encourages wider rebalancing ranges. In contrast, a belief in mean reversion encourages stricter adherence to rebalancing, including tighter ranges.

Illiquid assets complicate rebalancing. Relatively illiquid investments, such as hedge funds, private equity, or direct real estate, cannot be readily traded without substantial trading costs and/or delays. Accordingly, illiquid investments are commonly assigned wide rebalancing ranges. However, rebalancing of an illiquid asset may be affected indirectly when a highly correlated liquid asset can be traded or when exposure can be adjusted by means of positions in derivatives. For example, public equity could be reduced to offset an overweight in private equity. Rebalancing by means of highly correlated liquid assets and derivatives, however, involves some imprecision and basis risk.

This insight about liquidity is an instance where thinking ahead about rebalancing can affect the strategic asset allocation. It is one reason that allocations to illiquid assets are often smaller than if trading were possible.

Factor-based asset allocation, liability-relative investing, and goals-based investing, each a valid approach to asset allocation, can give rise to different rebalancing considerations. Factor exposures and liability hedges require monitoring (and rebalancing) the factors weights and surplus duration in addition to asset class weights. Goals-based investing in private wealth management may require both asset class rebalancing and moving funds between different goal sub-portfolios.

Tax considerations also complicate rebalancing. Rebalancing typically realizes capital gains and losses, which are taxable events in many jurisdictions. For private wealth managers, any rebalancing benefit must be compared with the tax cost. Taxes, as a cost, are much larger than other transaction costs, which often leads to wider rebalancing ranges in taxable portfolios than in tax-exempt portfolios. Because loss harvesting generates tax savings and realizing gains triggers taxes, rebalancing ranges in taxable accounts may also be asymmetric. (For example, a 25% target asset class might have an allowable range of 24%–28%, which is –1% to +3%.)

Modern cost–benefit approaches to rebalancing suggest considering derivatives as a rebalancing tool. Derivatives can often be used to rebalance synthetically at much lower transaction costs than the costs of using the underlying stocks and bonds. Using a derivatives overlay also avoids disrupting the underlying separate accounts in a multi-manager implementation of the strategic asset allocation. Tax considerations are also relevant; it may be more cost effective to reduce an exposure using a derivatives overlay than to sell the underlying asset and incur the capital gains tax liability. Lastly, trading a few derivatives may be quicker and easier than hundreds of underlying securities. Of course, using derivatives may require a higher level of risk oversight, but then risk control is the main rationale for rebalancing.

Estimates of the benefits of rebalancing vary. Many portfolios are statistically indistinguishable from each other, suggesting that much rebalancing is unnecessary. In contrast, Willenbrock (2011) demonstrates that even zero-return assets can, in theory, generate positive returns through rebalancing, which is a demonstrable (and surprising) benefit. Whatever the return estimate for the value added from rebalancing, the key takeaway is that rebalancing is chiefly about risk control, not return enhancement.

SUMMARY

This reading has introduced the subject of asset allocation. Among the points made are the following:

- Effective investment governance ensures that decisions are made by individuals or groups with the necessary skills and capacity and involves
  - articulating the long- and short-term objectives of the investment program;
  - effectively allocating decision rights and responsibilities among the functional units in the governance hierarchy, taking account of their knowledge, capacity, time, and position on the governance hierarchy;
  - specifying processes for developing and approving the investment policy statement, which will govern the day-to-day operation of the investment program;
  - specifying processes for developing and approving the program's strategic asset allocation;
  - establishing a reporting framework to monitor the program's progress toward the agreed-on goals and objectives; and
  - periodically undertaking a governance audit.
- The economic balance sheet includes non-financial assets and liabilities that can be relevant for choosing the best asset allocation for an investor's financial portfolio.
- The investment objectives of asset-only asset allocation approaches focus on the asset side of the economic balance sheet; approaches with a liability-relative orientation focus on funding liabilities; and goals-based approaches focus on achieving financial goals.
- The risk concepts relevant to asset-only asset allocation approaches focus on asset risk; those of liability-relative asset allocation focus on risk in relation to paying liabilities; and a goals-based approach focuses on the probabilities of not achieving financial goals.
- Asset classes are the traditional units of analysis in asset allocation and reflect systematic risks with varying degrees of overlap.
- Assets within an asset class should be relatively homogeneous; asset classes should be mutually exclusive; asset classes should be diversifying; asset classes as a group should make up a preponderance of the world's investable wealth; asset classes selected for investment should have the capacity to absorb a meaningful proportion of an investor's portfolio.
- Risk factors are associated with non-diversifiable (i.e., systematic) risk and are associated with an expected return premium. The price of an asset and/or asset class may reflect more than one risk factor, and complicated spread positions may be necessary to identify and isolate particular risk factors. Their use as units of analysis in asset allocation is driven by considerations of controlling systematic risk exposures.
- The global market portfolio represents a highly diversified asset allocation that can serve as a baseline asset allocation in an asset-only approach.
- There are two dimensions of passive/active choices. One dimension relates to the management of the strategic asset allocation itself—for example, whether to deviate from it tactically or not. The second dimension relates to passive and active implementation choices in investing the allocation to a given asset

class. Tactical and dynamic asset allocation relate to the first dimension; active and passive choices for implementing allocations to asset classes relate to the second dimension.

- Risk budgeting addresses the question of which types of risks to take and how much of each to take. Active risk budgeting addresses the question of how much benchmark-relative risk an investor is willing to take. At the level of the overall asset allocation, active risk can be defined relative to the strategic asset allocation benchmark. At the level of individual asset classes, active risk can be defined relative to the benchmark proxy.
- Rebalancing is the discipline of adjusting portfolio weights to more closely align with the strategic asset allocation. Rebalancing approaches include calendar-based and range-based rebalancing. Calendar-based rebalancing rebalances the portfolio to target weights on a periodic basis. Range-based rebalancing sets rebalancing thresholds or trigger points around target weights. The ranges may be fixed width, percentage based, or volatility based. Range-based rebalancing permits tighter control of the asset mix compared with calendar rebalancing.
- Strategic considerations in rebalancing include transaction costs, risk aversion, correlations among asset classes, volatility, and beliefs concerning momentum, taxation, and asset class liquidity.

REFERENCES

Ambachtsheer, Keith. 2007. *Pension Revolution: A Solution to the Pensions Crisis*. Hoboken, NJ: John Wiley.

Ang, Andrew. 2014. *Asset Management: A Systematic Approach to Factor Investing*. New York: Oxford University Press.

Blanchett, David M., and Philip U. Straehl. 2015. "No Portfolio is an Island." *Financial Analysts Journal*, vol. 71, no. 3 (May/June): 15–33.

Blanchett, David M., and Philip U. Straehl. 2016. "Portfolio Implications of Job-Specific Human Capital Risk." White paper, Morningstar.

Blanchett, David M., David M. Cordell, Michael S. Finke, and Thomas Idzorek. 2016. "Risk Management for Individuals." CFA Institute.

Brunel, Jean L.P. 2012. "Goals-Based Wealth Management in Practice." *Conference Proceedings Quarterly*, vol. 29, no. 1 (March): 57–65.

Brunel, Jean L.P. 2015. *Goals-Based Wealth Management: An Integrated and Practical Approach to Changing the Structure of Wealth Advisory Practices*. Hoboken, NJ: John Wiley.

Burger, John D., Francis E. Warnock, and Veronica Cacdac Warnock. 2012. "Emerging Local Currency Bond Markets." *Financial Analysts Journal*, vol. 68, no. 4 (July/August): 73–93.

Chhabra, Ashvin. 2005. "Beyond Markowitz: A Comprehensive Wealth Allocation Framework for Individual Investors." *Journal of Wealth Management*, vol. 7, no. 4 (Spring): 8–34.

Collie, Bob, and James A. Gannon. 2009. "Liability-Responsive Asset Allocation: A Dynamic Approach to Pension Plan Management." Russell Investments Insights (April).

Das, Sanjiv, Harry Markowitz, Jonathan Scheid, and Meir Statman. 2010. "Portfolio Optimization with Mental Accounts." *Journal of Financial and Quantitative Analysis*, vol. 45, no. 2 (April): 311–334.

Fraser, Steve P., and William W. Jennings. 2006. "Behavioral Asset Allocation for Foundations and Endowments." *Journal of Wealth Management*, vol. 9, no. 3 (Winter): 38–50.

Greer, Robert J. 1997. "What is an Asset Class, Anyway?" *Journal of Portfolio Management*, vol. 23, no. 2 (Winter): 86–91.

Ibbotson, Roger G., and Paul D. Kaplan. 2000. "Does Asset Allocation Policy Explain 40, 90, or 100 Percent of Performance?" *Financial Analysts Journal*, vol. 56, no. 1 (January/February): 26–33.

Ibbotson, Roger G., Moshe A. Milevsky, Peng Chen, and Kevin X. Zhu. 2007. *Lifetime Financial Advice: Human Capital, Asset Allocation, and Insurance*. Charlottesville, VA: CFA Institute Research Foundation.

Idzorek, Thomas M., and Maciej Kowara. 2013. "Factor-Based Asset Allocation versus Asset-Class-Based Asset Allocation." *Financial Analysts Journal*, vol. 69, no. 3 (May/June): 19–29.

Idzorek, Thomas, Jeremy Stempien, and Nathan Voris. 2013. "Bait and Switch: Glide Path Instability." *Journal of Investing*, vol. 22, no. 1 (Spring): 74–82.

Jeffrey, Robert H., and Robert D. Arnott. 1993. "Is Your Alpha Big Enough to Cover Its Taxes?" *Journal of Portfolio Management*, vol. 19, no. 3 (Spring): 15–25.

Kozhemiakin, Alexander. 2011. "Emerging Markets Local Currency Debt: Capitalizing on Improved Sovereign Fundamentals." BNY Mellon Asset Management.

Kritzman, Mark. 1999. "Toward Defining an Asset Class." *Journal of Alternative Investments*, vol. 2, no. 1 (Summer): 79–82.

Masters, Seth J. 2003. "Rebalancing." *Journal of Portfolio Management*, vol. 29, no. 3 (Spring): 52–57.

Milevsky, Moshe A. 2016. "It's Time to Retire Ruin (Probabilities)." *Financial Analysts Journal*, vol. 72, no. 2 (March/April): 8–12.

O'Barr, William M., and John M. Conley. 1992. "Managing Relationships: The Culture of Institutional Investing." *Financial Analysts Journal*, vol. 48, no. 5 (September/October): 21–27.

Perry, William. 2011. "The Case For Emerging Market Corporates." *Journal of Indexes*, vol. 14, no. 5 (September/October): 10–17.

Podkaminer, Eugene. 2013. "Risk Factors as Building Blocks for Portfolio Diversification: The Chemistry of Asset Allocation." CFA Institute Investment Risk and Performance papers (January).

Podkaminer, Eugene. 2015. "The Education of Beta: Can Alternative Indexes Make Your Portfolio Smarter?" *Journal of Investing*, vol. 24, no. 2 (Summer): 7–34.

Pompian, Michael M. 2011a. "The Behavioral Biases of Individuals." CFA Institute.

Pompian, Michael M. 2011b. "The Behavioral Finance Perspective." CFA Institute.

Pompian, Michael, Colin McLean, and Alistair Byrne. 2011. "Behavioral Finance and Investment Processes." CFA Institute.

Roncalli, Thierry. 2013. *Introduction to Risk Parity and Budgeting*. New York: CRC Press.

Rudd, Andrew, and Laurence B. Siegel. 2013. "Using an Economic Balance Sheet for Financial Planning." *Journal of Wealth Management*, vol. 16, no. 2 (Fall): 15–23.

Shefrin, H., and M. Statman. 2000. "Behavioral Portfolio Theory." *Journal of Financial and Quantitative Analysis*, vol. 35, no. 2 (June): 127–151.

CFA Institute.*Standards of Practice Handbook*, 11th edition. 2014. CFA Institute.

Swinkels, Laurens. 2012. "Emerging Market Inflation-Linked Bonds." *Financial Analysts Journal*, vol. 68, no. 5 (September/October): 38–56.

Waring, M. Barton, Duane Whitney, John Pirone, and Charles Castille. 2000. "Optimizing Manager Structure and Budgeting Manager Risk." *Journal of Portfolio Management*, vol. 26, no. 3 (Spring): 90–104.

Willenbrock, Scott. 2011. "Diversification Return, Portfolio Rebalancing, and the Commodity Return Puzzle." *Financial Analysts Journal*, vol. 67, no. 4 (July/August): 42–49.

Xiong, James X., Roger G. Ibbotson, Thomas M. Idzorek, and Peng Chen. 2010. "The Equal Importance of Asset Allocation and Active Management." *Financial Analysts Journal*, vol. 66, no. 2 (March/April): 22–30.

PRACTICE PROBLEMS

The following information relates to Questions 1–8

Meg and Cramer Law, a married couple aged 42 and 44, respectively, are meeting with their new investment adviser, Daniel Raye. The Laws have worked their entire careers at Whorton Solutions (WS), a multinational technology company. The Laws have two teenage children who will soon begin college.

Raye reviews the Laws' current financial position. The Laws have an investment portfolio consisting of $800,000 in equities and $450,000 in fixed-income instruments. Raye notes that 80% of the equity portfolio consists of shares of WS. The Laws also own real estate valued at $400,000, with $225,000 in mortgage debt. Raye estimates the Laws' pre-retirement earnings from WS have a total present value of $1,025,000. He estimates the Laws' future expected consumption expenditures have a total present value of $750,000.

The Laws express a very strong desire to fund their children's college education expenses, which have an estimated present value of $275,000. The Laws also plan to fund an endowment at their alma mater in 20 years, which has an estimated present value of $500,000. The Laws tell Raye they want a high probability of success funding the endowment. Raye uses this information to prepare an economic balance sheet for the Laws.

In reviewing a financial plan written by the Laws' previous adviser, Raye notices the following asset class specifications.

Equity:	US equities
Debt:	Global investment-grade corporate bonds and real estate
Derivatives:	Primarily large-capitalization foreign equities

The previous adviser's report notes the asset class returns on equity and derivatives are highly correlated. The report also notes the asset class returns on debt have a low correlation with equity and derivative returns.

Raye is concerned that the asset allocation approach followed by the Laws' previous financial adviser resulted in an overlap in risk factors among asset classes for the portfolio. Raye plans to address this by examining the portfolio's sensitivity to various risk factors, such as inflation, liquidity, and volatility, to determine the desired exposure to each factor.

Raye concludes that a portfolio of 75% global equities and 25% bonds reflects an appropriate balance of expected return and risk for the Laws with respect to a 20-year time horizon for most moderately important goals. Raye recommends the Laws follow a goals-based approach to asset allocation and offers three possible portfolios for the Laws to consider. Selected data on the three portfolios are presented in Exhibit 1.

© 2017 CFA Institute. All rights reserved.

Exhibit 1 Proposed Portfolio Allocations for the Law Family

	Cash	Fixed Income	Global Equities	Diversifying Strategies*
Portfolio 1	35%	55%	10%	0%
Portfolio 2	10%	15%	65%	10%
Portfolio 3	10%	30%	40%	20%

* Diversifying strategies consists of hedge funds

Raye uses a cost–benefit approach to rebalancing and recommends that global equities have a wider rebalancing range than the other asset classes.

1 Using the economic balance sheet approach, the Laws' economic net worth is *closest* to:

A $925,000.

B $1,425,000.

C $1,675,000.

2 Using an economic balance sheet, which of the Laws' current financial assets is *most* concerning from an asset allocation perspective?

A Equities

B Real estate

C Fixed income

3 Raye believes the previous adviser's specification for debt is incorrect given that, for purposes of asset allocation, asset classes should be:

A diversifying.

B mutually exclusive.

C relatively homogeneous.

4 Raye believes the previous adviser's asset class specifications for equity and derivatives are inappropriate given that, for purposes of asset allocation, asset classes should be:

A diversifying.

B mutually exclusive.

C relatively homogeneous.

5 To address his concern regarding the previous adviser's asset allocation approach, Raye should assess the Laws' portfolio using:

A a homogeneous and mutually exclusive asset class–based risk analysis.

B a multifactor risk model to control systematic risk factors in asset allocation.

C an asset class–based asset allocation approach to construct a diversified portfolio.

6 Based on Exhibit 1, which portfolio *best* meets the Laws' education goal for their children?

A Portfolio 1

B Portfolio 2

C Portfolio 3

7 Based on Exhibit 1, which portfolio *best* meets the Laws' goal to fund an endowment for their alma mater?

A Portfolio 1

B Portfolio 2

C Portfolio 3

8 Raye's approach to rebalancing global equities is consistent with:

A the Laws' being risk averse.

B global equities' having higher transaction costs than other asset classes.

C global equities' having lower correlations with other asset classes.

SOLUTIONS

1 A is correct. The Laws' economic net worth is closest to $925,000. An economic balance sheet includes conventional financial assets and liabilities, as well as extended portfolio assets and liabilities that are relevant in making asset allocation decisions. The economic balance sheet for the Law family is shown in the following exhibit.

Assets		Liabilities and Net Worth	
Financial Assets		*Financial Liabilities*	
Fixed income	450,000	Mortgage debt	225,000
Real estate	400,000		
Equity	800,000		
Extended Assets		*Extended Liabilities*	
Human capital	1,025,000	Children's education	275,000
		Endowment funding	500,000
		Present value of consumption	750,000
Total Economic Assets	2,675,000	*Total Economic Liabilities*	1,750,000
		Economic Net Worth	925,000

Economic net worth is equal to total economic assets minus total economic liabilities ($2,675,000 – $1,750,000 = $925,000).

2 A is correct. The Laws' equity portfolio is heavily concentrated in WS stock (80% of the equity portfolio), and both Laws work at WS. Should WS encounter difficult economic circumstances, the investment value of WS stock and the Laws' human capital are both likely to be adversely affected. Thus, their investment in WS should be reviewed and their equity portfolio diversified further.

3 C is correct. In order to effectively specify asset classes for the purpose of asset allocation, assets within an asset class should be relatively homogeneous and have similar attributes. The previous adviser's specification of the debt asset class includes global investment-grade corporate bonds and real estate. This definition results in a non-homogeneous asset class.

4 A is correct. For risk control purposes, an asset class should be diversifying and should not have extremely high expected correlations with other classes. Because the returns to the equity and the derivatives asset classes are noted as being highly correlated, inclusion of both asset classes will result in duplication of risk exposures. Including both asset classes is not diversifying to the asset allocation.

5 B is correct. Raye believes the Laws' previous financial adviser followed an asset allocation approach that resulted in an overlap in risk factors among asset classes. A multifactor risk model approach can be used to address potential risk factor overlaps. Risk factor approaches to asset allocation focus on assigning investments to the investor's desired exposures to specified risk factors. These methods are premised on the observation that asset classes often exhibit some overlaps in sources of risk.

6 A is correct. Portfolio 1 best meets the Laws' education goal for their children. The estimated present value of the Laws' expected education expense is $275,000. Given that the children will be starting college soon, and the Laws have a very strong desire to achieve this goal, Portfolio 1, which stresses liquidity and stability, is most appropriate to meet the Laws' short-term education goal.

7 B is correct. Portfolio 2 best meets the Laws' goal to fund an endowment for their alma mater in 20 years. In present value terms, the gift is valued at $500,000, with the Laws desiring a high probability of achieving this goal. Although slightly more conservative than the 75/25 global equity/bond mix, Portfolio 2 has a greater growth emphasis compared with Portfolios 1 and 3. Therefore, Portfolio 2 is best for funding the endowment at their alma mater given the goal's long-term horizon and the Laws' desire for a high probability of achieving it.

8 B is correct. Using the cost–benefit approach, higher transaction costs for an asset class imply wider rebalancing ranges. Raye's recommendation for a wider rebalancing range for global equities is consistent with the presence of higher transaction costs for global equities.

READING

17

Principles of Asset Allocation

by Jean L.P. Brunel, CFA, Thomas M. Idzorek, CFA, and John M. Mulvey, PhD

Jean L.P. Brunel, CFA (USA). Thomas M. Idzorek, CFA, is at Morningstar (USA). John M. Mulvey, PhD, is at the Bendheim Center for Finance at Princeton University (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe and critique the use of mean–variance optimization in asset allocation;
☐	**b.** recommend and justify an asset allocation using mean–variance optimization;
☐	**c.** interpret and critique an asset allocation in relation to an investor's economic balance sheet;
☐	**d.** discuss asset class liquidity considerations in asset allocation;
☐	**e.** explain absolute and relative risk budgets and their use in determining and implementing an asset allocation;
☐	**f.** describe how client needs and preferences regarding investment risks can be incorporated into asset allocation;
☐	**g.** discuss the use of Monte Carlo simulation and scenario analysis to evaluate the robustness of an asset allocation;
☐	**h.** describe the use of investment factors in constructing and analyzing an asset allocation;
☐	**i.** recommend and justify an asset allocation based on the global market portfolio;
☐	**j.** describe and evaluate characteristics of liabilities that are relevant to asset allocation;
☐	**k.** discuss approaches to liability-relative asset allocation;
☐	**l.** recommend and justify a liability-relative asset allocation;
☐	**m.** recommend and justify an asset allocation using a goals-based approach;
☐	**n.** describe and critique heuristic and other approaches to asset allocation;
☐	**o.** discuss factors affecting rebalancing policy.

© 2017 CFA Institute. All rights reserved.

1 INTRODUCTION

Determining a strategic asset allocation is arguably the most important aspect of the investment process. This reading builds on the "Introduction to Asset Allocation" reading and focuses on several of the primary frameworks for developing an asset allocation, including asset-only mean–variance optimization, various liability-relative asset allocation techniques, and goals-based investing. Additionally, it touches on various other asset allocation techniques used by practitioners, as well as important related topics, such as rebalancing.

The process of creating a diversified, multi-asset class portfolio typically involves two separate steps. The first step is the asset allocation decision, which can refer to both the process and the result of determining long-term (strategic) exposures to the available asset classes (or risk factors) that make up the investor's opportunity set. Asset allocation is the first and primary step in translating the client's circumstances, objectives, and constraints into an appropriate portfolio (or, for some approaches, multiple portfolios) for achieving the client's goals within the client's tolerance for risk. The second step in creating a diversified, multi-asset-class portfolio involves implementation decisions that determine the specific investments (individual securities, pooled investment vehicles, and separate accounts) that will be used to implement the targeted allocations.

Although it is possible to carry out the asset allocation process and the implementation process simultaneously, in practice, these two steps are often separated for two reasons. First, the frameworks for simultaneously determining an asset allocation and its implementation are often complex. Second, in practice, many investors prefer to revisit their strategic asset allocation policy somewhat infrequently (e.g., annually or less frequently) in a dedicated asset allocation study, while most of these same investors prefer to revisit/monitor implementation vehicles (actual investments) far more frequently (e.g., monthly or quarterly).

Section 2 covers the traditional mean–variance optimization (MVO) approach to asset allocation. We apply this approach in what is referred to as an "asset-only" setting, in which the goal is to create the most efficient mixes of asset classes in the absence of any liabilities. We highlight key criticisms of mean–variance optimization and methods used to address them. This section also covers risk budgeting in relation to asset allocation, factor-based asset allocation, and asset allocation with illiquid assets. The observation that almost all portfolios exist to help pay for what can be characterized as a "liability" leads to the next subject.

Section 3 introduces liability-relative asset allocation—including a straightforward extension of mean–variance optimization known as surplus optimization. Surplus optimization is an economic balance sheet approach extended to the liability side of the balance sheet that finds the most efficient asset class mixes in the presence of liabilities. Liability-relative optimization is simultaneously concerned with the return of the assets, the change in value of the liabilities, and how assets and liabilities interact to determine the overall value or health of the total portfolio.

Section 4 covers an increasingly popular approach to asset allocation called goals-based asset allocation. Conceptually, goals-based approaches are similar to liability-relative asset allocation in viewing risk in relation to specific needs or objectives associated with different time horizons and degrees of urgency.

Section 5 introduces some informal (heuristic) ways that asset allocations have been determined and other approaches to asset allocation that emphasize specific objectives.

Section 6 addresses the factors affecting choices that are made in developing specific policies relating to rebalancing to the strategic asset allocation. Factors discussed include transaction costs, correlations, volatility, and risk aversion.[1]

Section 7 summarizes important points and concludes the reading.

DEVELOPING ASSET-ONLY ASSET ALLOCATIONS

2

In this section, we discuss several of the primary techniques and considerations involved in developing strategic asset allocations, leaving the issue of considering the liabilities to Section 3 and the issue of tailoring the strategic asset allocation to meet specific goals to Section 4.

We start by introducing mean–variance optimization, beginning with unconstrained optimization, prior to moving on to the more common mean–variance optimization problem in which the weights, in addition to summing to 1, are constrained to be positive (no shorting allowed). We present a detailed example, along with several variations, highlighting some of the important considerations in this approach. We also identify several criticisms of mean–variance optimization and the major ways these criticisms have been addressed in practice.

2.1 Mean–Variance Optimization: Overview

Mean–variance optimization (MVO), as introduced by Markowitz (1952, 1959), is perhaps the most common approach used in practice to develop and set asset allocation policy. Widely used on its own, MVO is also often the basis for more sophisticated approaches that overcome some of the limitations or weaknesses of MVO.

Markowitz recognized that whenever the returns of two assets are not perfectly correlated, the assets can be combined to form a portfolio whose risk (as measured by standard deviation or variance) is less than the weighted-average risk of the assets themselves. An additional and equally important observation is that as one adds assets to the portfolio, one should focus not on the individual risk characteristics of the additional assets but rather on those assets' effect on the risk characteristics of the entire portfolio. Mean–variance optimization provides us with a framework for determining how much to allocate to each asset in order to maximize the *expected* return of the portfolio for an *expected* level of risk. In this sense, mean–variance optimization is a risk-budgeting tool that helps investors to spend their risk budget—the amount of risk they are willing to assume—wisely. We emphasize the word "expected" because the inputs to mean–variance optimization are necessarily forward-looking estimates, and the resulting portfolios reflect the quality of the inputs.

Mean–variance optimization requires three sets of inputs: returns, risks (standard deviations), and pair-wise correlations for the assets in the opportunity set. The objective function is often expressed as follows:

$$U_m = E(R_m) - 0.005\lambda\sigma_m^2 \tag{1}$$

1 In this reading, "volatility" is often used synonymously with "standard deviation."

where

U_m = the investor's utility for asset mix (allocation) m
R_m = the return for asset mix m
λ = the investor's risk aversion coefficient
σ_m^2 = the expected variance of return for asset mix m

The risk aversion coefficient (λ) characterizes the investor's risk–return trade-off; in this context, it is the rate at which an investor will forgo expected return for less variance. The value of 0.005 in Equation 1 is based on the assumption that $E(R_m)$ and σ_m are expressed as percentages rather than as decimals. If those quantities were expressed as decimals, the 0.005 would change to 0.5. For example, if $E(R_m) = 0.10$, $\lambda = 2$, and $\sigma = 0.20$ (variance is 0.04), then U_m is 0.06, or 6% [= 0.10 – 0.5(2)(0.04)]. In this case, U_m can be interpreted as a certainty-equivalent return—that is, the utility value of the risky return offered by the asset mix, stated in terms of the risk-free return that the investor would value equally. In Equation 1, 0.005 merely scales the second term appropriately.

In words, the objective function says that the value of an asset mix for an investor is equal to the expected return of the asset mix minus a penalty that is equal to one-half of the expected variance of the asset mix scaled by the investor's risk aversion coefficient. Optimization involves selecting the asset mix with the highest such value (certainty equivalent). Smaller risk aversion coefficients result in relatively small penalties for risk, leading to aggressive asset mixes. Conversely, larger risk aversion coefficients result in relatively large penalties for risk, leading to conservative asset mixes. A value of $\lambda = 0$ corresponds to a risk-neutral investor because it implies indifference to volatility. Most investors' risk aversion is consistent with λ between 1 and 10.[2] Empirically, $\lambda = 4$ can be taken to represent a moderately risk-averse investor, although the specific value is sensitive to the opportunity set in question and to market volatility.

In the absence of constraints, there is a closed-form solution that calculates, for a given set of inputs, the single set of weights (allocation) to the assets in the opportunity set that maximizes the investor's utility. Typically, this single set of weights is relatively extreme, with very large long and short positions in each asset class. Except in the special case in which the expected returns are derived using the reverse-optimization process of Sharpe (1974), the expected-utility-maximizing weights will not add up to 100%. We elaborate on reverse optimization in Section 2.4.1.

In most real-world applications, asset allocation weights must add up to 100%, reflecting a fully invested, non-leveraged portfolio. From an optimization perspective, when seeking the asset allocation weights that maximize the investor's utility, one must constrain the asset allocation weights to sum to 1 (100%). This constraint that weights sum to 100% is referred to as the "budget constraint" or "unity constraint." The inclusion of this constraint, or any other constraint, moves us from a problem that has a closed-form solution to a problem that must be solved numerically using optimization techniques.

In contrast to the single solution (single set of weights) that is often associated with unconstrained optimization (one could create an efficient frontier using unconstrained weights, but it is seldom done in practice), Markowitz's mean–variance optimization paradigm is most often identified with an efficient frontier that plots all potential efficient asset mixes subject to some common constraints. In addition to a typical budget constraint that the weights must sum to 1 (100% in percentage terms), the next most common constraint allows only positive weights or allocations (i.e., no negative or short positions).

2 See Ang (2014, p. 44).

Efficient asset mixes are combinations of the assets in the opportunity set that maximize expected return per unit of expected risk or, alternatively (and equivalently), minimize expected risk for a given level of expected return. To find all possible efficient mixes that collectively form the efficient frontier, *conceptually* the optimizer iterates through all the possible values of the risk aversion coefficient (λ) and for each value finds the combination of assets that maximizes expected utility. We have used the word *conceptually* because there are different techniques for carrying out the optimization that may vary slightly from our description, even though the solution (efficient frontier and efficient mixes) is the same. The efficient mix at the far left of the frontier with the lowest risk is referred to as the global minimum variance portfolio, while the portfolio at the far right of the frontier is the maximum expected return portfolio. In the absence of constraints beyond the budget and non-negativity constraints, the maximum expected return portfolio consists of a 100% allocation to the single asset with the highest expected return (which is not necessarily the asset with the highest level of risk).

Risk Aversion

Unfortunately, it is extremely difficult to precisely estimate a given investor's risk aversion coefficient (λ). Best practices suggest that when estimating risk aversion (or, conversely, risk tolerance), one should examine both the investor's *preference* for risk (willingness to take risk) and the investor's *capacity* for taking risk. Risk preference is a subjective measure and typically focuses on how an investor feels about and potentially reacts to the ups and downs of portfolio value. The level of return an investor hopes to earn can influence the investor's willingness to take risk, but investors must be realistic when setting such objectives. Risk capacity is an objective measure of the investor's ability to tolerate portfolio losses and the potential decrease in future consumption associated with those losses.[3] The psychometric literature has developed validated questionnaires, such as that of Grable and Joo (2004), to approximately locate an investor's risk preference, although this result then needs to be blended with risk capacity to determine risk tolerance. For individuals, risk capacity is affected by factors such as net worth, income, the size of an emergency fund in relation to consumption needs, and the rate at which the individual saves out of gross income, according to the practice of financial planners noted in Grable (2008).

With this guidance in mind, we move forward with a relatively global opportunity set, in this case defined from the point of view of an investor from the United Kingdom with an approximate 10-year time horizon. The analysis is carried out in British pounds (GBP), and none of the currency exposure is hedged. Exhibit 1 identifies 12 asset classes within the universe of available investments and a set of plausible forward-looking capital market assumptions: expected returns, standard deviations, and correlations. The reading on capital market expectations covers how such inputs may be developed.[4] In the exhibit, three significant digits at most are shown, but the subsequent analysis is based on full precision.

3 *Risk preference* and *risk capacity* are sometimes referred to as the willingness and the ability to take risk, respectively.

4 The standard deviations and correlations in Exhibit 1 are based on historical numbers, while expected returns come from reverse optimization (described later).

Time Horizon

Mean–variance optimization is a "single-period" framework in which the single period could be a week, a month, a year, or some other time period. When working in a "strategic" setting, many practitioners typically find it most intuitive to work with annual capital market assumptions, even though the investment time horizon could be considerably longer (e.g., 10 years). If the strategic asset allocation will not be re-evaluated within a long time frame, capital market assumptions should reflect the average annual distributions of returns expected over the entire investment time horizon. In most cases, investors revisit the strategic asset allocation decision more frequently, such as annually or every three years, rerunning the analysis and making adjustments to the asset allocation; thus, the annual capital market assumption often reflects the expectations associated with the evaluation horizon (e.g., one year or three years).

Exhibit 1 Hypothetical UK-Based Investor's Opportunity Set with Expected Returns, Standard Deviations, and Correlations

Panel A: Expected Returns and Standard Deviations

Asset Class	Expected Return (%)	Standard Deviation (%)
UK large cap	6.6	14.8
UK mid cap	6.9	16.7
UK small cap	7.1	19.6
US equities	7.8	15.7
Europe ex UK equities	8.6	19.6
Asia Pacific ex Japan equities	8.5	20.9
Japan equities	6.4	15.2
Emerging market equities	9.0	23.0
Global REITs	9.0	22.5
Global ex UK bonds	4.0	10.4
UK bonds	2.9	6.1
Cash	2.5	0.7

Panel B: Correlations

	UK Large Cap	UK Mid Cap	UK Small Cap	US Equities	Europe ex UK Equities	Asia Pacific ex Japan Equities	Japan Equities	Emerging Market Equities	Global REITs	Global ex UK Bonds	UK Bonds	Cash
UK large cap	1.00	0.86	0.79	0.76	0.88	0.82	0.55	0.78	0.64	–0.12	–0.12	–0.06
UK mid cap	0.86	1.00	0.95	0.76	0.84	0.75	0.51	0.74	0.67	–0.16	–0.10	–0.17
UK small cap	0.79	0.95	1.00	0.67	0.79	0.70	0.49	0.71	0.61	–0.22	–0.15	–0.17

Exhibit 1 (Continued)

	UK Large Cap	UK Mid Cap	UK Small Cap	US Equities	Europe ex UK Equities	Asia Pacific ex Japan Equities	Japan Equities	Emerging Market Equities	Global REITs	Global ex UK Bonds	UK Bonds	Cash
US equities	0.76	0.76	0.67	1.00	0.81	0.72	0.62	0.69	0.77	0.14	0.00	–0.12
Europe ex UK equities	0.88	0.84	0.79	0.81	1.00	0.82	0.60	0.80	0.72	0.04	–0.04	–0.03
Asia Pacific ex Japan equities	0.82	0.75	0.70	0.72	0.82	1.00	0.54	0.94	0.67	0.00	–0.02	0.02
Japan equities	0.55	0.51	0.49	0.62	0.60	0.54	1.00	0.56	0.52	0.18	0.07	–0.01
Emerging market equities	0.78	0.74	0.71	0.69	0.80	0.94	0.56	1.00	0.62	–0.02	–0.03	0.04
Global REITs	0.64	0.67	0.61	0.77	0.72	0.67	0.52	0.62	1.00	0.16	0.18	–0.15
Global ex UK bonds	–0.12	–0.16	–0.22	0.14	0.04	0.00	0.18	–0.02	0.16	1.00	0.62	0.24
UK bonds	–0.12	–0.10	–0.15	0.00	–0.04	–0.02	0.07	–0.03	0.18	0.62	1.00	0.07
Cash	–0.06	–0.17	–0.17	–0.12	–0.03	0.02	–0.01	0.04	–0.15	0.24	0.07	1.00

The classification of asset classes in the universe of available investments may vary according to local practices. For example, in the United States and some other larger markets, it is common to classify equities by market capitalization, whereas the practice of classifying equities by valuation ("growth" versus "value") is less common outside of the United States. Similarly, with regard to fixed income, some asset allocators may classify bonds based on various attributes—nominal versus inflation linked, corporate versus government issued, investment grade versus non-investment grade (high yield)—and/or by maturity/duration (short, intermediate, and long). By means of the non-negativity constraint and using a reverse-optimization procedure (to be explained later) based on asset class market values to generate expected return estimates, we control the typically high sensitivity of the composition of efficient portfolios to expected return estimates (discussed further in Section 2.4). Without such precautions, we would often find that efficient portfolios are highly concentrated in a subset of the available asset classes.

Running this set of capital market assumptions through a mean–variance optimizer with the traditional non-negativity and unity constraints produces the efficient frontier depicted in Exhibit 2. We have augmented this efficient frontier with some non-traditional information that will assist with the understanding of some key concepts related to the efficient frontier. A risk-free return of 2.5% is used in calculating the reserve-optimized expected returns as well as the Sharpe ratios in Exhibit 2.

Exhibit 2 Efficient Frontier—Base Case

The slope of the efficient frontier is greatest at the far left of the efficient frontier, at the point representing the global minimum variance portfolio. Slope represents the rate at which expected return increases per increase in risk. As one moves to the right, in the direction of increasing risk, the slope decreases; it is lowest at the point representing the maximum return portfolio. Thus, as one moves from left to right along the efficient frontier, the investor takes on larger and larger amounts of risk for smaller and smaller increases in expected return. The "kinks" in the line representing the slope (times 10) of the efficient frontier correspond to portfolios (known as corner portfolios) in which an asset either enters or leaves the efficient mix.

For most investors, at the far left of the efficient frontier, the increases in expected return associated with small increases in expected risk represent a desirable trade-off. The risk aversion coefficient identifies the specific point on the efficient frontier at which the investor refuses to take on additional risk because he or she feels the associated increase in expected return is not high enough to compensate for the increase in risk. Of course, each investor makes this trade-off differently.

For this particular efficient frontier, the three expected utility curves plot the solution to Equation 1 for three different risk aversion coefficients: 2.0, 4.0, and 6.0, respectively.[5] For a given risk aversion coefficient, the appropriate efficient mix from the efficient frontier is simply the mix in which expected utility is highest (i.e., maximized). As illustrated in Exhibit 2, a lower risk aversion coefficient leads to a riskier (higher) point on the efficient frontier, while a higher risk aversion coefficient leads to a more conservative (lower) point on the efficient frontier.

The vertical line (at volatility of 10.88%) identifies the asset mix with the highest Sharpe ratio; it intersects the Sharpe ratio line at a value of 3.7 (an unscaled value of 0.37). This portfolio is also represented by the intersection of the slope line and the Sharpe ratio line.

5 Numbers have been rounded to increase readability.

Exhibit 3 is an efficient frontier asset allocation area graph. Each vertical cross section identifies the asset allocation at a point along the efficient frontier; thus, the vertical cross section at the far left, with nearly 100% cash, is the asset allocation of the minimum variance portfolio, and the vertical cross section at the far right, with 45% in emerging markets and 55% in global REITs, is the optimal asset allocation for a standard deviation of 20.5%, the highest level of portfolio volatility shown. In this example, cash is treated as a risky asset; although its return volatility is very low, because it is less than perfectly correlated with the other asset classes, mixing it with small amounts of other asset classes reduces risk further. The vertical line identifies the asset mix with the highest Sharpe ratio and corresponds to the similar line shown on the original efficient frontier graph (Exhibit 2). The asset allocation mixes are well diversified for most of the first half of the efficient frontier, and in fact, for a large portion of the efficient frontier, all 12 asset classes in our opportunity set receive a positive allocation.[6]

Exhibit 3 Efficient Frontier Asset Allocation Area Graph—Base Case

The investment characteristics of potential asset mixes based on mean–variance theory are often further investigated by means of Monte Carlo simulation, as discussed in Section 2.2. Several observations from theory and practice are relevant to narrowing the choices.

Equation 1 indicates that the basic approach to asset allocation involves estimating the investor's risk aversion parameter and then finding the efficient mix that maximizes expected utility. When the risk aversion coefficient has not been estimated, the investor may be able to identify the maximum tolerable level of portfolio return volatility. If

6 Studying Exhibit 3 closely, one notices distinct regime shifts where the rate at which allocations are made to asset classes changes so that a line segment with a different slope begins. These regime shifts occur at what are called *corner portfolios*. The efficient mixes between two adjacent corner portfolios are simply linear combinations of those portfolios. The efficient frontier asset allocation area graph helps to clarify this result. More formally, corner portfolios are points on the efficient frontier at which an asset class either enters or leaves the efficient mix or a constraint either becomes binding or is no longer binding.

that level is 10% per annum, for example, only the part of the efficient frontier associated with volatility less than or equal to 10% is relevant. This approach is justifiable because for a given efficient frontier, every value of the risk aversion coefficient can be associated with a value of volatility that identifies the best point on the efficient frontier for the investor; the investor may also have experience with thinking in terms of volatility. In addition, when the investor has a numerical return objective, he or she can further narrow the range of potential efficient mixes by identifying the efficient portfolios expected to meet that return objective. For example, if the return objective is 5%, one can select the asset allocation with a 5% expected return.

Example 1 illustrates the use of Equation 1 and shows the adaptability of MVO by introducing the choice problem in the context of an investor who also has a shortfall risk concern.

EXAMPLE 1

Mean–Variance-Efficient Portfolio Choice 1

An investment adviser is counseling Aimée Goddard, a client who recently inherited €1,200,000 and who has above-average risk tolerance ($\lambda = 2$). Because Goddard is young and one of her goals is to fund a comfortable retirement, she wants to earn returns that will outpace inflation in the long term. Goddard expects to liquidate €60,000 of the inherited portfolio in 12 months to fund the down payment on a house. She states that it is important for her to be able to take out the €60,000 without invading the initial capital of €1,200,000. Exhibit 4 shows three alternative strategic asset allocations.

Exhibit 4 Strategic Asset Allocation Choices for Goddard

	Investor's Forecasts	
Asset Allocation	**Expected Return**	**Standard Deviation of Return**
A	10.00%	20%
B	7.00	10
C	5.25	5

1. Based only on Goddard's risk-adjusted expected returns for the asset allocations, which asset allocation would she prefer?
2. Recommend and justify a strategic asset allocation for Goddard.

Note: In addressing 2, calculate the minimum return, R_L, that needs to be achieved to meet the investor's objective not to invade capital, using the expression ratio $[E(R_P) - R_L]/\sigma_P$, which reflects the probability of exceeding the minimum given a normal return distribution assumption in a safety-first approach.[7]

7 See CFA Level 1 coverage of Roy's safety-first criterion.

Solution to 1:

Using Equation 1,

$$\begin{aligned} U_m &= E(R_m) - 0.005\lambda\sigma_m^2 \\ &= E(R_m) - 0.005(2)\sigma_m^2 \\ &= E(R_m) - 0.01\sigma_m^2 \end{aligned}$$

So Goddard's utility for Asset Allocations A, B, and C are as follows:

$$\begin{aligned} U_A &= E(R_A) - 0.01\,\sigma_A^2 \\ &= 10.0\% - 0.01(20\%)^2 \\ &= 10.0\% - 4.0\% \\ &= 6.0\% \\ U_B &= E(R_B) - 0.01\,\sigma_B^2 \\ &= 7.0\% - 0.01(10\%)^2 \\ &= 7.0\% - 1.0\% \\ &= 6.0\% \\ U_C &= E(R_C) - 0.01\,\sigma_C^2 \\ &= 5.25\% - 0.01(5\%)^2 \\ &= 5.25\% - 0.25\% \\ &= 5.0\% \end{aligned}$$

Goddard would be indifferent between A and B based only on their common perceived certainty-equivalent return of 6%.

Solution to 2:

Because €60,000/€1,200,000 is 5.0%, for any return less than 5.0%, Goddard will need to invade principal when she liquidates €60,000. So 5% is a threshold return level.

To decide which of the three allocations is best for Goddard, we calculate the ratio $[E(R_P) - R_L]/\sigma_P$:

Allocation A (10% – 5%)/20% = 0.25

Allocation B (7% – 5%)/10% = 0.20

Allocation C (5.25% – 5%)/5% = 0.05

Both Allocations A and B have the same expected utility, but Allocation A has a higher probability of meeting the threshold 5% return than Allocation B. Therefore, A would be the recommended strategic asset allocation.

There are several different approaches to determining an allocation to cash and cash equivalents, such as government bills. Exhibit 1 included cash among the assets for which we conducted an optimization to trace out an efficient frontier. The return to cash over a short time horizon is essentially certain in nominal terms. One approach to asset allocation separates out cash and cash equivalents as a (nominally) risk-free asset and calculates an efficient frontier of risky assets. Alternatively, a ray from the risk-free rate (a point on the return axis) tangent to the risky-asset efficient frontier (with cash excluded) then defines a linear efficient frontier. The efficient frontier then consists of combinations of the risk-free asset with the tangency portfolio (which has the highest Sharpe ratio among portfolios on the risky-asset efficient frontier).

A number of standard finance models (including Tobin two-fund separation) adopt this treatment of cash. According to two-fund separation, if investors can borrow or lend at the risk-free rate, they will choose the tangency portfolio for the risky-asset holdings and borrow at the risk-free rate to leverage the position in that portfolio to achieve a higher expected return, or they will split money between the tangency portfolio and the risk-free asset to reach a position with lower risk and lower expected return than that represented by the tangency portfolio. Since over horizons that are longer than the maturity of a money market instrument, the return earned would not be known, another approach that is well established in practice and reflected in Exhibit 1 is to include cash in the optimization. The amount of cash indicated by an optimization may be adjusted in light of short-term liquidity needs; for example, some financial advisers advocate that individuals hold an amount of cash equivalent to six months of expenses. All of these approaches are reasonable alternatives in practice.

Although we will treat cash as a risky asset in the following discussions, in Example 2, we stop to show the application of the alternative approach based on distinguishing a risk-free asset.

EXAMPLE 2

A Strategic Asset Allocation Based on Distinguishing a Nominal Risk-Free Asset

The Cafastani Foundation for the Fine Arts (CFFA) is a hypothetical charitable organization established to provide funding to Cafastani museums for their art acquisition programs.

CFFA's overall investment objective is to maintain its portfolio's real purchasing power after distributions. CFFA targets a 4% annual distribution of assets. CFFA has the following current specific investment policies.

Return objective

CFFA's assets shall be invested with the objective of earning an average nominal 6.5% annual return. This level reflects a spending rate of 4%, an expected inflation rate of 2%, and a 40 bp cost of earning investment returns. The calculation is $(1.04)(1.02)(1.004) - 1 = 0.065$, or 6.5%.

Risk considerations

CFFA's assets shall be invested to minimize the level of standard deviation of return subject to satisfying the expected return objective.

The investment office of CFFA distinguishes a nominally risk-free asset. As of the date of the optimization, the risk-free rate is determined to be 2.2%.

Exhibit 5 gives key outputs from a mean–variance optimization in which asset class weights are constrained to be non-negative.

Exhibit 5 Corner Portfolios Defining the Risky-Asset Efficient Frontier

Portfolio Number	Expected Nominal Returns	Standard Deviation	Sharpe Ratio
1	9.50%	18.00%	0.406
2	8.90	15.98	0.419
3	8.61	15.20	0.422
4	7.24	11.65	0.433
5	5.61	7.89	0.432

Exhibit 5 (Continued)

Portfolio Number	Expected Nominal Returns	Standard Deviation	Sharpe Ratio
6	5.49	7.65	0.430
7	3.61	5.39	0.262

The portfolios shown are corner portfolios (see footnote 6), which as a group define the risky-asset efficient frontier in the sense that any portfolio on the frontier is a combination of the two corner portfolios that bracket it in terms of expected return.

Based only on the facts given, determine the most appropriate strategic asset allocation for CFFA given its stated investment policies.

Solution:

An 85%/15% combination of Portfolio 4 and the risk-free asset is the most appropriate asset allocation. This combination has the required 6.5% expected return with the minimum level of risk. Stated another way, this combination defines the efficient portfolio at a 6.5% level of expected return based on the linear efficient frontier created by the introduction of a risk-free asset.

Note that Portfolio 4 has the highest Sharpe ratio and is the tangency portfolio. With an expected return of 7.24%, it can be combined with the risk-free asset, with a return of 2.2%, to achieve an expected return of 6.5%:

$$6.50 = 7.24w + 2.2(1 - w)$$
$$w = 0.853$$

Placing about 85% of assets in Portfolio 4 and 15% in the risk-free asset achieves an efficient portfolio with expected return of 6.4 with a volatility of 0.853(11.65) = 9.94%. (The risk-free asset has no return volatility by assumption and, also by assumption, zero correlation with any risky portfolio return.) This portfolio lies on a linear efficient frontier formed by a ray from the risk-free rate to the tangency portfolio and can be shown to have the same Sharpe ratio as the tangency portfolio, 0.433. The combination of Portfolio 4 with Portfolio 5 to achieve a 6.5% expected return would have a lower Sharpe ratio and would not lie on the efficient frontier.

Asset allocation decisions have traditionally been made considering only the investor's investment portfolio (and financial liabilities) and not the total picture that includes human capital and other non-traded assets (and liabilities), which are missing in a traditional balance sheet. Taking such extended assets and liabilities into account can lead to improved asset allocation decisions, however.

Depending on the nature of an individual's career, human capital can provide relatively stable cash flows similar to bond payments. At the other extreme, the cash flows from human capital can be much more volatile and uncertain, reflecting a lumpy, commission-based pay structure or perhaps a career in a seasonal business. For many individuals working in stable job markets, the cash flows associated with their human capital are somewhat like those of an inflation-linked bond, relatively consistent and tending to increase with inflation. If human capital is a relatively large component of the individual's total economic worth, accounting for this type of hidden asset in an asset allocation setting is extremely important and would presumably increase the individual's capacity to take on risk.

Let us look at a hypothetical example. Emma Beel is a 45-year-old tenured university professor in London. Capital market assumptions are as before (see Exhibit 1). Beel has GBP 1,500,000 in liquid financial assets, largely due to a best-selling book. Her employment as a tenured university professor is viewed as very secure and produces cash flows that resemble those of a very large, inflation-adjusted, long-duration bond portfolio. The net present value of her human capital is estimated at GBP 500,000. Beel inherited her grandmother's home on the edge of the city, valued at GBP 750,000. The results of a risk tolerance questionnaire that considers both risk preference and risk capacity suggest that Beel should have an asset allocation involving moderate risk. Furthermore, given our earlier assumption that the collective market risk aversion coefficient is 4.0, we assume that the risk aversion coefficient of a moderately risk-averse investor is approximately 4.0, from a total wealth perspective.

To account for Beel's human capital and residential real estate, these two asset classes were modeled and added to the optimization. Beel's human capital of GBP 500,000 was modeled as 70% UK long-duration inflation-linked bonds, 15% UK corporate bonds, and 15% UK equities.[8] Residential real estate was modeled based on a de-smoothed residential property index for London. (We will leave the complexities of modeling liabilities to Section 3.) Beel's assets include those shown in Exhibit 6.

Exhibit 6 Emma Beel's Assets

Asset	Value (GBP)	Percentage
Liquid financial assets	1,500,000	54.55
UK residential real estate	750,000	27.27
Human capital	500,000	18.18
	2,750,000	100

Beel's UK residential real estate (representing the London house) and human capital were added to the optimization opportunity set. Additionally, working under the assumption that Beel's house and human capital are non-tradable assets, the optimizer was forced to allocate 27.27% or more to UK residential real estate and 18.18% to human capital and then determined the optimal asset allocation based on a risk aversion coefficient of 4. Beel's expected utility is maximized by an efficient asset allocation with volatility of approximately 8.2%. Exhibit 7 displays the resulting asset allocation area graph.

8 These weights were used to create the return composite representing Beel's human capital that was used in the asset allocation optimization.

Exhibit 7 Efficient Frontier Asset Allocation Area Graph—Balance Sheet Approach

Looking past the constrained allocations to human capital and UK residential real estate, the remaining allocations associated with Beel's liquid financial assets do not include UK equities, UK fixed income, or global REITs. Each of these three asset classes is relatively highly correlated with either UK residential real estate or UK human capital.[9]

2.2 Monte Carlo Simulation

Monte Carlo simulation complements MVO by addressing the limitations of MVO as a single-period framework. Additionally, in the case in which the investor's risk tolerance is either unknown or in need of further validation, Monte Carlo simulation can help paint a realistic picture of potential future outcomes, including the likelihood of meeting various goals, the distribution of the portfolio's expected value through time, and potential maximum drawdowns. Simulation also provides a tool for investigating the effects of trading/rebalancing costs and taxes and the interaction of evolving financial markets with asset allocation. It is important to note that not all Monte Carlo simulation tools are the same: They vary significantly in their ability to model non-normal multivariate returns, serial and cross-correlations, tax rates, distribution requirements, an evolving asset allocation schedule (target-date glide path), non-traditional investments (e.g., annuities), and human capital (based on age, geography, education, and/or occupation).

Using Monte Carlo simulation, an investment adviser can effectively grapple with a range of practical issues that are difficult or impossible to formulate analytically. Consider rebalancing to a strategic asset allocation for a taxable investor. We can readily calculate the impact of taxes during a single time period. Also, in a single-period

9 For additional information on applying a total balance sheet approach, see, for example, Blanchett and Straehl (2015) or Rudd and Siegel (2013).

setting, as assumed by MVO, rebalancing is irrelevant. In the multi-period world of most investment problems, however, the portfolio will predictably be rebalanced, triggering the realization of capital gains and losses. Given a specific rebalancing rule, different strategic asset allocations will result in different patterns of tax payments (and different transaction costs too). Formulating the multi-period problem mathematically would be a daunting challenge. We could more easily incorporate the interaction between rebalancing and taxes in a Monte Carlo simulation.

We will examine a simple multi-period problem to illustrate the use of Monte Carlo simulation, evaluating the range of outcomes for wealth that may result from a strategic asset allocation (and not incorporating taxes).

The value of wealth at the terminal point of an investor's time horizon is a possible criterion for choosing among asset allocations. Future wealth incorporates the interaction of risk and return. The need for Monte Carlo simulation in evaluating an asset allocation depends on whether there are cash flows into or out of the portfolio over time. For a given asset allocation with no cash flows, the sequence of returns is irrelevant; ending wealth will be path independent (unaffected by the sequence or path of returns through time). With cash flows, the sequence is also irrelevant if simulated returns are independent, identically distributed random variables. We could find expected terminal wealth and percentiles of terminal wealth analytically.[10] Investors save/deposit money in and spend money out of their portfolios; thus, in the more typical case, terminal wealth is path dependent (the sequence of returns matters) because of the interaction of cash flows and returns. When terminal wealth is path dependent, an analytical approach is not feasible but Monte Carlo simulation is. Example 3 applies Monte Carlo simulation to evaluate the strategic asset allocation of an investor who regularly withdraws from the portfolio.

EXAMPLE 3

Monte Carlo Simulation for a Retirement Portfolio with a Proposed Asset Allocation

Malala Ali, a resident of the hypothetical country of Cafastan, has sought the advice of an investment adviser concerning her retirement portfolio. At the end of 2017, she is 65 years old and holds a portfolio valued at CAF$1 million. Ali would like to withdraw CAF$40,000 a year to supplement the corporate pension she has begun to receive. Given her health and family history, Ali believes she should plan for a retirement lasting 25 years. She is also concerned about passing along a portion of her portfolio to the families of her three children; she hopes that at least the portfolio's current real value can go to them. Consulting with her adviser, Ali has expressed this desire quantitatively: She wants the median value of her bequest to her children to be no less than her portfolio's current value of CAF$1 million in real terms. The median is the 50th percentile outcome. The asset allocation of her retirement portfolio is currently 50/50 Cafastani equities/Cafastani intermediate-term government bonds. Ali and her adviser have decided on the following set of capital market expectations (Exhibit 8):

10 Making a plausible statistical assumption, such as a lognormal distribution, for ending wealth.

Exhibit 8 Cafastani Capital Market Expectations

	Investor's Forecasts	
Asset Class	**Expected Return**	**Standard Deviation of Return**
Cafastani equities	9.4%	20.4%
Cafastani bonds	5.6%	4.1%
Inflation	2.6%	

The predicted correlation between returns of Cafastani equities and Cafastani intermediate-term government bonds is 0.15.

With the current asset allocation, the expected nominal return on Ali's retirement portfolio is 6.7% with a standard deviation of 11%. Exhibit 9 gives the results of the Monte Carlo simulation.[11] In Exhibit 9, the lowest curve represents, at various ages, levels of real wealth at or below which the 10% of worst real wealth outcomes lie (i.e., the 10th percentile for real wealth); curves above that represent, respectively, 25th, 50th, 75th, and 90th percentiles for real wealth.

Exhibit 9 Monte Carlo Simulation of Ending Real Wealth with Annual Cash Outflows

11 Note that the *y*-axis in this exhibit is specified using a logarithmic scale. The quantity CAF$1 million is the same distance from CAF$100,000 as CAF$10 million is from CAF$1 million because CAF$1 million is 10 times CAF$100,000, just as CAF$10 million is 10 times CAF$1 million. CAF$100,000 is 10^5, and CAF $1 million is 10^6. In Exhibit 9, a distance halfway between the CAF$100,000 and CAF$1 million hatch marks is $10^{5.5}$ = CAF$316,228.

Based on the information given, address the following:

1 Justify the presentation of ending wealth in terms of real rather than nominal wealth in Exhibit 9.

2 Is the current asset allocation expected to satisfy Ali's investment objectives?

Solution to 1:

Ali wants the median real value of her bequest to her children to be "no less than her portfolio's current value of CAF$1 million." We need to state future amounts in terms of today's values (i.e., in real dollars) to assess the purchasing power of those amounts relative to CAF$1 million today. Exhibit 9 thus gives the results of the Monte Carlo simulation in real dollar terms. The median real wealth at age 90 is clearly well below the target ending wealth of real CAF$1 million.

Solution to 2:

From Exhibit 9, we see that the median terminal (at age 90) value of the retirement portfolio in real dollars is less than the stated bequest goal of CAF$1 million. Therefore, the most likely bequest is less than the amount Ali has said she wants. The current asset allocation is not expected to satisfy all her investment objectives. Although one potential lever would be to invest more aggressively, given Ali's age and risk tolerance, this approach seems imprudent. An adviser may need to counsel that the desired size of the bequest may be unrealistic given Ali's desired income to support her expenditures. Ali will likely need to make a relatively tough choice between her living standard (spending less) and her desire to leave a CAF$1 million bequest in real terms. A third alternative would be to delay retirement, which may or may not be feasible.

2.3 Criticisms of Mean–Variance Optimization

With this initial understanding of mean–variance optimization, we can now elaborate on some of the most common criticisms of it. The following criticisms and the ways they have been addressed motivate the balance of the coverage of MVO:

1 The outputs (asset allocations) are highly sensitive to small changes in the inputs.

2 The asset allocations tend to be highly concentrated in a subset of the available asset classes.

3 Many investors are concerned about more than the mean and variance of returns, the focus of MVO.

4 Although the asset allocations may appear diversified across assets, the sources of risk may not be diversified.

5 Most portfolios exist to pay for a liability or consumption series, and MVO allocations are not directly connected to what influences the value of the liability or the consumption series.

6 MVO is a single-period framework that does not take account of trading/rebalancing costs and taxes.

In the rest of Section 2, we look at various approaches to addressing criticisms 1 and 2, giving some attention also to criticisms 3 and 4. Sections 3 and 4 present approaches to addressing criticism 5. "Asset Allocation with Real World Constraints" addresses some aspects of criticism 6.

It is important to understand that the first criticism above is not unique to MVO. Any optimization model that uses forward-looking quantities as inputs faces similar consequences of treating input values as capable of being determined with certainty. Sensitivity to errors in inputs is a problem that cannot be fully solved because it is inherent in the structure of optimization models that use as inputs forecasts of uncertain quantities.

To illustrate the importance of the quality of inputs, the sensitivity of asset weights in efficient portfolios to small changes in inputs, and the propensity of mean–variance optimization to allocate to a relatively small subset of the available asset classes, we made changes to the expected return of two asset classes in our base-case UK-centric opportunity set in Exhibit 1. We increased the expected return of Asia Pacific ex Japan equities from 8.5% to 9.0% and decreased the expected return of Europe ex UK equities from 8.6% to 8.1% (both changes are approximately 50 bps). We left all of the other inputs unchanged and reran the optimization. The efficient frontier as depicted in mean–variance space appears virtually unchanged (not shown); however, the efficient asset mixes of this new efficient frontier are dramatically different. Exhibit 10 displays the efficient frontier asset allocation area graph based on the slightly changed capital market assumptions. Notice the dramatic difference between Exhibit 10 and Exhibit 3. The small change in return assumptions has driven UK large cap, Europe ex-UK equities, and emerging market equities out of the efficient mixes, and the efficient mixes are now highly concentrated in a smaller subset of the available asset classes. Given that the expected returns of UK large cap and emerging market equities were unchanged, their disappearance from the efficient frontier is not intuitive.

Exhibit 10 Efficient Frontier Asset Allocation Area Graph—Changed Expected Returns

To aid with the comparison of Exhibit 10 with Exhibit 3, we identified three specific efficient asset allocation mixes and compared the version based on the ad hoc modification of expected returns to that of the base case. This comparison is shown in Exhibit 11.

Exhibit 11 Comparison of Select Efficient Asset Allocations—Ad Hoc Return Modification Allocations vs. Base-Case Allocations

	Modified 25/75	Base Case 25/75	Difference	Modified 50/50	Base Case 50/50	Difference	Modified 75/25	Base Case 75/25	Difference
UK large cap	0.0%	1.2%	–1.2%	0.0%	2.5%	–2.5%	0.0%	0.0%	0.0%
UK mid cap	0.8%	0.6%	0.3%	1.7%	0.8%	0.9%	0.0%	0.0%	0.0%
UK small cap	0.5%	0.5%	–0.1%	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%
US equities	13.7%	13.8%	–0.1%	26.6%	26.8%	–0.2%	40.1%	40.5%	–0.4%
Europe ex UK equities	0.0%	2.7%	–2.7%	0.0%	6.5%	–6.5%	0.0%	13.2%	–13.2%
Asia Pacific ex Japan equities	7.5%	1.0%	6.5%	16.6%	2.3%	14.2%	26.8%	1.5%	25.3%
Japan equities	2.2%	2.3%	–0.1%	4.5%	4.5%	0.0%	4.4%	4.3%	0.1%
Emerging market equities	0.0%	2.0%	–2.0%	0.0%	4.9%	–4.9%	0.0%	10.0%	–10.0%
Global REITs	0.3%	0.9%	–0.6%	0.2%	1.4%	–1.3%	3.8%	5.6%	–1.8%
Global ex UK bonds	10.9%	10.6%	0.3%	24.7%	23.9%	0.7%	25.0%	25.0%	0.0%
UK bonds	2.5%	2.7%	–0.2%	2.4%	3.0%	–0.6%	0.0%	0.0%	0.0%
Cash	61.6%	61.7%	–0.1%	22.9%	23.1%	–0.1%	0.0%	0.0%	0.0%
Subtotal equities	25.0%	25.0%		50.0%	50.0%		75.0%	75.0%	
Subtotal fixed income	75.0%	75.0%		50.0%	50.0%		25.0%	25.0%	

2.4 Addressing the Criticisms of Mean–Variance Optimization

In this section, we explore several methods for overcoming some of the potential short-comings of mean–variance optimization. Techniques that address the first two criticisms mostly take three approaches: improving the quality of inputs, constraining the optimization, and treating the efficient frontier as a statistical construct. These approaches are treated in the following three subsections.

In MVO, the composition of efficient portfolios is typically more sensitive to expected return estimates than it is to estimates of volatilities and correlations. Furthermore, expected returns are generally more difficult to estimate accurately than are volatilities and correlations. Thus, in addressing the first criticism of MVO—that outputs are highly sensitive to small changes in inputs—the reading will focus on expected return inputs. However, volatility and correlation inputs are also sources of potential error.

2.4.1 *Reverse Optimization*

Reverse optimization is a powerful tool that helps explain the implied returns associated with any portfolio. It can be used to estimate expected returns for use in a forward-looking optimization. MVO solves for optimal asset weights based on expected returns, covariances, and a risk aversion coefficient. Based on predetermined inputs, an optimizer solves for the optimal asset allocation weights. As the name implies, *reverse* optimization works in the opposite direction. Reverse optimization takes as its inputs a set of asset allocation weights *that are assumed to be optimal* and, with the

additional inputs of covariances and the risk aversion coefficient, solves for expected returns. These reverse-optimized returns are sometimes referred to as implied or imputed returns.

When using reverse optimization to estimate a set of expected returns for use in a forward-looking optimization, the most common set of starting weights is the observed market-capitalization value of the assets or asset classes that form the opportunity set. The market capitalization of a given asset or asset classes should reflect the collective information of market participants. In representing the world market portfolio, the use of non-overlapping asset classes representing the majority of the world's investable assets is most consistent with theory.

Some practitioners will find the link between reverse optimization and CAPM equilibrium elegant, while others will see it as a shortcoming. For those who truly object to the use of market-capitalization weights in estimating inputs, the mechanics of reverse optimization can work with any set of starting weights—such as those of an existing policy portfolio, the average asset allocation policy of a peer group, or a fundamental weighting scheme. For those with more minor objections, we will shortly introduce the Black–Litterman model, which allows the expression of alternative forecasts or views.

In order to apply reverse optimization, one must create a working version of the all-inclusive market portfolio based on the constituents of the opportunity set. The market size or capitalization for most of the traditional stock and bond asset classes can be easily inferred from the various indexes that are used as asset class proxies. Many broad market-capitalization-weighted indexes report that they comprise over 95% of the securities, by market capitalization, of the asset classes they are attempting to represent. Exhibit 12 lists approximate values and weights for the 12 asset classes in our opportunity set, uses the weights associated with the asset classes to form a working version of the global market portfolio, and then uses the beta of each asset relative to our working version of the global market portfolio to infer what expected returns would be if all assets were priced by the CAPM according to their market beta. We assume a risk-free rate of 2.5% and a global market risk premium of 4%. Note that expected returns are rounded to one decimal place from the more precise values shown later (in Exhibit 13); expected returns cannot in every case be exactly reproduced based on Exhibit 12 alone because of the approximations mentioned. Also, notice in the final row of Exhibit 12 that the weighted average return and beta of the assets are 6.5% and 1, respectively.

Exhibit 12 Reverse-Optimization Example (Market Capitalization in £ billions)

Asset Class	Mkt Cap	Weight	Return $E[R_i]$		Risk-Free Rate r_f		Beta $\beta_{i,mkt}$	Market Risk Premium
UK large cap	£1,354.06	3.2%	6.62%	=	2.5%	+	1.03	(4%)
UK mid cap	£369.61	0.9%	6.92%	=	2.5%	+	1.11	(4%)
UK small cap	£108.24	0.3%	7.07%	=	2.5%	+	1.14	(4%)
US equities	£14,411.66	34.4%	7.84%	=	2.5%	+	1.33	(4%)
Europe ex UK equities	£3,640.48	8.7%	8.63%	=	2.5%	+	1.53	(4%)
Asia Pacific ex Japan equities	£1,304.81	3.1%	8.51%	=	2.5%	+	1.50	(4%)
Japan equities	£2,747.63	6.6%	6.43%	=	2.5%	+	0.98	(4%)
Emerging market equities	£2,448.60	5.9%	8.94%	=	2.5%	+	1.61	(4%)
Global REITs	£732.65	1.8%	9.04%	=	2.5%	+	1.64	(4%)

(continued)

Exhibit 12 (Continued)

Asset Class	Mkt Cap	Weight	Return $E[R_i]$		Risk-Free Rate r_f		Beta $\beta_{i,mkt}$	Market Risk Premium
Global ex UK bonds	£13,318.58	31.8%	4.05%	=	2.5%	+	0.39	(4%)
UK bonds	£1,320.71	3.2%	2.95%	=	2.5%	+	0.112	(4%)
Cash	£83.00	0.2%	2.50%	=	2.5%	+	0.00	(4%)
	£41,840.04	100.0%	6.50%				1	

Notes: For the Mkt Cap and Weight columns, the final row is the simple sum. For the Return and Beta columns, the final row is the weighted average.

Looking back at our original asset allocation area graph (Exhibit 3), the reason for the well-behaved and well-diversified asset allocation mixes is now clear. By using reverse optimization, we are consistently relating assets' expected returns to their systematic risk. If there isn't a consistent relationship between the expected return and systematic risk, the optimizer will see this inconsistency as an opportunity and seek to take advantage of the more attractive attributes. This effect was clearly visible in our second asset allocation area graph after we altered the expected returns of Asia Pacific ex Japan equities and Europe ex UK equities.

As alluded to earlier, some practitioners find that the reverse-optimization process leads to a nice starting point, but they often have alternative forecasts or views regarding the expected return of one or more of the asset classes that differ from the returns implied by reverse optimization based on market-capitalization weights. One example of having views that differ from the reverse-optimized returns has already been illustrated, when we altered the returns of Asia Pacific ex Japan equities and Europe ex UK equities by approximately 50 bps. Unfortunately, due to the sensitivity of mean–variance optimization to small changes in inputs, directly altering the expected returns caused relatively extreme and unintuitive changes in the resulting asset allocations. If one has strong views on expected returns that differ from the reverse-optimized returns, an alternative or additional approach is needed; the next section presents one alternative.

2.4.2 *Black–Litterman Model*

A complementary addition to reverse optimization is the Black–Litterman model, created by Fischer Black and Robert Litterman (see Black and Litterman 1990, 1991, 1992). Although the Black–Litterman model is often characterized as an asset allocation model, it is really a model for deriving a set of expected returns that can be used in an unconstrained or constrained optimization setting. The Black–Litterman model starts with excess returns (in excess of the risk-free rate) produced from reverse optimization and then provides a technique for altering reverse-optimized expected returns in such a way that they reflect an investor's own distinctive views yet still behave well in an optimizer.

The Black–Litterman model has helped make the mean–variance optimization framework more useful. It enables investors to combine their unique forecasts of expected returns with reverse-optimized returns in an elegant manner. When coupled with a mean–variance or related framework, the resulting Black–Litterman expected returns often lead to well-diversified asset allocations by improving the consistency between each asset class's expected return and its contribution to systematic risk. These asset allocations are grounded in economic reality—via the market capitalization of the assets typically used in the reverse-optimization process—but still reflect the information contained in the investor's unique forecasts (or views) of expected return.

The mathematical details of the Black–Litterman model are beyond the scope of this reading, but many practitioners have access to asset allocation software that includes the Black–Litterman model.[12] To assist with an intuitive understanding of the model and to show the model's ability to blend new information (views) with reverse-optimized returns, we present an example based on the earlier views regarding the expected returns of Asia Pacific ex Japan equities and Europe ex UK equities. The Black–Litterman model has two methods for accepting views: one in which an absolute return forecast is associated with a given asset class and one in which the return differential of an asset (or group of assets) is expressed relative to another asset (or group of assets). Using the relative view format of the Black–Litterman model, we expressed the view that we believe Asia Pacific ex Japan equities will outperform Europe ex UK equities by 100 bps. We placed this view into the Black–Litterman model, which blends reverse-optimized returns with such views to create a new, mixed estimate.

Exhibit 13 compares the Black–Litterman model returns to the original reverse-optimized returns (as in Exhibit 12 but showing returns to the second decimal place based on calculations with full precision). The model accounts for the correlations of the assets with each other, and as one might expect, all of the returns change slightly (the change in return on cash was extremely small).

Exhibit 13 Comparison of Black–Litterman and Reverse-Optimized Returns

Asset Class	Reverse-Optimized Returns	Black–Litterman Returns	Difference
UK large cap	6.62%	6.60%	–0.02%
UK mid cap	6.92	6.87	–0.05
UK small cap	7.08	7.03	–0.05
US equities	7.81	7.76	–0.05
Europe ex UK equities	8.62	8.44	–0.18
Asia Pacific ex Japan equities	8.53	8.90	0.37
Japan equities	6.39	6.37	–0.02
Emerging market equities	8.96	9.30	0.33
Global REITs	9.02	9.00	–0.01
Global ex UK bonds	4.03	4.00	–0.03
UK bonds	2.94	2.95	0.01
Cash	2.50	2.50	0.00

Next, we created another efficient frontier asset allocation area graph based on these new returns from the Black–Litterman model, as shown in Exhibit 14. The allocations look relatively similar to those depicted in Exhibit 3. However, if you compare the allocations to Asia Pacific ex Japan equities and Europe ex UK equities to their allocations in the original efficient frontier asset allocation graph, you will notice that allocations to Asia Pacific ex Japan equities have increased across the frontier and allocations to Europe ex UK equities have decreased across the frontier with very little impact on the other asset allocations.

12 For those interested in the mathematical details of the Black–Litterman model, see Idzorek (2007); a pre-publication version is available here: http://corporate.morningstar.com/ib/documents/MethodologyDocuments/IBBAssociates/BlackLitterman.pdf).

Exhibit 14 Efficient Frontier Asset Allocation Area Graph, Black–Litterman Returns

As before, to aid in the comparison of Exhibit 14 (Black–Litterman allocations) with Exhibit 3 (the base-case allocations), we identified three specific mixes in Exhibit 14 and compared those efficient asset allocation mixes based on the expected returns from the Black–Litterman model to those of the base case. The results are shown in Exhibit 15.

Exhibit 15 Comparison of Select Efficient Asset Allocations, Black–Litterman Allocations vs. Base-Case Allocations

	Modified 25/75	Base Case 25/75	Difference	Modified 50/50	Base Case 50/50	Difference	Modified 75/25	Base Case 75/25	Difference
UK large cap	0.4%	1.2%	–0.8%	1.4%	2.5%	–1.1%	0.0%	0.0%	0.0%
UK mid cap	0.4	0.6	–0.2	0.5	0.8	–0.3	0.0	0.0	0.0
UK small cap	0.4	0.5	–0.1	0.2	0.4	–0.2	0.0	0.0	0.0
US equities	13.8	13.8	0.0	26.8	26.8	0.0	40.0	40.5	–0.5
Europe ex UK equities	0.0	2.7	–2.7	0.0	6.5	–6.5	0.0	13.2	–13.2
Asia Pacific ex Japan equities	5.2	1.0	4.2	10.8	2.3	8.5	15.4	1.5	14.0
Japan equities	2.2	2.3	0.0	4.5	4.5	0.0	4.2	4.3	–0.1
Emerging market equities	1.8	2.0	–0.1	4.6	4.9	–0.2	9.8	10.0	–0.1
Global REITs	0.8	0.9	–0.1	1.3	1.4	–0.2	5.5	5.6	–0.1
Global ex UK bonds	10.3	10.6	–0.2	23.6	23.9	–0.3	25.0	25.0	0.0

Exhibit 15 (Continued)

	Modified 25/75	Base Case 25/75	Difference	Modified 50/50	Base Case 50/50	Difference	Modified 75/25	Base Case 75/25	Difference
UK bonds	3.1	2.7	0.3	3.5	3.0	0.5	0.0	0.0	0.0
Cash	61.6	61.7	–0.1	22.9	23.1	–0.1	0.0	0.0	0.0
Subtotal equities	25.0%	25.0%		50.0%	50.0%		75.0%	75.0%	
Subtotal fixed income	75.0%	75.0%		50.0%	50.0%		25.0%	25.0%	

2.4.3 *Adding Constraints beyond the Budget Constraints*

When running an optimization, in addition to the typical budget constraint and the non-negativity constraint, one can impose additional constraints. There are two primary reasons practitioners typically apply additional constraints: (1) to incorporate real-world constraints into the optimization problem and (2) to help overcome some of the potential shortcomings of mean–variance optimization elaborated above (input quality, input sensitivity, and highly concentrated allocations).

Most commercial optimizers accommodate a wide range of constraints. Typical constraints include the following:

1. Specify a set allocation to a specific asset—for example, 30% to real estate or 45% to human capital. This kind of constraint is typically used when one wants to include a non-tradable asset in the asset allocation decision and optimize around the non-tradable asset.
2. Specify an asset allocation range for an asset—for example, the emerging market allocation must be between 5% and 20%. This specification could be used to accommodate a constraint created by an investment policy, or it might reflect the user's desire to control the output of the optimization.
3. Specify an upper limit, due to liquidity considerations, on an alternative asset class, such as private equity or hedge funds.
4. Specify the relative allocation of two or more assets—for example, the allocation to emerging market equities must be less than the allocation to developed equities.
5. In a liability-relative (or surplus) optimization setting, one can constrain the optimizer to hold one or more assets representing the systematic characteristics of the liability short. (We elaborate on this scenario in Section 3.)

In general, good constraints are those that model the actual circumstances/context in which one is attempting to set asset allocation policy. In contrast, constraints that are simply intended to control the output of a mean–variance optimization should be used cautiously. A perceived need to add constraints to control the MVO output would suggest a need to revisit one's inputs. If a very large number of constraints are imposed, one is no longer optimizing but rather specifying an asset allocation through a series of binding constraints.

2.4.4 *Resampled Mean–Variance Optimization*

Another technique used by asset allocators is called resampled mean–variance optimization (or sometimes "resampling" for short).[13] Resampled mean–variance optimization combines Markowitz's mean–variance optimization framework with Monte Carlo simulation and, all else equal, leads to more-diversified asset allocations. In contrast to reverse optimization, the Black–Litterman model, and constraints, resampled mean–variance optimization is an attempt to build a better optimizer that recognizes that forward-looking inputs are inherently subject to error.

Resampling uses Monte Carlo simulation to estimate a large number of potential capital market assumptions for mean–variance optimization and, eventually, for the resampled frontier. Conceptually, resampling is a large-scale sensitivity analysis in which hundreds or perhaps thousands of variations on baseline capital market assumptions lead to an equal number of mean–variance optimization frontiers based on the Monte Carlo–generated capital market assumptions. These intermediate frontiers are referred to as simulated frontiers. The resulting asset allocations, or portfolio weights, from these simulated frontiers are saved and averaged (using a variety of methods). To draw the resampled frontier, the averaged asset allocations are coupled with the starting capital market assumptions.

To illustrate how resampling can be used with other techniques, we conducted a resampled mean–variance optimization using the Black–Litterman returns from Exhibit 10, above. Exhibit 16 provides the asset allocation area graph from this optimization. Notice that the resulting asset allocations are smoother than in any of the previous asset allocation area graphs. Additionally, relative to Exhibit 15, based on the same inputs, the smallest allocations have increased in size while the largest allocations have decreased somewhat.

Exhibit 16 Efficient Frontier Asset Allocation Area Graph, Black–Litterman Returns with Resampling

13 The current embodiments of resampling grew out of the work of Jobson and Korkie (1980, 1981); Jorion (1992); DiBartolomeo (1993); and Michaud (1998).

The asset allocations from resampling as depicted in Exhibit 16 are appealing. Criticisms include the following: (1) Some frontiers have concave "bumps" where expected return decreases as expected risk increases; (2) the "riskier" asset allocations are over-diversified; (3) the asset allocations inherit the estimation errors in the original inputs; and (4) the approach lacks a foundation in theory.[14]

2.4.5 *Other Non-Normal Optimization Approaches*

From our list of shortcomings/criticisms of mean–variance optimization, the third is that investor preferences may go beyond the first two moments (mean and variance) of a portfolio's return distribution. The third and fourth moments are, respectively, skewness and kurtosis. Skewness measures the degree to which return distributions are asymmetrical, and kurtosis measures the thickness of the distributions' tails (i.e., how frequently extreme events occur). A normal distribution is fully explained by the first two moments because the skewness and (excess) kurtosis of the normal distribution are both zero.

Returning to the discussion of Equation 1, the mean–variance optimization program involves maximizing expected utility, which is equal to expected return minus a penalty for risk, where risk is measured as variance (standard deviation). Unfortunately, variance or standard deviation is an incomplete measure of risk when returns are not normally distributed. By studying historical return distributions for the major asset classes and comparing those historical distributions to normal distributions, one will quickly see that, historically, asset class returns are not normally distributed. In fact, empirically extreme returns seem to occur approximately 10 times more often than the normal distribution would suggest. Coupling this finding with the asymmetrical risk preferences observed in investors—whereby the pain of a loss is approximately twice as significant as the joy from an equivalent gain (according to Prospect theory)—has led to more complex utility functions and optimizers that expressly account for non-normal returns and asymmetric risk preference.[15] A number of variations of these more sophisticated optimization techniques have been put forth, making them challenging to cover. In general, most of them consider the non-normal return distribution characteristics and use a more sophisticated definition of risk, such as conditional value-at-risk. We view these as important advancements in the toolkit available to practitioners.

Exhibit 17 summarizes selected extensions of quantitative asset allocation approaches outside the sphere of traditional mean–variance optimization.

Exhibit 17 Selected Non-Mean–Variance Developments

Key Non-Normal Frameworks	Research/Recommended Reading
Mean–semivariance optimization	Markowitz (1959)
Mean–conditional value-at-risk optimization	Goldberg, Hayes, and Mahmoud (2013) Rockafellar and Uryasev (2000) Xiong and Idzorek (2011)
Mean–variance-skewness optimization	Briec, Kerstens, and Jokung (2007) Harvey, Liechty, Liechty, and Müller (2010)
Mean–variance-skewness-kurtosis optimization	Athayde and Flôres (2003) Beardsley, Field, and Xiao (2012)

14 For more details, see Scherer (2002).

15 For more on prospect theory, see Kahneman and Tversky (1979) and Tversky and Kahneman (1992).

Long-Term versus Short-Term Inputs

Strategic asset allocation is often described as "long term," while tactical asset allocation involves short-term movements away from the strategic asset allocation. In this context, "long term" is often defined as 10 or perhaps 20 or more years, yet in practice, very few asset allocators revisit their strategic asset allocation this infrequently. Many asset allocators update their strategic asset allocation annually, which makes it a bit more challenging to distinguish between strategic and tactical asset allocations. This frequent revisiting of the asset allocation policy brings up important questions about the time horizon associated with the inputs. In general, long-term (10-plus-year) capital market assumptions that ignore current market conditions, such as valuation levels, the business cycle, and interest rates, are often thought of as *unconditional* inputs. Unconditional inputs focus on the average capital market assumptions over the 10-plus-year time horizon. In contrast, shorter-term capital market assumptions that explicitly attempt to incorporate current market conditions (i.e., that are "conditioned" on them) are conditional inputs. For example, a practitioner who believes that the market is overvalued and that as a result we are entering a period of low returns, high volatility, and high correlations might prefer to use conditional inputs that reflect these beliefs.[16]

EXAMPLE 4

Problems in Mean–Variance Optimization

In a presentation to US-based investment clients on asset allocation, the results of two asset allocation exercises are shown, as presented in Exhibit 18.

Exhibit 18 Asset Allocation Choices

Panel A: Area Graph 1

16 Relatedly, Chow, Jacquier, Kritzman, and Lowry (1999) showed a procedure for blending the optimal portfolios for periods of normal and high return volatility. The approach accounts for the tendency of asset returns to be more highly correlated during times of high volatility.

Exhibit 18 (Continued)

Panel B: Area Graph 2

1 Based on Panel A, address the following:

   A Based on mean–variance analysis, what is the asset allocation that would most likely be selected by a risk-neutral investor?

   B Based only on the information that can be inferred from Panel A, discuss the investment characteristics of non-US developed market equity (NUSD) in efficient portfolios.

   C Critique the efficient asset mixes represented in Panel A.

2 Compare the asset allocations shown in Panel A with the corresponding asset allocations shown in Panel B. (Include a comparison of the panels at the level of risk indicated by the line in Panel B.)

3 A Identify three techniques that the asset allocations in Panel B might have incorporated to improve the characteristics relative to those of Panel A.

B Discuss how the techniques described in your answer to 3A address the high input sensitivity of MVO.

Solution to 1A:

For a risk-neutral investor, the optimal asset allocation is 100% invested in emerging market equities. For a risk-neutral investor ($\lambda = 0$), expected utility is simply equal to expected return. The efficient asset allocation that maximizes expected return is the one with the highest level of volatility, as indicated on the x-axis. Panel A shows that that asset allocation consists entirely of emerging market equities.

Solution to 1B:

The weights of NUSD as the efficient frontier moves from its minimum to its maximum risk point suggest NUSD's investment characteristics. This asset class is neither the lowest-volatility asset (which can be inferred to be cash) nor the highest-volatility asset (which is emerging market equity). At the point of the peak of NUSD, when the weight in NUSD is about to begin its decline in higher-risk efficient portfolios, US bonds drop out of the efficient frontier. Further, NUSD leaves the efficient frontier portfolio at a point at which US small cap reaches its highest weight. These observations suggest that NUSD provided diversification benefits in portfolios including US bonds—a relatively low correlation with US bonds can be inferred—that are lost at this point on the efficient frontier. Beyond a volatility level of 20.3%, representing a corner portfolio, NUSD drops out of the efficient frontier.

Solution to 1C:

Of the nine asset classes in the investor's defined opportunity set, five at most are represented by portfolios on the efficient frontier. Thus, a criticism of the efficient frontier associated with Panel A is that the efficient portfolios are highly concentrated in a subset of the available asset classes, which likely reflects the input sensitivity of MVO.

Solution to 2:

The efficient asset mixes in Panels A and B cover a similar risk range: The risk levels of the two minimum-variance portfolios are similar, and the risk levels of the two maximum-return portfolios are similar. Over most of the range of volatility, however, the efficient frontier associated with Panel B is better diversified. For example, at the line in Panel B, representing a moderate level of volatility likely relevant to many investors, the efficient portfolio contains nine asset classes rather than four, as in Panel A. At that point, for example, the allocation to fixed income is spread over US bonds, non-US bonds, and US TIPS in Panel B, as opposed to just US bonds in Panel A.

Solution to 3A:

To achieve the better-diversified efficient frontier shown in Panel B, several methods might have been used, including reverse optimization, the Black–Litterman model, and constrained asset class weights.

Solution to 3B:

Reverse optimization and the Black–Litterman model address the issue of MVO's sensitivity to small differences in expected return estimates by anchoring expected returns to those implied by the asset class weights of a proxy for the

global market portfolio. The Black–Litterman framework provides a disciplined way to tilt the expected return inputs in the direction of the investor's own views. These approaches address the problem by improving the balance between risk and return that is implicit in the inputs.

A very direct approach to the problem can be taken by placing constraints on weights in the optimization to force an asset class to appear in a constrained efficient frontier within some desired range of values. For example, non-US bonds did not appear in any efficient portfolio in Panel A. The investor could specify that the weight on non-US bonds be strictly positive. Another approach would be to place a maximum on the weight in US bonds to make the optimizer spread the fixed-income allocation over other fixed-income assets besides US bonds.

2.5 Allocating to Less Liquid Asset Classes

Large institutional investors have the ability to invest in less liquid asset classes, such as direct real estate, infrastructure, and private equity. These less liquid asset classes represent unique challenges to many of the common asset allocation techniques, such as mean–variance optimization.

For traditional, highly liquid asset classes, such as publicly listed equities and bonds, almost all of the major index providers have indexes that do an outstanding job of representing the performance characteristics of the asset class (and its various sub–asset classes). For example, over any reasonably long time period, the risk and return characteristics of a given asset class are nearly identical across the major global equity indexes and the correlations between the returns of the indexes are close to 1. Additionally, in most cases, there are passive, low-cost investment vehicles that allow investors to capture the performance of the asset class with very little tracking error.

Cash, the Risk-Free Asset, and Liquidity Needs

The so called "risk-free asset" has a special and somewhat tricky spot in the world of finance. Asset allocators typically use indexes for either 30-day or 90-day government bills to represent the characteristics associated with holding cash, which they may or may not treat as the risk-free asset. The volatility associated with these total return indexes is extremely low, but it isn't zero. An alternative to using a cash index as a proxy for the risk-free asset is to use a government bond with a duration/maturity that matches the time horizon of the investor. Some asset allocators like to include cash or another asset that could be considered a risk-free asset in the optimization and to allow the optimizer to determine how to mix it with the other asset classes included in the optimization. Other asset allocators prefer to exclude the risk-free asset from the optimization and allow real-world needs, such as liquidity needs, to determine how much to allocate to cash-like assets.

Illiquid assets may offer an expected return premium as compensation for illiquidity as well as diversification benefits. Determining an appropriate allocation to these assets is associated with various challenges, however. Common illiquid asset classes cannot be readily diversified to eliminate idiosyncratic risk, so representing an overall asset class performance is problematic. Furthermore, for less liquid asset classes, such as direct real estate, infrastructure, and private equity, there are, in general, far fewer indexes that attempt to represent aggregate performance. If one were to compare the performance characteristics of multiple indexes representing one of these less liquid asset classes, there would be noticeable risk and return differences, suggesting that

it is difficult to accurately measure the risk and return characteristics of these asset classes. Also, due to the illiquid nature of the constituents that make up these asset classes, it is widely believed that the indexes don't accurately reflect their true volatility. In contrast to the more traditional, highly liquid asset classes, there are no low-cost passive investment vehicles that would allow investors to closely track the aggregate performance of these less liquid asset classes.

Thus, the problem is twofold: (1) Due to the lack of accurate indexes, it is more challenging to make capital market assumptions for these less liquid asset classes, and (2) even if there were accurate indexes, there are no low-cost passive investment vehicles to track them.

Compounding the asset allocator's dilemma is the fact that the risk and return characteristics associated with actual investment vehicles, such as direct real estate funds, infrastructure funds, and private equity funds, are typically significantly different from the characteristics of the asset classes themselves. For example, the private equity "asset class" should represent the risk and return characteristics of owning all private equity, just as the MSCI All Country World Index represents the risk and return characteristics of owning all public equity. Purchasing the exchange-traded fund (ETF) that tracks the MSCI All Country World Index completely diversifies public company-specific risk. This scenario is in direct contrast to the typical private equity fund, in which the risk and return characteristics are often dominated by company-specific (idiosyncratic) risk.

In addressing asset allocation involving less liquid asset classes, practical options include the following:

1. Exclude less liquid asset classes (direct real estate, infrastructure, and private equity) from the asset allocation decision and then consider real estate funds, infrastructure funds, and private equity funds as potential implementation vehicles when fulfilling the target strategic asset allocation.
2. Include less liquid asset classes in the asset allocation decision and attempt to model the inputs to represent the *specific risk* characteristics associated with the likely *implementation vehicles*.
3. Include less liquid asset classes in the asset allocation decision and attempt to model the inputs to represent the *highly diversified* characteristics associated with the *true asset classes*.

Related to this last option, some practitioners use listed real estate indexes, listed infrastructure, and public equity indexes that are deemed to have characteristics similar to their private equity counterparts to help estimate the risk of the less liquid asset classes and their correlation with the other asset classes in the opportunity set. It should be noted that the use of listed alternative indexes often violates the recommendation that asset classes be mutually exclusive—the securities in these indexes are likely also included in indexes representing other asset classes—and thus typically results in higher correlations among different asset classes, which has the negative impact of increasing input sensitivity in most optimization settings.

For investors who do not have access to direct real estate funds, infrastructure funds, and private equity funds—for example, small investors—the most common approach is to use one of the indexes based on listed equities to represent the asset class and then to implement the target allocation with a fund that invests similarly. Thus global REITs might be used to represent (approximately) global real estate.

2.6 Risk Budgeting

> [A] risk budget is simply a particular allocation of portfolio risk. An optimal risk budget is simply the allocation of risk such that the first order of conditions for portfolio optimization are satisfied. The risk budgeting process is the process of finding an optimal risk budget.
>
> Kurt Winkelmann (2003, p. 173)

As this quote from Kurt Winkelmann suggests, there are three aspects to risk budgeting:

- The risk budget identifies the total amount of risk and allocates the risk to a portfolio's constituent parts.
- An optimal risk budget allocates risk efficiently.
- The process of finding the optimal risk budget is risk budgeting.

Although its name suggests that risk budgeting is all about risk, risk budgeting is really using risk in relation to seeking return. The goal of risk budgeting is to maximize return per unit of risk—whether overall market risk in an asset allocation setting or active risk in an asset allocation implementation setting.

The ability to determine a position's marginal contribution to portfolio risk is a powerful tool that helps one to better understand the sources of risk. The marginal contribution to a type of risk is the partial derivative of the risk in question (total risk, active risk, or residual risk) with respect to the applicable type of portfolio holding (asset allocation holdings, active holdings, or residual holdings). Knowing a position's marginal contribution to risk allows one to (1) approximate the change in portfolio risk (total risk, active risk, or residual risk) due to a change in an individual holding, (2) determine which positions are optimal, and (3) create a risk budget. *Risk-budgeting tools assist in the optimal use of risk in the pursuit of return.*

Exhibit 19 contains risk-budgeting information for the Sharpe ratio–maximizing asset allocation from our original UK example. The betas are from Exhibit 12. The marginal contribution to total risk (MCTR) identifies the rate at which risk would change with a small (or marginal) change in the current weights. For asset class i, it is calculated as MCTR_i = (Beta of asset class i with respect to portfolio)(Portfolio return volatility). The absolute contribution to total risk (ACTR) for an asset class measures how much it contributes to portfolio return volatility and can be calculated as the weight of the asset class in the portfolio times its marginal contribution to total risk: $\text{ACTR}_i = (\text{Weight}_i)(\text{MCTR}_i)$. Critically, beta takes account not only of the asset's own volatility but also of the asset's correlations with other portfolio assets.

The sum of the ACTR in Exhibit 19 is approximately 10.88%, which is equal to the expected standard deviation of this asset allocation mix. Dividing each ACTR by the total risk of 10.88% gives the percentage of total risk that each position contributes. Finally, an asset allocation is optimal from a risk-budgeting perspective when the ratio of excess return (over the risk-free rate) to MCTR is the same for all assets and matches the Sharpe ratio of the tangency portfolio. So in this case, which is based on reverse-optimized returns, we have an optimal risk budget.

Exhibit 19 Risk-Budgeting Statistics

Asset Class	Weight	MCTR	ACTR	Percent Contribution to Total Standard Deviation	Ratio of Excess Return to MCTR
UK large cap	3.2%	11.19%	0.36%	3.33%	0.368
UK mid cap	0.9	12.02	0.11	0.98	0.368

(continued)

Exhibit 19 (Continued)

Asset Class	Weight	MCTR	ACTR	Percent Contribution to Total Standard Deviation	Ratio of Excess Return to MCTR
UK small cap	0.3	12.44	0.03	0.30	0.368
US equities	34.4	14.51	5.00	45.94	0.368
Europe ex UK equities	8.7	16.68	1.45	13.34	0.368
Asia Pacific ex Japan equities	3.1	16.35	0.51	4.69	0.368
Japan equities	6.6	10.69	0.70	6.46	0.368
Emerging market equities	5.9	17.51	1.02	9.42	0.368
Global REITs	1.8	17.79	0.31	2.86	0.368
Global ex UK bonds	31.8	4.21	1.34	12.33	0.368
UK bonds	3.2	1.22	0.04	0.35	0.368
Cash	0.2	0.00	0.00	0.00	0.368
	100.0		10.88	100.00	

For additional clarity, the following are the specific calculations used to derive the calculated values for UK large-cap equities (where we show some quantities with an extra decimal place in order to reproduce the values shown in the exhibit):

- Marginal contribution to risk (MCTR):

  Asset beta relative to portfolio × Portfolio standard deviation

  1.0289 × 10.876 = 11.19%

- ACTR:

  Asset weight in portfolio × MCTR

  3.2% × 11.19% = 0.36%

- Ratio of excess return to MCTR:

  (Expected return – Risk-free rate)/MCTR

  (6.62% – 2.5%)/11.19% = 0.368

EXAMPLE 5

Risk Budgeting in Asset Allocation

1. Describe the objective of risk budgeting in asset allocation.
2. Consider two asset classes, A and B. Asset class A has two times the weight of B in the portfolio. Under what condition would B have a larger ACTR than A?
3. When is an asset allocation optimal from a risk-budgeting perspective?

Solution to 1:

The objective of risk budgeting in asset allocation is to use risk efficiently in the pursuit of return. A risk budget specifies the total amount of risk and how much of that risk should be budgeted for each allocation.

Solution to 2:

Because ACTR_i = (Weight_i)(Beta with respect to portfolio)$_i$(Portfolio return volatility), the beta of B would have to be more than twice as large as the beta of A for B to contribute more to portfolio risk than A.

Solution to 3:

An asset allocation is optimal when the ratio of excess return (over the risk-free rate) to MCTR is the same for all assets.

2.7 Factor-Based Asset Allocation

Until now, we have primarily focused on the mechanics of asset allocation optimization as applied to an opportunity set consisting of traditional, non-overlapping asset classes. An alternative approach used by some practitioners is to move away from an opportunity set of *asset classes* to an opportunity set consisting of investment *factors*.

In factor-based asset allocation, the factors in question are typically similar to the fundamental (or structural) factors in widely used multi-factor investment models. Factors are typically based on observed market premiums and anomalies. In addition to the all-important market (equity) exposure, typical factors used in asset allocation include size, valuation, momentum, liquidity, duration (term), credit, and volatility. Most of these factors were identified as return drivers that help to explain returns that were not explained by the CAPM. These factors can be constructed in a number of different ways, but with the exception of the market factor, typically, the factor represents what is referred to as a zero (dollar) investment, or self-financing investment, in which the underperforming attribute is sold short to finance an offsetting long position in the better-performing attribute. For example, the size factor is the combined return from shorting large-cap stocks and going long small-cap stocks (Size factor return = Small-cap stock return – Large-cap stock return). Of course, if large-cap stocks outperform small-cap stocks, the realized size return would be negative. Constructing factors in this manner removes most market exposure from the factors (because of the short positions that offset long positions); as a result, the factors generally have low correlations with the market and with one another.

We next present an example of a factor-based asset allocation optimization. Exhibit 20 shows the list of factors, how they were specified, and their historical returns and standard deviations (in excess of the risk-free rate as proxied by the return on three-month Treasury bills). The exhibit also includes historical statistics for three-month Treasury bills.

Thus far, our optimization examples have taken place in "total return space," where the expected return of each asset has equaled the expected return of the risk-free asset plus the amount of expected return in excess of the risk-free rate. In order to stay in this familiar total return space when optimizing with risk factors, the factor return needs to include the return on the assumed collateral (in this example, cash, represented by three-month Treasury bills). This adjustment is also needed if one plans to include both risk factors and some traditional asset classes in the same optimization, so that the inputs for the risk factors and traditional asset classes are similarly specified. Alternatively, one could move in the opposite direction, subtracting the return of the three-month Treasury bills from asset class returns and then conducting the

optimization in excess-return space. One way to think about a self-financing allocation to a risk factor is that in order to invest in the risk factor, one must put up an equivalent amount of collateral that is invested in cash.

Exhibit 20 Factors/Asset Classes, Factor Definitions, and Historical Statistics (US data, January 1979 to March 2016)

Factor/Asset Class	Factor Definition	Compound Annual Factor Return	Standard Deviation	Total Return	Standard Deviation
Cash	3-Month Treasury bills			7.77%	5.66%
Market	Total market return – Cash	7.49%	16.56%	12.97	17.33
Size	Small cap – Large cap	0.41	10.15	5.56	10.65
Valuation	Value – Growth	0.68	9.20	5.84	9.76
Credit	Corporate – Treasury	0.70	3.51	5.87	3.84
Duration	Long Treasury bonds – Treasury bills	4.56	11.29	9.91	11.93
Mortgage	Mortgage-backed – Treasury bonds	0.30	3.38	5.45	3.83
Large growth	—	—	—	12.64	19.27
Large value	—	—	—	13.23	16.52
Small growth	—	—	—	12.30	25.59
Small value	—	—	—	14.54	19.84
Mortgage-backed sec.	—	—	—	8.09	6.98
Corporate bonds	—	—	—	8.52	7.52
Treasury bonds	—	—	—	7.77	5.66
Cash	—	—	—	5.13	1.23

Because of space considerations, we have not included the full correlation matrix, but it is worth noting that the average pair-wise correlation of the risk factor–based opportunity set (in excess of the risk-free rate collateral return) is 0.31, whereas that of the asset class–based opportunity set is 0.57. Given the low pair-wise correlations of the risk factors, there has been some debate among practitioners around whether it is better to optimize using asset classes or risk factors. The issue was clarified by Idzorek and Kowara (2013), who demonstrated that in a proper comparison, neither approach is inherently superior. To help illustrate risk factor optimization and to demonstrate that if the two opportunity sets are constructed with access to similar exposures, neither approach has an inherent advantage, we present two side-by-side optimizations. These optimizations are based on the data given in Exhibit 20.

Exhibit 21 contains the two efficient frontiers. As should be expected, given that the opportunity sets provide access to similar exposures, the two historical efficient frontiers are very similar. This result illustrates that when the same range of potential exposures is available in two opportunity sets, the risk and return possibilities are very similar.

Exhibit 21 Efficient Frontiers Based on Historical Capital Market Assumptions (January 1979 to March 2016)

Moving to Exhibit 22, examining the two asset allocation area graphs associated with the two efficient frontiers reveals that the efficient mixes have some relatively clear similarities. For example, in Panel A (risk factors), the market, size, and valuation exposures mirror the pattern (allocations) of Panel B (asset classes) large value and small value exposures, respectively.

Exhibit 22 Asset Allocation Area Graphs—Risk Factors and Asset Classes

Panel A: Risk Factor Asset Allocation Area Graph

Panel B: Asset Class Asset Allocation Area Graph

Practitioners should choose to carry out asset allocation in the particular space—risk factors or asset classes—in which they are most equipped to make capital market assumptions. Regardless of which space a practitioner prefers, expanding one's opportunity set to include new, weakly correlated risk factors or asset classes should improve the potential risk–return trade-offs.

DEVELOPING LIABILITY-RELATIVE ASSET ALLOCATIONS

3

Liability-relative asset allocation is aimed at the general issue of rendering decisions about asset allocation in conjunction with the investor's liabilities. Liability-relative investors view assets as an inventory of capital, sometimes increased by additions, which is available to achieve goals and to pay future liabilities. What is the chance that an institution's capital is sufficient to cover future cash flow liabilities? This type of question is critical for liability-relative asset allocation because many large institutional investors—for example, banks, insurance companies, and pension plans—possess legal liabilities and operate in regulated environments in which an institution's inability to meet its liabilities with current capital has serious consequences. This concern gives rise to unique risk measures, such as the probability of meeting future cash flow requirements, and the restatement of traditional risk metrics, such as volatility, in relation to liabilities.

Liability-relative methods were developed in an institutional investor context, but these ideas have also been applied to individual investors. This section will focus on institutional investors. A later section addresses a thematically similar approach with behavioral finance roots—goals-based asset allocation.

3.1 Characterizing the Liabilities

To be soundly applied, liability-relative asset allocation requires an accurate understanding of the liabilities. A liability is a promise by one party to pay a counterparty based on a prior agreement. Liabilities may be fixed or contingent. When the amounts and timing of payments are fixed in advance by the terms of a contract, the liability is said to be fixed or non-contingent. A corporate bond with a fixed coupon rate is an example.

In many cases relevant to asset allocation, payments depend upon future, uncertain events. In such cases, the liability is a contingent liability.[17] An important example involves the liabilities of a defined benefit (DB) pension plan. The plan sponsor has a legal commitment to pay the beneficiaries of the plan during their retirement years. However, the exact dates of the payments depend on the employees' retirement dates, longevity, and cash payout rules. Insurance companies' liabilities—created by the sale of insurance policies—are also contingent liabilities: The insurance company promises to pay its policyholders a specified amount contingent on the occurrence of a predefined event.

We distinguish legal liabilities from cash payments that are expected to be made in the future and are essential to the mission of an institution but are not legal liabilities. We call these quasi-liabilities. The endowment of a university can fit this category because, in many cases, the endowment contributes a major part of the university's operating budget. The endowment assures its stakeholders that it will continue to support its essential activities through spending from the endowment capital, and failure to provide such support will often lead to changes in how the endowment is managed. Accordingly, the asset allocation decisions are made in conjunction with the university's spending rules and policies. Asset allocation is just one portion of the investment problem. Although we do not explicitly discuss them here, as suggested in Section 2, the spending needs of an individual represent another type of quasi-liability. Exhibit 23 summarizes the characteristics of liabilities that can affect asset allocation.

17 Note that the term "contingent liability" has a specific definition in accounting. We are using the term more broadly here.

Exhibit 23 Characteristics of Liabilities That Can Affect Asset Allocation

1. Fixed versus contingent cash flows
2. Legal versus quasi-liabilities
3. Duration and convexity of liability cash flows
4. Value of liabilities as compared with the size of the sponsoring organization
5. Factors driving future liability cash flows (inflation, economic conditions, interest rates, risk premium)
6. Timing considerations, such as longevity risk
7. Regulations affecting liability cash flow calculations

The above liability characteristics are relevant to liability-relative asset allocation in various ways. For example, they affect the choice of appropriate discount rate(s) to establish the present value of the liabilities and thus the degree to which assets are adequate in relation to those liabilities. Liability characteristics determine the composition of the liability-matching portfolio and that portfolio's basis risk with respect to the liabilities. (Basis risk in this context quantifies the degree of mismatch between the hedging portfolio and the liabilities.)

We will discuss the following case study in detail. It involves a frozen pension plan for LOWTECH, a hypothetical US company. The company has decided to close its defined benefit pension plan and switch to a defined contribution plan. The DB plan has the fixed liabilities (accumulated benefit obligations) shown in Exhibit 24.

Exhibit 24 Projected Liability Cash Flows for Company LOWTECH (US$ billions)

		PV(Liabilities)	
Beginning of Year	**Cash Outflow (Liability)**	**4% Discount Rate**	**2% Discount Rate**
2015	—	$2.261	$3.039
2016	$0.100	2.352	3.10
2017	0.102	2.342	3.06
2018	0.104	2.329	3.02
2019	0.106	2.314	2.97
2020	0.108	2.297	2.92
2021	0.110	2.276	2.87
2022	0.113	2.252	2.82
2023	0.115	2.225	2.76
2024	0.117	2.195	2.69
2025	0.120	2.161	2.63
2026	0.122	2.123	2.56
2027	0.124	2.081	2.49
2028	0.127	2.035	2.41
2029	0.129	1.984	2.33
2030	0.132	1.929	2.24
2031	0.135	1.869	2.15

Exhibit 24 (Continued)

Beginning of Year	Cash Outflow (Liability)	PV(Liabilities) 4% Discount Rate	PV(Liabilities) 2% Discount Rate
2032	0.137	1.804	2.06
2033	0.140	1.733	1.96
2034	0.143	1.657	1.86
2035	0.146	1.575	1.75
2036	0.149	1.486	1.63
2037	0.152	1.391	1.52
2038	0.155	1.289	1.39
2039	0.158	1.180	1.26
2040	0.161	1.063	1.13
2041	0.164	0.938	0.98
2042	0.167	0.805	0.84
2043	0.171	0.663	0.68
2044	0.174	0.512	0.52
2045	0.178	0.352	0.36
2046	0.181	0.181	0.181

In the Cash Outflow (Liability) column, the assumption is made that payments for a given year are made at the beginning of the year (in the exhibit, outflows have a positive sign). As of the beginning of 2015, the present value of these liabilities, given a 4% discount rate for high-quality corporate bonds (required in the United States by the Pension Protection Act of 2006, which applies to private DB pension plans), is US$2.261 billion. The current market value of the assets is assumed to equal US$2.5 billion, for a surplus of US$0.239 billion. On the other hand, if the discount rate is equal to the long-term government bond rate at 2% (required before the 2006 US legislation), the surplus becomes a deficit at –$0.539 billion. In many cases, regulations set the appropriate discount rates; these rates have an impact on the determination of surplus or deficit and thus on future contribution rules.

Like other institutions with legal liabilities, the LOWTECH company must analyze its legal future cash flows under its DB pension system and evaluate them in conjunction with the current market value of its assets on an annual basis. The following steps of the valuation exercise for a DB pension plan occur on a fixed annual date:

1. Calculate the market value of assets.
2. Project liability cash flows (via actuarial principles and rules).
3. Determine an appropriate discount rate for liability cash flows.
4. Compute the present value of liabilities, the surplus value, and the funding ratio.

$$\text{Surplus} = \text{Market value (assets)} - \text{Present value (liabilities)}.$$

The surplus for the LOWTECH company is US$2.500 billion – US$2.261 billion = US$0.239 billion, given the 4% discount rate assumption.

The funding ratio is another significant measure: Funding ratio = Market value (assets)/Present value (liabilities). We say that an investor is fully funded if the investor's funding ratio equals 1 (or the surplus is 0). A state of overfunding occurs when

the funding ratio is greater than 1, and a state of underfunding takes place when the funding ratio is less than 1. Based on a discount rate of 4%, the funding ratio for LOWTECH = US$2.5 billion/US$2.261 billion = 1.1057, so that the company is about 10.6% overfunded.

The surplus value and the funding ratio are highly dependent upon the discount rate assumption. For example, if the discount rate is equal to 2.0% (close to the 10-year US Treasury bond rate in early 2016), the surplus drops to –US$0.539 billion and the funding ratio equals 0.8226. The company's status changes from overfunded to underfunded. The choice of discount rate is generally set by regulations and tradition. Rate assumptions are different across industries, countries, and domains. From the standpoint of economic theory, if the liability cash flows can be hedged perfectly by a set of market-priced assets, the discount rate can be determined by reference to the discount rate for the assets. For example, if the pension plan liabilities are fixed (without any uncertainty), the discount rate should be the risk-free rate with reference to the duration of the liability cash flows—for example, a five-year zero-coupon bond yield for a liability with a (modified) duration of 5. In other cases, it can be difficult to find a fully hedged portfolio because an ongoing DB pension plan's liabilities will depend upon future economic growth and inflation, which are clearly uncertain. Even a frozen pension plan can possess uncertainty due to the changing longevity of the retirees over the long-term future.

3.2 Approaches to Liability-Relative Asset Allocation

Various approaches to liability-relative asset allocation exist. These methods are influenced by tradition, regulations, and the ability of the stakeholders to understand and extend portfolio models that come from the asset-only domain.

There are several guiding principles. The first is to gain an understanding of the make-up of the investor's liabilities and especially the factors that affect the amount and timing of the cash outflows. Given this understanding, the present value of the liabilities is calculated, along with the surplus and funding ratio. These measures are used to track the results of ongoing investment and funding policies and for other tasks. Next come the decisions regarding the asset allocation taking account of the liabilities. There are a number of ways to proceed. We will discuss three major approaches:

- *Surplus optimization.* This approach involves applying mean–variance optimization (MVO) to an efficient frontier based on the volatility of the surplus ("surplus volatility," or "surplus risk") as the measure of risk. Surplus optimization is thus an extension of MVO based on asset volatility.[18] Depending on context, surplus risk may be stated in money or percentage terms ("surplus return volatility" is then another, more precise term for this measure).
- *Hedging/return-seeking portfolios approach.* This approach involves separating assets into two groups: a hedging portfolio and a return-seeking portfolio. The reading also refers to this as the two-portfolio approach. The concept of allocating assets to two distinct portfolios can be applied for various funding ratios, but the reading distinguishes as the basic approach the case in which there is a positive surplus available to allocate to the return-seeking portfolio.
- *Integrated asset–liability approach.* For some institutional investors, such as banks and insurance companies and long–short hedge funds, asset and liability decisions can be integrated and jointly optimized.

We cover these three approaches in turn.

18 Among the papers that discuss the surplus optimization model are Leibowitz and Henriksson (1988); Mulvey (1989, 1994); Sharpe and Tint (1990); Elton and Gruber (1992).

3.2.1 *Surplus Optimization*

Surplus optimization involves adapting asset-only mean–variance optimization by substituting surplus return for asset return over any given time horizon. The quadratic optimization program involves choosing the asset allocation (mix) that maximizes expected surplus return net of a penalty for surplus return volatility at the chosen time horizon. The objective function is

$$U_m^{LR} = E\left(R_{s,m}\right) - 0.005\lambda\sigma^2\left(R_{s,m}\right) \quad (2)$$

where U_m^{LR} is the surplus objective function's expected value for a particular asset mix m; $E(R_{s,m})$ is the expected surplus return for asset mix m, with surplus return defined as (Change in asset value – Change in liability value)/(Initial asset value); and the parameter λ (lambda) indicates the investor's risk aversion. The more risk averse the investor, the greater the penalty for surplus return volatility. Note that the change in liability value (liability return) measures the time value of money for the liabilities plus any expected changes in the discount rate and future cash flows over the planning horizon.

This surplus efficient frontier approach is a straightforward extension of the asset-only portfolio model. Surplus optimization assumes that the relationship between the value of liabilities and the value of assets can be approximated through a correlation coefficient. Surplus optimization exploits natural hedges that may exist between assets and liabilities as a result of their systematic risk characteristics.

The following steps describe the surplus optimization approach:

1. Select asset categories and determine the planning horizon. One year is often chosen for the planning exercise, although funding status analysis is based on an analysis of all cash flows.
2. Estimate expected returns and volatilities for the asset categories and estimate liability returns (expanded matrix).
3. Determine any constraints on the investment mix.
4. Estimate the expanded correlation matrix (asset categories and liabilities) and the volatilities.[19]
5. Compute the surplus efficient frontier and compare it with the asset-only efficient frontier.
6. Select a recommended portfolio mix.

Exhibit 25 lists LOWTECH's asset categories and current allocation for a one-year planning horizon. The current allocation for other asset categories, such as cash, is zero. LOWTECH has been following an asset-only approach but has decided to adopt a liability-relative approach. The company is exploring several liability-relative approaches. With respect to surplus optimization, the trustees want to maintain surplus return volatility at a level that tightly controls the risk that the plan will become underfunded, and they would like to keep volatility of surplus below US$0.25 billion (10%).

19 A covariance matrix is computed by combining the correlation matrix and the volatilities.

Exhibit 25 Asset Categories and Current Allocation for LOWTECH

	Private Equity	Real Estate	Hedge Funds	Real Assets	US Equities	Non-US Equities (Developed Markets)	Non-US Equities (Emerging Markets)	US Corporate Bonds
Allocation	20.0%	12.0%	18.0%	7.0%	15.0%	12.0%	8.0%	8.0%

The second step is to estimate future expected asset and liability returns, the expected present value of liabilities, and the volatility of both assets and PV(liabilities). The capital market projections can be made in several ways—based on historical data, economic analysis, or expert judgment, for example. The plan sponsor and its advisers are responsible for employing one or a blend of these approaches. Exhibit 26 shows the plan sponsor's capital market assumptions over a three- to five-year horizon. Note the inclusion of the present value of liabilities in Exhibit 26.

Exhibit 26 LOWTECH's Capital Market Assumptions: Expected Annual Compound Returns and Volatilities

	Private Equity	Real Estate	Hedge Funds	Real Assets	US Equities	Non-US Equities (Developed Markets)	Emerging Markets	US Corporate Bonds	Cash	PV (Liabilities)
Expected returns	8.50%	7.50%	7.00%	6.00%	7.50%	7.20%	7.80%	4.90%	1.00%	4.90%
Volatilities	14.20%	9.80%	7.70%	6.10%	18.00%	19.50%	26.30%	5.60%	1.00%	5.60%

Typically, in the third step, the investor imposes constraints on the composition of the asset mix, including policy and legal limits on the amount of capital invested in individual assets or asset categories (e.g., a constraint that an allocation to equities must not exceed 50%). In our example, we simply constrain portfolio weights to be non-negative and to sum to 1.

The fourth step is to estimate the correlation matrix and volatilities. We assume that the liabilities have the same expected returns and volatilities as US corporate bonds; thus, the expanded matrix has a column and a row for liabilities with values equal to the corporate bond values. For simplicity, the investor may employ historical performance. Exhibit 27 shows the correlation matrix of asset categories based on historical quarterly returns. Recall that we assume that liability returns (changes in liabilities) are driven by changes in the returns of US corporate bonds. An alternative approach is to deploy a set of underlying factors that drive the returns of the assets. Factors include changes in nominal and real interest rates, changes in economic activity (such as employment levels), and risk premiums. This type of factor investment model can be applied in an asset-only or a liability-relative asset allocation context.

Exhibit 27 Correlation Matrix of Returns

	Private Equity	Real Estate	Hedge Funds	Real Assets	US Equities	Non-US Equities (Developed Markets)	Non-US Equities (Emerging Markets)	US Corporate Bonds	Cash	PV (Liabilities)
Private equity	1	0.41	0.57	0.32	0.67	0.59	0.49	–0.27	0	–0.27
Real estate	0.41	1	0.45	0.41	0.31	0.33	0.17	–0.08	0	–0.08
Hedge funds	0.57	0.45	1	0.11	0.68	0.61	0.54	–0.23	0	–0.23
Real assets	0.32	0.41	0.11	1	0.04	0.06	–0.06	0.34	0	0.34
US equities	0.67	0.31	0.68	0.04	1	0.88	0.73	–0.38	0	–0.38
Non-US equities (developed)	0.59	0.33	0.61	0.06	0.88	1	0.81	–0.39	0	–0.39
Non-US equities (emerging)	0.49	0.17	0.54	–0.06	0.73	0.81	1	–0.44	0	–0.44
US corporate bonds	–0.27	–0.08	–0.23	0.34	–0.38	–0.39	–0.44	1	0	1
Cash	0	0	0	0	0	0	0	0	1	0
PV(liabilities)	–0.27	–0.08	–0.23	0.34	–0.38	–0.39	–0.44	1	0	1

Exhibit 28 shows a surplus efficient frontier that results from the optimization program based on the inputs from Exhibits 26 and 27. Surplus risk (i.e., volatility of surplus) in money terms (US$ billions) is on the *x*-axis, and expected surplus in money terms (US$ billions) is on the *y*-axis. By presenting the efficient frontier in money terms, we can associate the level of risk with the level of plan surplus, US$0.239 billion. Like the asset-only efficient frontier, the surplus efficient frontier has a concave shape.

Exhibit 28 Surplus Efficient Frontier

The first observation is that the current mix in Exhibit 28 lies below the surplus efficient frontier and is thus suboptimal.[20] We can attain the same expected total surplus as that of the current mix at a lower level of surplus volatility by choosing the portfolio on the efficient frontier at the current mix's level of expected total surplus. Another observation is that by uncovering the implications of asset mixes for surplus and surplus volatility, this approach allows the deliberate choice of an asset allocation in terms of the tolerable level of risk in relation to liabilities. It may be the case, for example, that neither the surplus volatility of the current mix nor that of the efficient mix with equal expected surplus is the appropriate level of surplus risk for the pension.

The surplus efficient frontier in Exhibit 28 shows efficient reward–risk combinations but does not indicate the asset class composition of the combinations. Exhibit 29 shows the asset class weights for surplus efficient portfolios.

Exhibit 29 Surplus Efficient Frontier Asset Allocation Area Graph

Exhibit 30, showing weights for portfolios on the usual *asset-only* efficient frontier based on the same capital market assumptions reflected in Exhibit 29, makes the point that efficient portfolios from the two perspectives are meaningfully different.[21]

20 The current mix can also be shown to lie below the asset-only mean–variance frontier.

21 In Exhibit 30, the annualized percentage returns can be equated to monetary surplus returns by multiplying by the asset value, US$2.5 billion.

Exhibit 30 Asset-Only Efficient Frontier Asset Allocation Area Graph

The asset mixes are very different on the conservative side of the two frontiers. The most conservative mix for the surplus efficient frontier (in Exhibit 29) consists mostly of the US corporate bond index (the hedging asset) because it results in the lowest volatility of surplus over the one-year horizon. Bonds are inversely correlated with changes in the present value of the frozen liability cash flows (because the liabilities indicate negative cash flows). In contrast, the most conservative mix for the asset-only efficient frontier (in Exhibit 30) consists chiefly of cash. As long as there is a hedging asset and adequate asset value, the investor can achieve a very low volatility of surplus, and for conservative investors, the asset value at the horizon will be uncertain but the surplus will be constant (or as constant as possible).

The two asset mixes (asset-only and surplus) become similar as the degree of risk aversion decreases, and they are identical for the most aggressive portfolio (private equity). Bonds disappear from the frontier about halfway between the most conservative and the most aggressive mixes, as shown in Exhibits 29 and 30.

To summarize, the current asset mix is moderately aggressive and below the surplus efficient frontier. Thus, a mean–variance improvement is possible: either higher expected surplus with the same surplus risk or lower surplus risk for the same expected surplus. The current portfolio is also poorly hedged with regard to surplus volatility; the hedging asset (long bonds in this case) has a low commitment.

The LOWTECH plan has been frozen, and the investment committee is interested in lowering the volatility of the surplus. Accordingly, it seems appropriate to choose an asset allocation toward the left-hand side of the surplus efficient frontier. For instance, a surplus efficient portfolio with about 60% bonds and the remainder in other assets (as can be approximately identified from Exhibit 29) will drop surplus volatility by about 50%.

In the end, the investment committee for the plan sponsor and its advisers and stakeholders are responsible for rendering the best decision, taking into account all of the above considerations. And as always, the recommendations of a portfolio-modeling exercise are only as good as the input data and assumptions.

Multi-Period Portfolio Models

The traditional mean–variance model assumes that the investor follows a buy-and-hold strategy over the planning horizon. Thus, the portfolio is not rebalanced at intermediate dates. A portfolio investment model requires multiple time periods if rebalancing decisions are to be directly incorporated into the model. Mulvey, Pauling, and Madey (2003) discuss the pros and cons of building and implementing multi-period portfolio models. Applicable to both asset-only and liability-relative asset allocation, multi-period portfolio models are more comprehensive than single-period models but are more complex to implement. These models are generally implemented by means of the integrated asset–liability methods discussed in Section 3.2.1

EXAMPLE 6

Surplus Optimization

1. Explain how surplus optimization solutions differ from mean–variance optimizations based on asset class risk alone.
2. What is a liability return?
3. Compare the composition of a surplus optimal portfolio at two points on the surplus efficient frontier. In particular, take one point at the lower left of the surplus frontier (surplus return = US$0.26 billion) and the other point higher on the surplus efficient frontier (surplus return = US$0.32 billion). Refer to Exhibit 29. Explain the observed relationship in terms of the use of corporate bonds as the hedging asset for the liabilities.

Solution to 1:

The surplus optimization model considers the impact of asset decisions on the (Market value of assets – Present value of liabilities) at the planning horizon.

Solution to 2:

Liability returns measure the time value of money for the liabilities plus any expected changes in the discount rate over the planning horizon.

Solution to 3:

Whereas the portfolio at the US$0.26 billion surplus return point on the efficient frontier has a substantial position in corporate bonds, the efficient mix with US$0.32 billion surplus return does not include them. The observed relationship that the allocation to corporate bonds declines with increasing surplus return can be explained by the positive correlation of bond price with the present value of liabilities. The hedging asset (corporate bonds) is employed to a greater degree at the low end of the surplus efficient frontier.

3.2.2 *Hedging/Return-Seeking Portfolio Approach*

In this approach, the liability-relative asset allocation task is divided into two parts. We distinguish as "basic" the two-portfolio approach in the case in which there is a surplus available to allocate to a return-seeking portfolio and as "variants" the approach as applied when there is not a positive surplus. In the basic case, the first part of the asset allocation task consists of hedging the liabilities through a hedging portfolio.

In the second part, the surplus (or some part of it) is allocated to a return-seeking portfolio, which can be managed independently of the hedging portfolio (for example, using mean–variance optimization or another method). An essential issue involves the composition of the hedging portfolio. In some cases, such as the LOWTECH frozen DB pension plan, the hedging portfolio is straightforward to identify. The designated cash flows can be hedged via cash flow matching, duration matching, or immunization (as explained in the fixed-income readings). This hedge will support the future cash flows with little or no risk.

In LOWTECH's application of the basic two-portfolio approach, the small surplus causes the pension plan to invest most of its capital in the hedging portfolio. The hedging portfolio can be approximated by the long-bond indexed investment as a first cut. Thus, given a 4% discount rate, US$2.261 billion is placed in long bonds. The remaining US$0.239 billion is invested in a portfolio of higher expected return assets, such as stocks, real estate, and hedge funds. This approach guarantees that the capital is adequate to pay future liabilities, as long as the hedging portfolio does not experience defaults.

Note that if the discount rate were 2% rather than 4%, the pension plan would be underfunded even if all assets were placed in a hedging portfolio. In such a case, the pension plan sponsor would either develop a strategy to increase the funding ratio so that the liabilities would be eventually paid or apply a variant of the two-portfolio approach. An underfunded plan will require higher contributions from the sponsor than a plan that is fully funded or overfunded.

The basic two-portfolio approach is most appropriate for conservative investors, such as insurance companies, and for overfunded pension plans that wish to reduce or eliminate the risk of not being able to pay future liabilities.

Several variants of the two-portfolio approach are possible. These include a partial hedge, whereby capital allocated to the hedging portfolio is reduced in order to generate higher expected returns, and dynamic versions whereby the investor increases the allotment to the hedging portfolio as the funding ratio increases. The specification of this allotment is often referred to as the liability glide path. These variants do not hedge the liabilities to the full extent possible given the assets and thus are less conservative than the basic approach discussed above. Still, there can be benefits to a partial hedge when the sponsor is able to increase contributions if the funding ratio does not increase in the future to 1 or above.

In the following discussion, we focus on determining the hedging portfolio.

Forming the Hedging Portfolio The hedging portfolio must include assets whose returns are driven by the same factor(s) that drive the returns of the liabilities. Otherwise, even if the assets and liabilities start with equal values, the assets and liabilities will likely become inconsistent over time. One example involves promises (cash outflows) that are dependent upon future inflation. The hedging portfolio in this situation would often include index-linked (inflation-linked) Treasury bonds, again cash matched to the liabilities or immunized to the degree possible.

If there is an active market for the hedging portfolio (securities) in question, the present value of future cash flows is equal to a market value of the assets contained in the hedging portfolio. In this case, the date of valuation for the assets must be the same as the date of valuation for the liabilities. Absent market values, some form of appraised value is used.

The task of forming the hedging portfolio is complicated by the discount rate assumption and by the need to identify assets that are driven by the same factors that affect the liabilities. For example, if the discount rate is set by reference to a marketable instrument, such as the long government bond index, but the liability cash flows are driven by a factor such as inflation, the hedging task may require the use of instruments beyond nominal bonds (perhaps multiple instruments, such as interest rate

swaps, inflation-linked bonds, and real assets). And in many applications, the hedge cannot be fully accomplished due to the nature of the driving factors (e.g., if they are non-marketable factors, such as economic growth).

If the uncertainties in the cash flows are related to non-market factors, such as future salary increases, the discount rate will depend upon regulations and tradition. Clearly, high discount rates lead to high funding ratios and in most cases require lower contributions from the sponsoring organization (at least in the short run). Conversely, lower discount rates give rise to lower funding ratios and thereby higher contributions. In the former case, investors with high discount rates will need to generate higher asset returns to achieve their promises if the pension plan sponsor wishes to avoid future contributions. A more conservative route is to designate a lower discount rate, as is the case in much of Europe and Asia. In all cases, it is the regulator's responsibility to set the guidelines, rules, and penalties involved in determining contribution policy.

Several issues complicate the valuation of liability cash flows. In many situations, investors must satisfy their promises without being able to go to a market and purchase a security with positive cash flows equal in magnitude to the liability cash flows.

At times, uncertain liabilities can be made more certain through the law of large numbers. For example, life insurance companies promise to pay beneficiaries when a policyholder dies. The life insurance company can minimize the risk of unexpected losses by insuring large numbers of individuals. Then, valuation of liabilities will use present value of expected cash flows based on a low (or even zero) risk premium in the discount rate. The field of application of the law of large numbers can be limited. For example, averages do not eliminate longevity risk.

Limitations The basic two-portfolio approach cannot be directly applied under several circumstances. First, if the funding ratio is less than 1, the investor cannot create a fully hedging portfolio unless there is a sufficiently large positive cash flow (contribution). In this case, the sponsor might increase contributions enough to generate a positive surplus. As an alternative, there are conditional strategies that might help improve the investor's funding ratio, such as the glide path rules.[22]

A second barrier occurs when a true hedging portfolio is unavailable. An example involves losses due to weather-related causes, such as hurricanes or earthquakes. In these cases, the investor might be able to partially hedge the portfolio with instruments that share some of the same risks. The investor has "basis risk" when imperfect hedges are employed. (As an aside, the investor might be able to set up a contract with someone who, for a fee, will take on the liability risk that cannot be hedged. Insurance contracts have this defining characteristic.)

EXAMPLE 7

The Hedging/Return-Seeking Portfolios Approach

1. Compare how surplus optimization and the hedging/return-seeking portfolio approach take account of liabilities.
2. How does funding status affect the use of the basic hedging/return-seeking portfolio approach?

22 See Gannon and Collins (2009).

Solution to 1:

The surplus optimization approach links assets and the present value of liabilities through a correlation coefficient. The two-portfolio model does not require this input. Surplus optimization considers the asset allocation problem in one step; the hedging/return-seeking portfolio approach divides asset allocation into two steps.

Solution to 2:

Implementation of the basic two-portfolio approach depends on having an overfunded plan. A variant of the two-portfolio approach might be applied, however. Surplus optimization does not require an overfunded status. Both approaches address the present value of liabilities, but in different ways.

3.2.3 *Integrated Asset–Liability Approach*

The previous two approaches are most appropriate when asset allocation decisions are made after, and relatively independently of, decisions regarding the portfolio of liabilities. However, there are numerous applications of the liability-relative perspective in which the institution must render significant decisions regarding the composition of its liabilities *in conjunction with the asset allocation*. Banks, long–short hedge funds (for which short positions constitute liabilities), insurance companies, and re-insurance companies routinely fall into this situation. Within this category, the liability-relative approaches have several names, including asset–liability management (ALM) for banks and some other investors and dynamic financial analysis (DFA) for insurance companies. These approaches are often implemented in the context of multi-period models. Using the following two cases, we review the major issues.

Integrated Asset–Liability Approach for Property/Casualty Insurance Companies

A property/casualty insurance company must make asset investment decisions in conjunction with business decisions about the portfolio of insured properties, its liabilities. To that end, asset and liability decisions are frequently integrated in an enterprise risk management system. In fact, the liability portfolio is essential to the company's long-term viability. For example, a particular property/casualty (PC) insurance company might engage (accept) liabilities for catastrophic risks such as earthquakes and hurricanes. In this case, the liabilities depend upon rare events and thus are most difficult to hedge against. Specialized firms calculate insured losses for a chosen set of properties for property/casualty insurance companies, and these firms provide liability cash flows on a probabilistic (scenario) basis. In this way information is gathered about the probability of losses over the planning horizon and the estimated losses for each loss event. An important issue involves the amount of capital needed to support the indicated liabilities. This issue is addressed by evaluating the tail risks, such as the 1% Value-at-Risk or Conditional-Value-at-Risk amount. To reduce this risk, there are major advantages to forming a diversified global portfolio of liabilities and rendering asset allocation decisions in conjunction with the liability portfolio decisions. The hedging portfolio in this case is not well defined. Therefore, it is difficult to hedge liabilities for a book of catastrophic risk policies. Liabilities might be addressed via customized products or by purchasing re-insurance. The assets and liabilities are integrated so that the worst-case events can be analyzed with regard to both sides of the balance sheet.

Integrated Asset–Liability Approach for Banks

Large global banks are often required to analyze their ability to withstand stress scenarios, in accordance with the Basel III framework. These institutions must be able to show that their current capital is adequate to withstand losses in their business units, such as asset trading, in conjunction with increases in liabilities. The chief risk officer evaluates these scenarios by means of integrated asset–liability approaches. The asset and liability decisions are linked in an enterprise manner. Both the portfolio of assets and the portfolio of liabilities have major impacts on the organization's risk. Thus, decisions to take on new products or expand an existing product—thereby generating liabilities—must take into account the associated decisions on the asset side. The integrated asset–liability management system provides a mechanism for discovering the optimal mix of assets and liabilities (products). These applications often employ multi-period models via a set of projected scenarios.

Decisions about asset allocation will affect the amount of business available to a financial intermediary, such as a bank or insurance company. Similarly, decisions about the portfolio of liabilities and concentration risks will feed back to the asset allocation decisions. Accordingly, we can set up a linked portfolio model. In a similar fashion, the performance of the assets of an institution possessing quasi-liabilities, such as a university endowment, will affect the spending rules for the institution. We can reduce worst-case outcomes by adjusting spending during crash periods, for example. Portfolio models linked to liabilities can provide significant information, helping the institution make the best compromise decisions for both the assets and the liabilities under its control. The twin goals are to maximize the growth of surplus over time subject to constraints on worst-case and other risk measures relative to the institution's surplus.

3.2.4 *Comparing the Approaches*

We have introduced three approaches for addressing asset allocation decisions in the context of liability issues; Exhibit 31 summarizes their characteristics. Each of these approaches has been applied in practice. The surplus optimization approach is a straightforward extension of the traditional (asset-only) mean–variance model. Surplus optimization demonstrates the importance of the hedging asset for risk-averse investors and provides choices for investors who are less risk averse in the asset mixes located on the middle and the right-hand side of the efficient frontier. The assumptions are similar to those of the traditional Markowitz model, where the inputs are expected returns and a covariance matrix. Thus, the assets and liabilities are linked through correlation conditions. The second approach, separating assets into two buckets, has the advantage of simplicity. The basic approach is most appropriate for conservative investors, such as life insurance companies, and for overfunded/fully funded institutional investors that can fully hedge their liabilities. Another advantage of this approach is a focus on the hedging portfolio and its composition. The hedging portfolio can be constructed using a factor model and then linked to the assets via the same factors. Unfortunately, underfunded investors do not have the luxury of fully hedging their liabilities and investing the surplus in the risky portion; they must apply variants of the two-portfolio approach. The third approach, integrating the liability portfolio with the asset portfolio, is the most comprehensive of the three. It requires a formal method for selecting liabilities and for linking the asset performance with changes in the liability values. This approach can be implemented in a factor-based model, linking the assets and liabilities to the underlying driving factors. It has the potential to improve the institution's overall surplus. It does not require the linear

correlation assumption and is capable of modeling transaction costs, turnover constraints, and other real-world constraints. The capital required for this approach is often determined by reference to the output of integrated asset–liability systems in banks and property/casualty insurance and re-insurance companies.

Exhibit 31 Characteristics of the Three Liability-Relative Asset Allocation Approaches

Surplus Optimization	Hedging/Return-Seeking Portfolios	Integrated Asset–Liability Portfolios
Simplicity	Simplicity	Increased complexity
Linear correlation	Linear or non-linear correlation	Linear or non-linear correlation
All levels of risk	Conservative level of risk	All levels of risk
Any funded ratio	Positive funded ratio for basic approach	Any funded ratio
Single period	Single period	Multiple periods

EXAMPLE 8

Liability-Relative Asset Allocation: Major Approaches

1. Discuss how the probability of not being able to pay future liabilities when they come due is or is not addressed by each of the major approaches to liability-relative asset allocation.
2. What are the advantages of the three approaches for investors who are more interested in protecting the surplus than growing their assets? Assume that the investor has a positive surplus.

Solution to 1:

Such issues are best addressed by means of multi-period integrated asset–liability models. Surplus optimization and the two-portfolio approach, being single-period models, have difficulty estimating the probability of meeting future obligations.

Solution to 2:

The three liability-relative approaches are appropriate for conservative investors (investors who are more interested in protecting the surplus than growing their assets). All of the three approaches force investors to understand the nature of their liabilities. This type of information can help inform the decision-making process.

3.3 Examining the Robustness of Asset Allocation Alternatives

As part of a liability-relative asset allocation study, the institutional investor can evaluate performance over selected events and "simulated" historical time periods. Each of the selected events can be interpreted as a "what if" sensitivity analysis. For example, we might wish to consider the effect of a 100 bp increase in interest rates across all maturities—that is, a parallel shift in the yield curve. This event would have a significant impact on the value of government bonds, clearly. Also, there would be

a corresponding positive impact on the present discounted value of liabilities that are discounted at the government bond rate. The effect on other liability-relative asset allocation elements is less direct, and assumptions must be made. Suppose, for example, that the investor must discount at the high-quality corporate rate. In that case, we need to estimate the effect of changing government rates on corporate rates. These designated studies are part of the stress tests required by banking and other regulators.

Another type of event study is the construction of scenarios based on carefully selected historical time periods. For example, we might select late 2008 as a reference point. In such a scenario, we are interested in the changes in the economic factors and the associated changes in the values of the institution's assets and liabilities. What would be the impact on our current (or projected) portfolio—assets and PV(liabilities)—if the conditions seen in late 2008 occurred again?

A more comprehensive method for examining robustness involves setting up a multi-stage simulation analysis. Here, we use scenarios to model uncertainty and replace decisions with "rules." The process begins with a set of scenarios for the underlying driving economic factors. Each scenario designates a path for the asset returns and the liability values at each stage of the planning horizon. The result is a set of probabilistic outcomes for the institutional investor's asset portfolio and the cash flows for its liabilities. In such modeling, one must take care to be consistent between asset returns and corresponding liabilities within a scenario; for example, if interest rates are a common factor driving both asset performance and the PV (liabilities), the interest rate effects should be based on the same assumptions.

Through the scenario analysis, the probability of both good and bad outcomes can be estimated. For example, we can measure the probability that an institutional investor will make a capital contribution in the future. Exhibit 32 shows the decision structure for the simulation of an insurance company over several periods, including modeling of the company's business strategy and the required capital rules.

To evaluate robustness, we can apply the simulation system with different assumptions. For instance, if we change the expected return of US equities, what is the effect on the probability of meeting the liabilities over an extended horizon, such as 10 years? This type of sensitivity analysis is routinely done in conjunction with the modeling exercise.

Exhibit 32 Simulation Analysis

3.4 Factor Modeling in Liability-Relative Approaches

A factor-based approach for liability-relative asset allocation has gained interest and credibility for several reasons. First, in many applications, the liability cash flows are dependent on multiple uncertainties. The two primary macro factors are future economic conditions and inflation. Many pension payments to beneficiaries will be based on inflation and salary changes over the employees' work span. A fully hedged portfolio cannot be constructed when the liabilities are impacted by these uncertain factors. Recall that a hedged portfolio can be constructed for a frozen plan with fixed liabilities. For ongoing pension schemes, the best that can be done is to add asset categories to the portfolio that are positively correlated with the underlying driving risk factors, such as inflation-linked bonds. A factor-based approach can be implemented with any of the three liability-relative asset allocation methods discussed above.

EXAMPLE 9

Robustness and Risk Assessment in Liability-Relative Asset Allocation

What types of sensitivity analysis can be evaluated with a multi-period ALM simulation system?

Solution:

To provide estimates of the probability of meeting future obligations and the distribution of outcomes, several types of sensitivity analysis are likely to be performed.

- For example, the expected returns could be increased or decreased to evaluate the impact on future contributions to the plan.
- Likewise, by analyzing historical events, the investor can estimate the size of losses during crash periods and make decisions about the best asset allocation to protect against these worst-case events. Multiple risk measures over time (temporal risk measures) can be readily included in a simulation system.

DEVELOPING GOALS-BASED ASSET ALLOCATIONS

4

In this section, we review the concept of goals-based asset allocation, focusing first on the rationale behind this different approach and its investment implications. We then discuss the major elements of the process, illustrating them with specific, simplified examples when necessary. We conclude with a discussion of the applicability of the approach and its major shortcomings.

A goals-based asset allocation process disaggregates the investor's portfolio into a number of sub-portfolios, each of which is designed to fund an individual goal (or "mental account") with its own time horizon and required probability of success. The literature behind the development of this approach is very rich. Initially, goals-based wealth management was specifically proposed by a small group of practitioners,[23] each of whom offered his own solution for taking into account the tendency of individuals

23 See Brunel (2003, 2005); Nevins (2004); Pompian and Longo (2004); Chhabra (2005).

to classify money into non-fungible mental accounts. Shefrin and Statman (2000) developed the concept of the behavioral portfolio, which can be related to the Maslow (1943) hierarchy of needs. Das, Markowitz, Scheid, and Statman (2010, 2011) showed that traditional and behavioral finance could be viewed as equivalent if one were prepared to change the definition of risk from volatility of returns to the probability of not achieving a goal.[24] The essential point is that optimality requires both a suitably structured portfolio that can meet the given need *and* the correct capital allocation based on an appropriate discount rate, reflecting considerations of time horizon and the required probability of success.

Individuals have needs that are different from those of institutions. The most important difference is that individuals often have multiple goals, each with its own time horizon and its own "urgency," which can be expressed as a specific required probability of success. Exhibit 33 summarizes differences in institutional and individual investor definitions of goals. An individual's goals are not necessarily mutually compatible in two senses: The investor may not be able to address them all given the financial assets available, and there may be internal contradictions among the goals. An alternative process using one set of overall investment objectives—and thus effectively ignoring or "averaging" the different time horizons and required probabilities of success of individual goals—ostensibly loses the granular nature of client goals; as a result, the inherent complexities of the investment problem are less likely to be addressed fully. An approach that breaks the problem into sub-portfolios carries a higher chance of fully addressing an investor's goals, although it may require several iterations to ensure that the investor's portfolio is internally consistent and satisfactory.

Exhibit 33 Institutional and Individual Ways of Defining Goals

	Institutions	Individuals
Goals	Single	Multiple
Time horizon	Single	Multiple
Risk measure	Volatility (return or surplus)	Probability of missing goal
Return determination	Mathematical expectations[a]	Minimum expectations
Risk determination	Top-down/bottom-up	Bottom-up
Tax status	Single, often tax-exempt	Mostly taxable

[a] "Mathematical expectations" here means the weighted expected return of portfolio components.

The characteristics of individuals' goals have three major implications for an investment process that attempts to address the characteristics directly:

- The overall portfolio needs to be divided into sub-portfolios to permit each goal to be addressed individually.
- Both taxable and tax-exempt investments are important.
- Probability- and horizon-adjusted expectations (called "minimum expectations" in Exhibit 33) replace the typical use of mathematically expected average returns in determining the appropriate funding cost for the goal (or "discount rate" for future cash flows).

24 We apologize to these authors for grossly oversimplifying their work, but our aim is to make their insights more readily available without going into excruciating detail.

Compared with average return expectations—the median or average return anticipated for a combination of assets that is appropriate to address a goal—minimum expectations reflect a more complex concept. Minimum expectations are defined as the minimum return expected to be earned over the given time horizon with a given minimum required probability of success.

To illustrate, assume that a portfolio associated with a goal has an expected return of 7% with 10% expected volatility and the investor has indicated that the goal is to be met over the next five years with at least 90% confidence. Over the next five years, that portfolio is expected to produce returns of 35% with a volatility of 22.4%.[25] In short, this portfolio is expected to experience an average compound return of only 1.3% per year over five years with a probability of 90%; this result is quite a bit lower than the portfolio's average 7% expected return (see Exhibit 34). Thus, rather than discounting expected cash outflows by 7% to compute the dollar amount needed to defease the goal over that five-year horizon, one must use a considerably lower discount rate and by implication reserve a higher level of capital to meet that goal. Under moderate simplifying assumptions, that computation is valid whether or not return and volatility numbers are pretax or after-tax. Exhibit 34 shows, for the case of a normal distribution of returns, a return level that is expected to be exceeded 90% of the time (the 40% of the probability that lies between the vertical lines plus the 50% to the right of the median).

Exhibit 34 Probability-Weighted Return vs. Expected (= Median) Return

4.1 The Goals-Based Asset Allocation Process

Investment advisers taking a goals-based approach to investing client assets may implement this approach in a variety of ways. Exhibit 35 illustrates the major elements of the goals-based asset allocation process described in this reading. Ostensibly, there are two fundamental parts to this process. The first centers on the creation of portfolio modules, while the second involves identifying client goals and matching each of these goals to the appropriate sub-portfolio of a suitable asset size.

25 The return is the product of the annual return times the number of years, while the volatility is the product of the annual volatility times the square root of the number of years (under the assumption of independently and identically distributed returns).

Exhibit 35 A Stylized Representation of the Goals-Based Asset Allocation Process

Determining the lowest-cost funding for any given goal requires the formulation of an optimized portfolio that will be used to defease that goal optimally in the sense that risks are not taken for which the investor is not fairly compensated. Note that this process is most often generic and internal to the adviser and his or her firm. The adviser will typically not create a specific sub-portfolio for each goal of each client but rather will select, from a pre-established set, one of a few modules—or model portfolios—that best meet each goal.[26] As discussed above, adjusting the expected return on that portfolio to account for the time horizon and the required probability of success allows one to formulate the relevant discount rate which, when applied to the expected cash flows, will help determine the capital required at the outset. That capital will then be invested in the optimized portfolio asset allocation, where the balance will decline until the end of the horizon, when it runs out.[27] Note that the process is somewhat iterative because individual investors may describe a certain horizon as set when in fact they view it as "the next x years," with the horizon rolling by one year every year. Note also that discounting needs based on probability- and

26 See the next paragraph for a discussion of when it makes sense to create specific optimal sub-portfolios.

27 An important reason for the use of a declining-balance portfolio relates to the need for individuals and families to plan for the transfer of assets at death. In order for the income from assets to be used by an individual, these assets must be in the individual's name, or at least in a structure of which he or she is a beneficiary. Such assets would then be a part of the estate of the individual. Using a declining-balance portfolio allows the individual to receive the income—and some of the principal liquidated every year—while still ensuring that the amount of assets kept in the individual's name remains as low as appropriate given the individual's goals. An exception to this scenario would be the case of families whose income needs are so modest in relation to total assets that there is no need to provide income in planning for generational transfers or families that have such large eventual philanthropic intentions that assets kept in some beneficiaries' names are meant to be transferred to charity at death.

horizon-adjusted minimum expectations naturally means that these expectations will be exceeded under "normal circumstances." Thus, it is not unusual for the funding for a goal to seem excessive with the benefit of hindsight.

Although the great majority of advisers will likely create individual client portfolios using model portfolios—precisely, pre-optimized modules—a greater degree of customization is possible. Such customization involves creating specific sub-portfolios for each goal of each client. Indeed, it is conceivable, and mathematically possible, to create an optimal sub-portfolio for each goal. In fact, in practice, one would often proceed in this way when dealing with complex situations and with clients who have highly differentiated needs and constraints.[28] The adviser may find it impossible to use pre-optimized modules if the investment constraints imposed by the client are incompatible with those used in the creation of the module set. These might include, for instance, geographical or credit emphases—or de-emphases—that conflict with the market portfolio concept. Other restrictions might concern base currency, the use of alternative strategies, or the acceptability of illiquid investments, for example. Thus, although it is feasible for advisers to create client-specific modules, this approach can become prohibitively expensive. In short, one would likely use standardized modules for most individuals, except for those whose situation is so complex as to require a fully customized approach.

Many multi-client advisers may prefer to create a set of "goal modules" whose purpose is, collectively, to cover a full range of capital market opportunities and, individually, to represent a series of return–risk trade-offs that are sufficiently differentiated to offer adequate but not excessive choices to meet all the goals they expect their clients to express. These modules should therefore collectively appear to create a form of efficient frontier, though the frontier they depict in fact does not exist because the modules may well be based on substantially different sets of optimization constraints.

The two most significant differences from one module to the next, besides the implied return–risk trade-offs, are liquidity requirements and the eligibility of certain asset classes or strategies. Additionally, while intra–asset class allocation to individual sub–asset classes or strategies may typically be guided by the market portfolio for that asset class, one can conceive of instances where the selection of a specific sub–asset class or strategy is justified, even though the asset class per se may seem inappropriate. For instance, one might agree to hold high-yield bonds in an equity-dominated portfolio because of the equity risk factor exposure inherent in lower-credit fixed income. Conversely, the fixed-income market portfolio might be limited to investment-grade bonds and possibly the base-currency-hedged variant of non-domestic investment-grade bonds. We will return to the construction of these modules in Section 4.5.

4.2 Describing Client Goals

At this point, it is important to note that individual investors do not always consider all goals as being equal and similarly well-formulated in their own minds. Thus, while certain investors will have a well-thought-out set of goals—which may at times not be simultaneously achievable given the financial assets available—others will focus only on a few "urgent" goals and keep other requirements in the background.

Thus, a first step is to distinguish between goals for which anticipated cash flows are available—whether regularly or irregularly timed across the horizon or represented by a bullet payment at some future point—and those we call "labeled goals," for which details are considerably less precise. The term "labeled" here simply means that the individual has certain "investment features" in mind—such as minimal risk, capital

28 Note that such an approach, being more complex, is also costlier. It would therefore be more likely to be economically feasible for those advisory clients who also have the ability to pay a higher fee.

preservation, purchasing power preservation, and long-term growth—but has not articulated the actual need that stands behind each label. The individual may already have mentally allocated some portion of his or her assets, in currency or percentage terms, to one or several of these labels. For cash flow–based goals,[29] the time horizon over which the goal is to be met is usually not difficult to ascertain: It is either the period over which cash outflows are expected to be made or the point in time at which a bullet payment is expected. More complex, however, is the issue of the urgency of the goal and thus of the required minimum probability of success.

By working to preserve a human (as opposed to a technical) tone in the advisory conversations, the adviser can serve the client without forcing him or her to come up with a quantified probability of success. The adviser may start with the simple observation that there are two fundamental types of goals: those that one seeks to achieve and those whose consequences one seeks to avoid. Dividing the goals the investor seeks to achieve into "needs, wants, wishes, and dreams" provides the adviser with an initial sense of the urgency of each goal. A need typically must be met and so should command a 90%–99% probability of success, while at the other end of the spectrum, it is an unfortunate fact that we all live with unfulfilled dreams, whose required probabilities of success probably fall below 60%. A parallel—and analogous—structure can be created to deal with goals one seeks to avoid:[30] "nightmares, fears, worries, and concerns," with similar implications in terms of required probabilities of success. In short, while some discussion of probability level may well take place, it can be informed and guided by the use of commonly accepted everyday words that will ensure that the outcome is internally consistent. The adviser avoids the use of jargon, which many clients dislike, and yet is able to provide professional advice.[31]

The simplest way to bring this concept to life is to work with a basic case study. Imagine a family, the Smiths, with financial assets of US$25 million. (For the sake of simplicity, we are assuming that they do not pay taxes and that all assets are owned in a single structure.) The parents are in their mid-fifties, and the household spends about US$500,000 a year. They expect that inflation will average about 2% per year for the foreseeable future. They express four important goals and are concerned that they may not be able to meet all of them:

1. They *need* a 95% chance of being able to maintain their current expenditures over the next five years.
2. They *want* an 85% chance of being able to maintain their current expenditures over the ensuing 25 years, which they see as a reasonable estimate of their joint life expectancy.
3. They *need* a 90% chance of being able to transfer US$10 million to their children in 10 years.
4. They *wish* to have a 75% chance to be able to create a family foundation, which they wish to fund with US$10 million in 20 years.

---

29 Note that all cash flows do not have to be negative (i.e., outflows). One can easily imagine circumstances where certain future inflows are anticipated and yet are not seen, individually, as sufficient to meet the specified goal.

30 Although negative goals may sound surprising, they do exist and play a double role. First, when a negative goal is explicitly stated, it can be "replaced" by a specific positive goal: Avoiding the nightmare of running out of capital, for example, can be turned into the need to meet a certain expense budget. Second, negative goals serve as a useful feedback loop to check the internal consistency of the investor's goal set.

31 Note that the adviser can also identify a series of "secondary" words to help determine whether a need, for instance, means that the required probability of success should be set at 99%, 95%, or 90%. An *indispensable* need could require a 99% probability of being met, while an *urgent* need might require only a 95% probability of success, and a *serious* need a 90% probability.

EXAMPLE 10

Understanding Client Goals

1. A client describes a desire to have a reserve of €2 million for business opportunities that may develop when he retires in five years. What are the important features of this goal?
2. A 70-year-old client discusses the need to be able to maintain her lifestyle for the balance of her life and wishes to leave US$3 million to be split among her three grandchildren at her death. What are the important features of this situation?

Solution to 1:

The time horizon is five years. Words such as "desire" in describing a goal, compared with expressions indicating "need," indicate that there is room for "error" in the event that capital markets are not supportive. The portfolio required to meet the goal described as a desire will likely be able to involve a riskier profile. One would want to verify this assumption by comparing the size of that goal compared with the total financial assets available to the client.

Solution to 2:

The key takeaway is that although the two goals have the same time horizon, the two portfolios designed to defease them will have potentially significantly different risk profiles. The time horizon is approximately 20 years. The first goal relates to maintaining the client's lifestyle and must be defeased with an appropriately structured portfolio. The second goal, relating to the wish to leave some money to grandchildren, will allow more room for risk taking.

4.3 Constructing Sub-Portfolios

Having defined the needs of the investor in as much detail as possible, the next step in the process is to identify the amount of money that needs to be allocated to each goal and the asset allocation that will apply to that sum. For most advisers, the process will start with a set of sub-portfolio modules (such as those we briefly discussed in Section 4.1 and will study in more depth in Section 4.5). When using a set of pre-optimized modules, the adviser will then need to identify the module best suited to each of the specific goals of the client. That process is always driven by the client's time horizon and required probability of success, and it involves identifying the module that offers the highest possible return given the investor's risk tolerance as characterized by a given required probability of success over a given time horizon.

To illustrate, consider the set of six modules shown in Exhibit 36;[32] these modules result from an optimization process that will be explained later.[33]

32 The different ranges of required probabilities of success for various time horizons reflect the fact that the differentiation across modules can occur more or less rapidly, reflecting the different ratios of return per unit of risk.

33 Exhibit 38 presents the details of the asset allocation of these modules and the constraints underpinning their optimization.

Exhibit 36 "Highest Probability- and Horizon-Adjusted Return" Sub-Portfolio Module under Different Horizon and Probability Scenarios

	A	B	C	D	E	F
Portfolio Characteristics						
Expected return	4.3%	5.5%	6.4%	7.2%	8.0%	8.7%
Expected volatility	2.7%	4.5%	6.0%	7.5%	10.0%	12.5%
	Annualized Minimum Expectation Returns					
Time Horizon (years)				5		
Required Success						
99%	1.5%	0.9%	0.2%	–0.6%	–2.4%	–4.3%
95	2.3	2.2	2.0	1.7	0.7	–0.5
90	2.7	3.0	3.0	2.9	2.3	1.5
75	3.5	4.2	4.6	4.9	5.0	4.9
Time Horizon (years)				10		
Required Success						
99%	2.3%	2.2%	2.0%	1.7%	0.7%	–0.5%
90	3.2	3.7	4.0	4.1	4.0	3.6
75	3.7	4.6	5.1	5.6	5.9	6.0%
60	4.1	5.2	5.9	6.6	7.2	7.7
Time Horizon (years)				20		
Required Success						
95%	3.3%	3.9%	4.2%	4.4%	4.4%	4.1%
90	3.5	4.3	4.7	5.0	5.2	5.1
85	3.7	4.5	5.0	5.4	5.7	5.8
75	3.9	4.9	5.5	6.0	6.5	6.8
Time Horizon (years)				25		
Required Success						
95%	3.4%	4.1%	4.4%	4.7%	4.7%	4.6%
90	3.6	4.4	4.9	5.2	5.5	5.5
85	3.7	4.6	5.2	5.6	6.0	6.1
75	3.9	4.9	5.6	6.2	6.7	7.0

In Exhibit 36, the top section, on portfolio characteristics, presents the expected return and expected volatility of each module. Below that are four sections, one for each of four time horizons: 5, 10, 20, and 25 years. In a given section, the entries are the returns that are expected for a given required probability of achieving success. For example, at a 10-year horizon and a 90% required probability of success, Modules A, B, C, D, E, and F are expected to return, respectively, 3.2%, 3.7%, 4.0%, 4.1%, 4.0%, and 3.6%. In this case, Module D would be selected to address a goal with this time horizon and required probability of success because its 4.1% expected return is higher than those of all the other modules. Thus, Module D offers the lowest "funding cost" for

the given goal. The highest expected return translates to the lowest initially required capital when the expected cash flows associated with the goal are discounted using that expected return.

EXAMPLE 11

Selecting a Module

Address the following module selection problems using Exhibit 36:

1. A client describes a desire to have a reserve of €2 million for business opportunities that may develop when he retires in five years. Assume that the word "desire" points to a wish to which the adviser will ascribe a probability of 75%.
2. A 70-year-old client with a 20-year life expectancy discusses the need to be able to maintain her lifestyle for the balance of her life and wishes to leave US$3 million to be split among her three grandchildren at her death.

Solution to 1:

The time horizon is five years. Exhibit 36 shows that Module E has the highest expected return (5.0%) over the five-year period and with the assumed 75% required probability of success.

Solution to 2:

The time horizon is 20 years. The first goal is a need, while the second is a wish. We assume a required probability of success of 95% for a need and 75% for a wish. Exhibit 36 shows that Module D provides the highest horizon- and required-probability-adjusted return (4.4%) for the first goal. Module F is better suited to the second goal because, even though the second goal has the same time horizon, it involves only a 75% required probability of success; the appropriately adjusted return is 6.8%, markedly the highest, which means the initially required capital is lower.

Returning to the Smiths, let us use that same set of modules to look at their four specific goals. The results of our analysis are presented in Exhibit 37.

1. The first goal is a need, with a five-year time horizon and a 95% required probability of success. Looking at the 95% required probability line in the five-year time horizon section of Exhibit 36, we can see that the module with the highest expected return on a time horizon- and required probability-adjusted basis is Module A and that the appropriately adjusted expected return for that module is 2.3%. Discounting a US$500,000 annual cash flow, inflated by 2% a year from Year 2 onwards, required a US$2,430,000 initial investment. This amount represents 9.7% of the total financial wealth of the Smiths.
2. The second goal is a want, with a 25-year time horizon and an 85% required probability of success. The corresponding line of the table in Exhibit 36 points to Module F and a discount rate of 6.1%. Discounting their current expenses with the same assumption over the 25 years starting in Year 6 with a 6.1% rate points to an initially required capital of US$4,978,000, representing 19.9% of the Smiths' wealth.

3 The third goal is another need, with a 10-year time horizon and a 90% required probability of success. Module D is the best module, and the US$6,671,000 required capital reflects the discounting of a US$10 million payment in 10 years at the 4.1% indicated in Exhibit 36.

4 Finally, the fourth goal is a wish with a 20-year time horizon and a 75% required probability of success. Module F is again the best module, and the discounting of a US$10 million payment 20 years from now at the 6.8% expected return from Exhibit 36 points to a required capital of US$2,426,000 today.

Note that different goals may, in fact, be optimally addressed using the same module; thus, an individual module may be used more than once in the allocation of the individual's overall financial assets. Here, Goals 2 and 4 can both be met with the riskiest of the six modules, although their time horizons differ, as do the required probabilities of success, with Goal 2 being characterized as a want and Goal 4 as a wish.

Exhibit 37 Module Selection and Dollar Allocations (US$ thousands)

	Total Financial Assets				25,000	
	Goals					
	1	2	3	4	Surplus	Overall Asset Allocation
Horizon (years)	5	25	10	20		
Required probability of success	95%	85%	90%	75%	$E(R_t)$	7.1%
Discount rate	2.3%	6.1%	4.1%	6.8%	$\sigma(R_t)$	7.6%
Module	**A**	**F**	**D**	**F**	**C**	
Required capital						
In currency	2,430	4,978	6,671	2,426	8,495	25,000
As a % of total	9.7%	19.9%	26.7%	9.7%	34.0%	100.0%

Note also that the Smiths' earlier worry, that they might not be able to meet all their goals, can be addressed easily. Our assumptions suggest that, in fact, they have excess capital representing 34% of their total financial wealth. They can either revisit their current goals and bring the timing of payments forward or raise their probability of success. The case suggests that they would rather think of additional goals but will want to give themselves some time to refine their intentions. Their adviser then suggests that a "middle of the road" module be used as a "labeled goal" for that interim period, and they call this module (Module C) "capital preservation."

4.4 The Overall Portfolio

Assuming the same six modules, with their detailed composition shown in Exhibit 38, one can then derive the overall asset allocation by aggregating the individual exposures to the various modules. In short, the overall allocation is simply the weighted average exposure to each of the asset classes or strategies within each module, with the weight being the percentage of financial assets allocated to each module. Exhibit 39 presents these computations and the overall asset allocation, which is given in bold in the right-most column. The overall portfolio's expected return and volatility are

also shown. In Exhibit 38, liquidity[34] is measured as the ratio of the average number of days that might be needed to liquidate a position to the number of trading days in a year. (Note that the column B values add up to 101 because of rounding.)

Exhibit 38 Asset Allocation of Each Module

	A	B	C	D	E	F
Portfolio Characteristics						
Expected return	4.3%	5.5%	6.4%	7.2%	8.0%	8.7%
Expected volatility	2.7%	4.5%	6.0%	7.5%	10.0%	12.5%
Expected liquidity	100.0%	96.6%	90.0%	86.1%	83.6%	80.0%
Portfolio Allocations						
Cash	80%	26%	3%	1%	1%	1%
Global investment-grade bonds	20	44	45	25	0	0
Global high-yield bonds	0	5	11	25	34	4
Lower-volatility alternatives	0	9	13	0	0	0
Global developed equities	0	9	13	19	34	64
Global emerging equities	0	2	2	3	6	11
Equity-based alternatives	0	0	0	8	0	0
Illiquid global equities	0	0	5	10	15	20
Trading strategy alternatives	0	1	3	6	7	0
Global real estate	0	5	5	3	3	0
Total	100%	100%	100%	100%	100%	100%

Exhibit 39 Goals-Based Asset Allocation (US$ thousands)

	Total Financial Assets				25,000	
	Goals					Overall Asset Allocation
	1	2	3	4	Surplus	
Horizon	5	25	10	20		
Required success	95%	85%	90%	75%	$E(R_t)$	7.1%
Discount rate	2.3%	6.1%	4.1%	6.8%	$\sigma(R_t)$	7.6%

(continued)

34 Note that we need to incorporate some estimate of liquidity for all asset classes and strategies to ensure that the client's and the goals' liquidity constraints can be met.

Exhibit 39 (Continued)

Module	A	F	D	F	C	
Required capital						
In currency	2,430	4,978	6,671	2,426	8,495	25,000
As a % of total	9.7	19.9	26.7	9.7	34.0	100.0
Cash	80%	1%	1%	1%	3%	**9%**
Global investment-grade bonds	20	0	25	0	45	**24**
Global high-yield bonds	0	4	25	4	11	**12**
Lower-volatility alternatives	0	0	0	0	13	**4**
Global developed equities	0	64	19	64	13	**28**
Global emerging equities	0	11	3	11	2	**5**
Equity-based alternatives	0	0	8	0	0	**2**
Illiquid global equities	0	20	10	20	5	**10**
Trading strategy alternatives[a]	0	0	6	0	3	**3**
Global real estate	0	0	3	0	5	**2**
Total	100	100	100	100	100	**100**

[a] "Trading strategy alternatives" refers to discretionary or systematic trading strategies such as global macro and managed futures.

4.5 Revisiting the Module Process in Detail

Having explained and illustrated the client process in Exhibit 35, we now explore how modules are developed. Creating an appropriate set of optimized modules starts with the formulation of capital market assumptions. Exhibit 40 presents a possible set of forward-looking pretax capital market expectations for expected return, volatility, and liquidity[35] in Panel A and a historical 15-year correlation matrix in Panel B.[36]

35 For clients who might invest in traditional asset classes by means of vehicles such as mutual funds or ETFs, these asset classes can be treated as providing virtually instant liquidity. For clients with particularly large asset pools who might use separately managed accounts, the liquidity factor for high-yield or emerging market bonds, small-capitalization equities, and certain real assets might be adjusted downward.
36 For illiquid equities, data availability reduces the time period to seven years. The correlation matrix is based on the 15 years ending with March 2016.

Exhibit 40 Example of Capital Market Expectations for a Possible Asset Class Universe

Panel A

	Expected		
	Return	Volatility	Liquidity
Cash	4.0%	3.0%	100%
Global investment-grade bonds	5.5	6.5	100
Global high-yield bonds	7.0	10.0	100
Lower-volatility alternatives	5.5	5.0	65
Global developed equities	8.0	16.0	100
Global emerging equities	9.5	22.0	100
Equity-based alternatives	6.0	8.0	65
Illiquid global equities	11.0	30.0	0
Trading strategy alternatives	6.5	10.0	80
Global real estate	7.0	15.0	100

Panel B

	Global				Global					
	Cash	IG Bonds	HY Bonds	Lower-Volatility Alts	Developed Equities	Emerging Equities	Equity-Based Alts	Trading Strategy Alts	Illiquid Equities	Global Real Estate
Cash	**1.00**	0.00	–0.12	0.08	–0.06	–0.04	0.02	0.04	–0.26	–0.01
Global investment-grade bonds	0.00	**1.00**	0.27	0.14	0.28	0.09	0.07	0.16	0.20	0.24
Global high-yield bonds	–0.12	0.27	**1.00**	0.46	0.70	0.17	0.31	–0.08	0.35	0.28
Lower-volatility alternatives	0.08	0.14	0.46	**1.00**	0.44	0.61	0.86	0.12	0.65	0.47
Global developed equities	–0.06	0.28	0.70	0.44	**1.00**	0.17	0.32	–0.03	0.47	0.38
Global emerging equities	–0.04	0.09	0.17	0.61	0.17	**1.00**	0.72	–0.03	0.67	0.49
Equity-based alternatives	0.02	0.07	0.31	0.86	0.32	0.72	**1.00**	0.11	0.72	0.45
Trading strategy alternatives	0.04	0.16	–0.08	0.12	–0.03	–0.03	0.11	**1.00**	–0.09	0.07
Illiquid global equities	–0.26	0.20	0.35	0.65	0.47	0.67	0.72	–0.09	**1.00**	0.88
Global real estate	–0.01	0.24	0.28	0.47	0.38	0.49	0.45	0.07	0.88	**1.00**

Ostensibly, in the real world, the process ought to be associated with a set of after-tax expectations, which usually cannot be limited to broad asset classes or sub–asset classes. Indeed, the tax impact of management processes within individual asset classes or strategies (for instance, index replication, index replication with systematic tax-loss harvesting, broadly diversified portfolios, or concentrated portfolios) requires that each

management process within each asset class or strategy be given its own expected return and volatility. We will dispense with that step here for the sake of simplicity, both in absolute terms and with respect to jurisdictional differences.

Exhibit 41 presents a possible set of such modules based on the capital market expectations from Exhibit 40. The optimization uses a mean–variance process and is subject to a variety of constraints that are meant to reflect both market portfolio considerations and reasonable asset class or strategy suitability given the goals that we expect to correspond to various points on the frontier. Note that the frontier is not "efficient" in the traditional sense of the term because the constraints applied to the portfolios differ from one to the next. Three elements within the set of constraints deserve special mention. The first is the need to be concerned with the liquidity of the various strategies: It would make little sense, even if it were appropriate based on other considerations, to include any material exposure to illiquid equities in a declining-balance portfolio expected to "mature" within 10 years, for instance. Any exposure thus selected would be bound to increase through time because portfolio liquidation focuses on more-liquid assets. The second relates to strategies whose return distributions are known not to be "normal." This point applies particularly to a number of alternative strategies that suffer from skew and kurtosis,[37] which a mean–variance optimization process does not take into account (see Section 2.4.4). Finally, the constraints contain a measure of drawdown control to alleviate the problems potentially associated with portfolios that, although apparently optimal, appear too risky in overly challenging market circumstances. Drawdown controls are an important element in that they help deal with the often-observed asymmetric tolerance of investors for volatility: upward volatility is much preferred to downward volatility.

Exhibit 41 Six Possible Sub-Portfolio Modules

	A	B	C	D	E	F
Portfolio Characteristics						
Expected return	4.3%	5.5%	6.4%	7.2%	8.0%	8.7%
Expected volatility	2.7	4.5	6.0	7.5	10.0	12.5
Expected liquidity	100.0	96.6	90.0	86.1	83.6	80.0
Portfolio Allocations						
Cash	80%	26%	3%	1%	1%	1%
Global investment-grade bonds	20	44	45	25	0	0
Global high-yield bonds	0	5	11	25	34	4
Lower-volatility alternatives	0	9	13	0	0	0
Global developed equities	0	9	13	19	34	64
Global emerging equities	0	2	2	3	6	11
Equity-based alternatives	0	0	0	8	0	0
Illiquid global equities	0	0	5	10	15	20
Trading strategy alternatives	0	1	3	6	7	0
Global real estate	0	5	5	3	3	0
Total	100%	100%	100%	100%	100%	100%

37 Kat (2003) described the challenge, and Davies, Kat, and Lu (2009) presented a solution that involves the use of mean–variance-skew-kurtosis optimization, which is typically too complex for most real-life circumstances.

Exhibit 41 (Continued)

Constraints						
Maximum volatility	3.0%	4.5%	6.0%	7.5%	10.0%	12.5%
Minimum liquidity	100.0	95.0	90.0	85.0	80.0	70.0
Maximum alternatives	0.0	10.0	20.0	30.0	30.0	30.0
Minimum cash	80.0	20.0	0.3	0.5	0.7	1.0
Maximum HY as a percent of total fixed income	0.0	10.0	20.0	50.0	100.0	100.0
Maximum equity spectrum	0.0	10.0	20.0	40.0	75.0	100.0
Maximum EM as a percent of public equities	15.0	15.0	15.0	15.0	15.0	15.0
Maximum illiquid equities	0.0	0.0	5.0	10.0	15.0	20.0
Maximum trading as a percent of equity spectrum	0.0	10.0	15.0	15.0	20.0	25.0
Maximum real estate	0.0	5.0	10.0	15.0	20.0	25.0
Escrow cash as a percent of illiquid equities	5.0	5.0	5.0	5.0	5.0	5.0
Maximum probability of return < drawdown	1.0	1.5	2.0	2.0	2.5	2.5
Drawdown horizon	3	3	3	3	3	3
Drawdown amount	0.0	–5.0	–7.5	–10.0	–15.0	–20.0

The six sub-portfolios shown in Exhibit 41 satisfy two major design goals: First, they cover a wide spectrum of the investment universe, ranging from a nearly all-cash portfolio (Portfolio A) to an all-equity alternative (Portfolio F). Second, they are sufficiently differentiated to avoid creating distinctions without real differences. These portfolios are graphed in Exhibit 42.

Exhibit 42 Sub-Portfolio Modules Cover a Full Range

Returning to an earlier point about "labeled goals," one can easily imagine "aspirations" to describe each of these modules, ranging from "immediate- to short-term lifestyle" for Module A to "aggressive growth" for Module F. Module B might be labeled "long-term lifestyle," while C and D might represent forms of capital preservation and E a form of "balanced growth."

A final point deserves special emphasis: Modules need to be revisited on a periodic basis. While equilibrium assumptions will likely not change much from one year to the next, the need to identify one's position with respect to a "normal" market cycle can lead to modest changes in forward-looking assumptions. It would indeed be foolish to keep using long-term equilibrium assumptions when it becomes clear that one is closer to a market top than to a market bottom. The question of the suitability of revisions becomes moot when using a systematic approach such as the Black–Litterman model. One may also need to review the continued suitability of constraints, not to mention (when applicable) the fact that the make-up of the market portfolio may change in terms of geography or credit distribution.

4.6 Periodically Revisiting the Overall Asset Allocation

Once set, the goals-based allocation must be regularly reviewed. Two considerations dominate:

1. Goals with an initially fixed time horizon are not necessarily one year closer to maturity after a year. Superficially, one would expect that someone who says that his or her need is to meet lifestyle expenditures over the next five years, for instance, means exactly this. Accordingly, next year, the time horizon should shift down to four years. Yet experience suggests that certain horizons are "placeholders": One year on, the time horizon remains five years. This is particularly—and understandably—relevant when the horizon reflects the anticipated death of an individual.
2. The preference for upward rather than downward volatility, combined with perceptions that goals may have higher required probabilities of success than is truly the case, leads to portfolios that typically outperform the discount rate used to compute the required initial capital. Thus, one would expect there to be some need for portfolio rebalancing when the assets allocated to certain goals appear excessive, at least in probability- and horizon-adjusted terms. This situation gives rise to important discussions with taxable clients because any form of portfolio rebalancing is inherently more complex and costly in a taxable environment than when taxes do not come into consideration.

4.7 Issues Related to Goals-Based Asset Allocation

Although goals-based asset allocation offers an elegant and mathematically sound way to deal with the circumstances of individuals, it is not a panacea. By definition, goals-based asset allocation applies best to individuals who have multiple goals, time horizons, and urgency levels. The classic example of the professional who is just starting to save for retirement and who has no other significant goal (as in the case of Aimée Goddard in Example 1) can be easily be handled with the traditional financial

tools discussed in the earlier sections of this reading.[38] However, one should always be cautious to ensure that there is no "hidden" goal that should be brought out and that the apparently "single" retirement goal is not in fact an aggregation of several elements with different levels of urgency, if not also different time horizons. Single-goal circumstances may still be helped by the goals-based asset allocation process when there are sustainability or behavioral questions. In that case, one can look at the single goal as being made up of several similar goals over successive time periods with different required probabilities of success. For instance, one might apply a higher sense of urgency—and thus require a lower risk profile—to contributions made in the first few years, on the ground that adverse market circumstances might negatively affect the willingness of the client to stay with the program. In many ways, this approach can be seen as a conceptual analog to the dollar-cost-averaging investment framework.

Goals-based asset allocation is ideally suited to situations involving multiple goals, time horizons, and urgency levels, whether the assets are large or more modest. In fact, in cases where "human capital" is considered, a multi-goal approach can help investors understand the various trade-offs they face. Ostensibly, the larger the assets, the more complex the nature of the investment problem, the more diverse the list of investment structures, and the more one should expect a client-focused approach to offer useful benefits. However, the ratio of cash outflows to assets under consideration is a more germane issue than the overall size of the asset pool.

Advisers using goals-based wealth management must contend with a considerably higher level of business management complexity. They will naturally expect to have a different policy for each client and potentially more than one policy per client. Thus, managing these portfolios day to day and satisfying the usual regulatory requirement that all clients be treated in an equivalent manner can appear to be a major quandary.

Typically, the solution would involve developing a systematic approach to decision making such that it remains practical for advisers to formulate truly individual policies that reflect their investment insights. Exhibit 43 offers a graphical overview of advisers' activities, divided into those that involve "firm-wide" processes, defined as areas where no real customization is warranted, and those that must remain "client focused." The result is analogous to a customized racing bicycle, whose parts are mass produced but then combined into a truly unique bike custom-designed for the individual racer.

38 However, an adviser may find it appropriate to help the individual divide the funds he or she believes are needed for retirement into several categories. For instance, there may be some incompressible lifestyle expenditure that represents a minimum required spending level, but there may also be some luxury or at least compressible spending that does not have such a high level of urgency or that applies over a different time frame (say, the early or late years). Thus, one could still describe the problem as involving multiple goals, multiple time horizons, and multiple urgency levels. Then, one could compare the costs associated with the funding of these goals and have the individual weigh potential future satisfaction against the loss of current purchasing power.

Exhibit 43 Goals-Based Wealth Management Advisory Overview

5 HEURISTICS AND OTHER APPROACHES TO ASSET ALLOCATION

In addition to the various asset allocation approaches already covered, a variety of heuristics (rules that provide a reasonable but not necessarily optimal solution) and other techniques deserve mention:

The "120 minus your age" rule. The phrase "120 minus your age" is a heuristic for inferring a hidden, age-driven risk tolerance coefficient that then leads directly to an age-based stock versus fixed income split: 120 – Age = Percentage allocated to stocks. Thus, a 25-year-old man would allocate 95% of his investment portfolio to stocks. Although we are aware of no theoretic basis for this heuristic—or its older and newer cousins, "100 minus your age" and "125 minus your age," respectively—it results in a linear decrease in equity exposure that seems to fit the general equity glide paths associated with target-date funds, including those that are based on a total balance sheet approach that includes human capital. A number of target-date funds (sometimes called life-cycle or age-based funds) and some target-date index providers report that their glide path (the age-based change in equity exposure) is based on the evolution of an individual's human capital. For example, one set of indexes[39] explicitly targets an investable proxy for the world market portfolio in which the glide path is the result of the evolving relationship of financial capital to human capital.[40]

Exhibit 44 displays the glide paths of the 60 largest target-date fund families in the United States. The retirement year (typically part of the fund's name) on the x-axis denotes the year in which the investor is expected to retire, which is almost always assumed to be the year the investor turns 65. Thus, as of 2016, the 2060 allocations correspond to a 21-year-old investor (79% equity, using the heuristic), whereas the 2005

39 Morningstar's Lifetime Allocation (target-date) indexes.
40 See Idzorek (2008).

allocation corresponds to a 76-year-old investor (24% equity, using the heuristic).[41] One dashed line represents the equity allocation based on the "100 minus your age" heuristic, while another dashed line represents the "120 minus your age" heuristic. The heuristic lines lack some of the nuances of the various glide path lines, but it would appear that an age-based heuristic leads to asset allocations that are broadly similar to those used by target-date funds.

Exhibit 44 Target-Date Funds and Age Heuristics (as of January 2016)

The 60/40 stock/bond heuristic. Some investors choose to skip the various optimization techniques and simply adopt an asset allocation consisting of 60% equities and 40% fixed income.

The equity allocation is viewed as supplying a long-term growth foundation, and the fixed-income allocation as supplying risk reduction benefits. If the stock and bond allocations are themselves diversified, an overall diversified portfolio should result.

There is some evidence that the global financial asset market portfolio is close to this prototypical 60/40 split. Exhibit 45 displays the estimated market value of eight major components of the market portfolio from 1990 to 2012. In approximately 7 of the 23 years, equities, private equity, and real estate account for slightly more than 60%, while for the rest of the time, the combined percentage is slightly less.

41 Many target-date funds continue to offer a "2005" vintage that would have been marketed/sold to people retiring in 2005.

Exhibit 45 Global Market Portfolio, 1990 to 2012

Source: Doeswijk, Lam, and Swinkels (2014).

The endowment model. An approach to asset allocation that emphasizes large allocations to non-traditional investments, including equity-oriented investments driven by investment manager skill (e.g., private equities), has come to be known as the endowment model or Yale model. The label "Yale model" reflects the fact that the Yale University Investments Office under David Swensen pioneered the approach in the 1990s; the label "endowment model" reflects the influence of this approach among US university endowments. Swensen (2009) stated that most investors should not pursue the Yale model but should instead embrace a simpler asset allocation implemented with low-cost funds. Besides high allocations to non-traditional assets and a commitment to active management, the approach characteristically seeks to earn illiquidity premiums, which endowments with long time horizons are well positioned to capture. Exhibit 46, showing the Yale endowment asset allocation, makes these points. In the exhibit, "absolute return" indicates investment in event-driven and value-driven strategies.

Exhibit 46 Yale University Endowment Asset Allocation as of June 2014

	Yale University	US Educational Institution Mean
Absolute return	17.4%	23.3%
Domestic equity	3.9	19.3
Fixed income	4.9	9.3
Foreign equity	11.5	22.0
Natural resources	8.2	8.5
Private equity	33.0	10.0

Exhibit 46 (Continued)

	Yale University	US Educational Institution Mean
Real estate	17.6	4.2
Cash	3.5	3.5

Source: Yale University (2014, p. 13).

In almost diametrical contrast to the endowment model is the asset allocation approach of Norway's Government Pension Fund Global (Statens pensjonsfond Utland), often called the Norway model.[42] This model's asset allocation is highly committed to passive investment in publicly traded securities (subject to environmental, social, and governance [ESG] concerns), reflecting a belief in the market's informational efficiency. Since 2009, the asset allocation has followed an approximate 60/40 stock/bond mix.

Risk parity. A risk parity asset allocation is based on the notion that each asset (asset class or risk factor) should contribute equally to the total risk of the portfolio for a portfolio to be well diversified. Recall that in Section 2, we identified various criticisms and potential shortcomings of mean–variance optimization, one of which was that, while the resulting asset allocations may appear diversified across assets, the sources of risk may not be diversified. In the section on risk budgeting, Exhibit 19 contained a risk decomposition of a reverse-optimization-based asset allocation from a United Kingdom–based investor. There, we noted that the overall equity/fixed income split was approximately 54% equities and 46% fixed income, yet of the 10% standard deviation, approximately 74% of the risk came from equities while only 26% came from fixed income.

Risk parity is a relatively controversial approach. Although there are several variants, the most common risk parity approach has the following mathematical form:

$$w_i \times \mathrm{Cov}(r_i, r_P) = \frac{1}{n}\sigma_P^2 \tag{3}$$

where

w_i = the weight of asset i
$\mathrm{Cov}(r_i, r_P)$ = the covariance of asset i with the portfolio
n = the number of assets
σ_P^2 = the variance of the portfolio

In general, there is not a closed-form solution to the problem, and it must be solved using some form of optimization (mathematical programming). Prior to Markowitz's development of mean–variance optimization, which simultaneously considered both risk and return, most asset allocation approaches focused only on return *and ignored risk* (or accounted for it in an ad hoc manner). The primary criticism of risk parity is that it makes the opposite mistake: It *ignores expected returns*. In general, most of the rules-based risk approaches—such as other forms of volatility weighting, minimum volatility, and target volatility—suffer from this shortcoming.

With risk parity, the contribution to risk is highly dependent on the formation of the opportunity set. For example, if the opportunity set consists of seven equity asset classes and three fixed-income asset classes, intuitively, 70% of risk will come from the equities and 30% of risk will come from fixed income. Conversely, if the

42 See Curtis (2012).

opportunity set consists of three equity asset classes and seven fixed-income asset classes, intuitively, 70% of risk will come from fixed income and 30% of risk will come from equities. The point is that practitioners of risk parity must be very cognizant of the formation of their opportunity set.

Exhibit 47 gives a US-centric example consisting of five equity asset classes and three fixed-income asset classes. A constrained optimization routine (weights must sum to 100%) was used to determine the weight to each asset class, such that all asset classes contributed the same amount to total risk. In this case, each asset class contributed 0.8%, resulting in an asset allocation with a total standard deviation of 6.41%. In this example, 5/8 of total risk comes from equity asset classes and 3/8 comes from fixed-income asset classes. Earlier, we explained that reverse optimization can be used to infer the expected return of any set of presumed efficient weights. In Exhibit 47, based on a total market risk premium of 2.13% and a risk-free rate of 3%, we inferred the reverse-optimized total returns (final column). In this case, these seem to be relatively reasonable expected returns.

Exhibit 47 Risk Parity Portfolio Weights and Risk-Budgeting Statistics Based on Reverse-Optimized Returns

Asset Class	Weight	Marginal Contribution to Total Risk (MCTR)	ACTR	Percentage Contribution to Total Standard Deviation	Reverse-Optimized Total Returns
US large-cap equities	7.7%	10.43%	0.80%	12.50%	6.47%
US mid-cap equities	6.1	13.03	0.80	12.50	7.33
US small-cap equities	5.9	13.61	0.80	12.50	7.52
Non-US developed market equities	5.6	14.38	0.80	12.50	7.78
Emerging market equities	4.5	17.74	0.80	12.50	8.89
Non-US bonds	15.5	5.17	0.80	12.50	4.72
US TIPS	23.9	3.36	0.80	12.50	4.12
US bonds	30.8	2.60	0.80	12.50	3.86
Total	100.0%		6.41%	100.00%	5.13%

After deriving a risk parity–based asset allocation, the next step in the process is to borrow (use leverage) or to lend (save a portion of wealth, presumably in cash) so that the overall portfolio corresponds to the investor's risk appetite. Continuing with our example, the market risk premium is 2.13% (above the assumed risk-free rate of 3%) and the market variance is 0.41% (i.e., 6.41% squared); thus, the implied market trade-off of expected return (in excess of the risk-free rate) for risk is 2.13% divided by 0.41%, which equals approximately 5.2. Investors with a greater appetite for risk than the market as a whole would borrow money to lever up the risk parity portfolios, while investors with a lower appetite for risk would invest a portion of their wealth in cash.

Back tests of levered risk parity portfolios have produced promising results, although critics of these back tests argue that they suffer from look-back bias and are very dependent on the ability to use extremely large amounts of leverage at low borrow rates (which may not have been feasible); see, for example, Anderson, Bianchi, and Goldberg (2012). Proponents of risk parity have suggested that the idea of "leverage aversion" contributes to the success of the strategy. Black (1972) suggested that restrictions on leverage and a general aversion to leverage may cause return-seeking investors to pursue higher-returning assets, such as stocks. All else equal, this behavior would

reduce the price of bonds, thus allowing the investor to buy bonds at a small discount, hold them to maturity, and realize the full value of the bond. Asness, Frazzini, and Pedersen (2012) have offered this idea as a potential explanation for why a levered (bond-centric) asset allocation might outperform an equity-centric asset allocation with equivalent or similar risk.

The 1/N rule. One of the simplest asset allocation heuristics involves equally weighting allocations to assets. DeMiguel, Garlappi, and Uppal (2009) define an approach in which $1/N$ of wealth is allocated to each of N assets available for investment at each rebalancing date. Calendar rebalancing to equal weighting at quarterly intervals is one common rebalancing discipline used. By treating all assets as indistinguishable in terms of mean returns, volatility, and correlations, in principle, $1/N$ rule portfolios should be dominated by methods that optimize asset class weights to exploit differences in investment characteristics. In empirical studies comparing approaches, however, the $1/N$ rule has been found to perform considerably better, based on Sharpe ratios and certainty equivalents, than theory might suggest. One possible explanation is that the $1/N$ rule sidesteps problems caused by optimizing when there is estimation error in inputs.

PORTFOLIO REBALANCING IN PRACTICE

6

The reading "Introduction to Asset Allocation" provided an introduction to rebalancing, including some detailed comments on strategic considerations. This section aims to present useful additional insight and information.

Meanings of "Rebalancing"

Rebalancing has been defined as the discipline of adjusting portfolio weights to more closely align with the strategic asset allocation. In that sense, rebalancing includes policy regarding the correction of any drift away from strategic asset allocation weights resulting from market price movements and the passage of time for finite-lived assets, such as bonds. In liability-relative asset allocation, adjusting a liability-hedging portfolio to account for changes in net duration exposures from the passage of time, for example, would fall under the rubric of rebalancing.

Some use the term "rebalancing" more expansively, to include the combined effects on asset class weights not only of rebalancing in the above sense but also of active allocation activities. In that sense, rebalancing would include tactical allocations. Although rebalancing policy can be established to accommodate tactical adjustments, tactical asset allocation per se is not covered under "rebalancing" as the term is used here.

Changes in asset allocation weights in response to changes in client circumstances, goals, or other client factors are sometimes also referred to as "rebalancing" (especially if the adjustments are minor). These activities fall under the scope of client monitoring and asset allocation review, as described elsewhere in the CFA curriculum.

An appropriate rebalancing policy involves a weighing of benefits and costs. Benefits depend on the idea that if an investor's strategic asset allocation is optimal, then any divergence in the portfolio from that asset allocation represents an expected utility loss to the investor. Rebalancing benefits the investor by reducing the present

value of expected losses from not tracking the optimum. In theory, the basic cost of not rebalancing is this present value of expected utility losses from straying from the optimum.[43]

Apart from the above considerations of trade-offs, disciplined rebalancing has tended to reduce risk while incrementally adding to returns. Several interpretations of this empirical finding have been offered, including the following:

- *Rebalancing earns a diversification return*. The compound growth rate of a portfolio is greater than the weighted average compound growth rates of the component portfolio holdings (given positive expected returns and positive asset weights). Given sufficiently low transaction costs, this effect leads to what has been called a *diversification return* to frequent rebalancing to a well-diversified portfolio.[44]
- *Rebalancing earns a return from being short volatility*. In the case of a portfolio consisting of a risky asset and a risk-free asset, the return to a rebalanced portfolio can be replicated by creating a buy-and-hold position in the portfolio, writing out-of-the-money puts and calls on the risky asset, and investing the premiums in risk-free bonds.[45] As the value of puts and calls is positively related to volatility, such a position is called being short volatility (or being short gamma, by reference to the option Greeks).

Practice appears not to have produced a consensus on the most appropriate rebalancing discipline. Introduction to Asset Allocation defined and discussed calendar rebalancing[46]—sometimes mentioned as common in portfolios managed for individual investors—and percent-range rebalancing. Calendar rebalancing involves lower overhead because of lower monitoring costs. Percent-range rebalancing is a more disciplined risk control policy, however, because it makes rebalancing contingent on market movements. Without weighing costs and benefits in the abstract, Exhibit 48 assumes percent-range rebalancing and summarizes the effects of each of several key factors on the corridor width of an asset class, holding all else equal, except for the factor of the asset class's own volatility.[47] For taxable investors, transactions trigger capital gains in jurisdictions that tax them; therefore, for such investors, higher tax rates on capital gains should also be associated with wider corridors.

Exhibit 48 Factors Affecting the Optimal Corridor Width of an Asset Class

Factor	Effect on Optimal Width of Corridor (All Else Equal)	Intuition
Factors Positively Related to Optimal Corridor Width		
Transaction costs	The higher the transaction costs, the wider the optimal corridor.	High transaction costs set a high hurdle for rebalancing benefits to overcome.
Risk tolerance	The higher the risk tolerance, the wider the optimal corridor.	Higher risk tolerance means less sensitivity to divergences from the target allocation.
Correlation with the rest of the portfolio	The higher the correlation, the wider the optimal corridor.	When asset classes move in sync, further divergence from target weights is less likely.

43 See Leland (2000).
44 See Willenbrock (2011). This phenomenon was called *rebalancing return* by Mulvey and Kim (2009). Luenberger (2013) suggests that the phenomenon could be exploited by a strategy of buying high-volatility assets and rebalancing often, a process he called *volatility pumping*.
45 As shown in Ang (2014, pp. 135–139).
46 Rebalancing a portfolio to target weights on a periodic basis—for example, monthly, quarterly, semi-annually, or annually.
47 See Masters (2003).

Exhibit 48 (Continued)

Factor	Effect on Optimal Width of Corridor (All Else Equal)	Intuition
Factors Inversely Related to Optimal Corridor Width		
Volatility of the rest of the portfolio	The higher the volatility, the narrower the optimal corridor.	Higher volatility makes large divergences from the strategic asset allocation more likely.

Among positive factors, the cases of transaction costs and risk tolerance are obvious. Transaction costs can be reduced to the extent that portfolio cash flows can be used to rebalance. The case of correlation is less obvious. Because of correlations, the rebalancing triggers among different asset classes are linked.

Consider correlation in a two–asset class scenario. Suppose one asset class is above its target weight, so the other asset class is below its target weight. A further increase in the value of the overweight asset class implies, on average, a smaller divergence in the asset mix if the asset classes' returns are more highly positively correlated (because the denominator in computing the overweight asset class's weight is the sum of the values of the two asset classes). In a multi-asset-class scenario, all pair-wise asset class correlations would need to be considered, making the interpretation of correlations complex. To expand the application of the two-asset case's intuition, one simplification involves considering the balance of a portfolio to be a single hypothetical asset and computing an asset class's correlation with it.

As indicated in Exhibit 48, the higher the volatility of the rest of the portfolio, excluding the asset class being considered, the more likely a large divergence from the strategic asset allocation becomes. That consideration should point to a narrower optimal corridor, all else being equal.

In the case of an asset class's own volatility, "holding all else equal" is not practically meaningful. If rebalancing did not involve transaction costs, then higher volatility would lead to a narrower corridor, all else equal, for a risk-averse investor.[48] Higher volatility implies that if an asset class is not brought back into the optimal range after a given move away from it, the chance of an even further divergence from optimal is greater. In other words, higher volatility makes large divergence from the strategic asset allocation more likely. However, reducing a corridor's width means more frequent rebalancing and higher transaction costs. Thus, the effect of volatility on optimal corridor width involves a trade-off between controlling transaction costs and controlling risk. Conclusions also depend on the assumptions made about asset price return dynamics.

In practice, corridor width is often specified to be proportionally greater, the higher an asset class's volatility, with a focus on transaction cost control. In *volatility-based rebalancing*, corridor width is set proportionally to the asset class's own volatility. In one variation of *equal probability rebalancing* (McCalla 1997), the manager specifies a corridor for each asset class in terms of a common multiple of the standard deviation of the asset class's returns such that, under a normal probability assumption, each asset class is equally likely to trigger rebalancing.

48 As in Masters (2003).

EXAMPLE 12

Tolerance Bands for an Asset Allocation

An investment committee is reviewing the following strategic asset allocation:

Domestic equities 50% ± 5% (i.e., 45% to 55% of portfolio value)

International equities 15% ± 1.5%

Domestic bonds 35% ± 3.5%

The market for the domestic bonds is relatively illiquid. The committee views the above corridors as appropriate *if* each asset class's risk and transaction cost characteristics remain unchanged. The committee now wants to account for differences among the asset classes in setting the corridors.

Evaluate the implications of the following sets of facts for the stated tolerance bands, given an all-else-equal assumption in each case:

1. Tax rates for international equities increase by 10 percentage points.
2. Transaction costs in international equities increase by 20% relative to domestic equities, but the correlation of international equities with domestic equities and bonds declines. What is the expected effect on the tolerance band for international equities?
3. The volatility of domestic bonds increases. What is the expected effect on their tolerance band? Assume that domestic bonds are relatively illiquid.

Solution to 1:

The tolerance band for international equities should increase if the entity is a taxable investor.

Solution to 2:

Increased transaction costs point to widening the tolerance band for international equities, but declining correlations point to narrowing it. The overall effect is indeterminate.

Solution to 3:

Given that the market for domestic bonds is relatively illiquid, the increase in volatility suggests widening the rebalancing band. Containing transaction costs is more important than the expected utility losses from allowing a larger divergence from the strategic asset allocation.

One decision involved in rebalancing policy is whether to adjust asset class holdings to their target proportions, to the limits of the corridors, or to within the corridors but not to target weights. Compared with rebalancing to target weights, rebalancing to the upper or lower limit of the allowed range results in less close alignment with target proportions but lower transaction costs—an especially important consideration in the case of relatively illiquid assets. The choice among alternatives may be influenced by judgmental tactical considerations.

Because one rebalancing decision affects later rebalancing decisions, the optimal rebalancing decisions at different points in time are linked. However, optimal rebalancing in a multi-period, multi-asset case is an unsolved problem.

The analysis of Dybvig (2005) suggests that fixed transaction costs favor rebalancing to the target weights and variable transaction costs favor rebalancing to the nearest corridor border (the interior of the corridor being therefore a "no trade zone"). A number of studies have contrasted rebalancing to target weights and rebalancing to

the allowed range based on particular asset classes, time periods, and measures of the benefits of rebalancing. These studies have reached a variety of conclusions, suggesting that no simple, empirically based advice can be provided.

Rebalancing in a Goals-Based Approach

The use of probability- and horizon-adjusted discount rates to size the various goal-defeasing sub-portfolios means that portfolios will usually produce returns that are higher than assumed. Thus, as time passes, the dollars allocated to the various sub-portfolios—other than labeled-goal portfolios—may be expected to exceed the actual requirements. For example, in average markets, returns should exceed the conservative requirements of a goal associated with a 90% required probability of success. Sub-portfolios with shorter time horizons for goals with high required probabilities of success will tend to contain relatively low-risk assets, whereas riskier assets may have high allocations in longer-horizon portfolios for goals with lower required probabilities of success. Thus, there is a greater chance that the exposure to lower-risk assets will creep up before one experiences the same for riskier assets. Thus, failing to rebalance the portfolio will gradually move it down the risk axis—and the defined efficient frontier—and thus lead the client to take less risk than he or she can bear.

CONCLUSIONS

7

This reading has surveyed how appropriate asset allocations can be determined to meet the needs of a variety of investors. Among the major points made have been the following:

- The objective function of asset-only mean–variance optimization is to maximize the expected return of the asset mix minus a penalty that depends on risk aversion and the expected variance of the asset mix.
- Criticisms of MVO include the following:
  - The outputs (asset allocations) are highly sensitive to small changes in the inputs.
  - The asset allocations are highly concentrated in a subset of the available asset classes.
  - Investors are often concerned with characteristics of asset class returns such as skewness and kurtosis that are not accounted for in MVO.
  - While the asset allocations may appear diversified across assets, the sources of risk may not be diversified.
  - MVO allocations may have no direct connection to the factors affecting any liability or consumption streams.
  - MVO is a single-period framework that tends to ignore trading/rebalancing costs and taxes.
- Deriving expected returns by reverse optimization or by reverse optimization tilted toward an investor's views on asset returns (the Black–Litterman model) is one means of addressing the tendency of MVO to produce efficient portfolios that are not well diversified.

- Placing constraints on asset class weights to prevent extremely concentrated portfolios and resampling inputs are other ways of addressing the same concern.
- For some relatively illiquid asset classes, a satisfactory proxy may not be available; including such asset classes in the optimization may therefore be problematic.
- Risk budgeting is a means of making optimal use of risk in the pursuit of return. A risk budget is optimal when the ratio of excess return to marginal contribution to total risk is the same for all assets in the portfolio.
- Characteristics of liabilities that affect asset allocation in liability-relative asset allocation include the following:
  - Fixed versus contingent cash flows
  - Legal versus quasi-liabilities
  - Duration and convexity of liability cash flows
  - Value of liabilities as compared with the size of the sponsoring organization
  - Factors driving future liability cash flows (inflation, economic conditions, interest rates, risk premium)
  - Timing considerations, such longevity risk
  - Regulations affecting liability cash flow calculations
- Approaches to liability-relative asset allocation include surplus optimization, a hedging/return-seeking portfolios approach, and an integrated asset–liability approach.
  - Surplus optimization involves MVO applied to surplus returns.
  - A hedging/return-seeking portfolios approach assigns assets to one of two portfolios. The objective of the hedging portfolio is to hedge the investor's liability stream. Any remaining funds are invested in the return-seeking portfolio.
  - An integrated asset–liability approach integrates and jointly optimizes asset and liability decisions.
- A goals-based asset allocation process combines into an overall portfolio a number of sub-portfolios, each of which is designed to fund an individual goal with its own time horizon and required probability of success.
- In the implementation, there are two fundamental parts to the asset allocation process. The first centers on the creation of portfolio modules, while the second relates to the identification of client goals and the matching of these goals to the appropriate sub-portfolios to which suitable levels of capital are allocated.
- Other approaches to asset allocation include "120 minus your age," 60/40 stocks/bonds, the endowment model, risk parity, and the $1/N$ rule.
- Disciplined rebalancing has tended to reduce risk while incrementally adding to returns. Interpretations of this empirical finding include that rebalancing earns a diversification return, that rebalancing earns a return from being short volatility, and that rebalancing earns a return to supplying liquidity to the market.
- Factors positively related to optimal corridor width include transaction costs, risk tolerance, and an asset class's correlation with the rest of the portfolio. The higher the correlation, the wider the optimal corridor, because when asset classes move in sync, further divergence from target weights is less likely.

- The volatility of the rest of the portfolio (outside of the asset class under consideration) is inversely related to optimal corridor width.
- An asset class's own volatility involves a trade-off between transaction costs and risk control. The width of the optimal tolerance band increases with transaction costs for volatility-based rebalancing.

REFERENCES

Anderson, Robert M., Stephen W. Bianchi, and Lisa R. Goldberg. 2012. "Will My Risk Parity Strategy Outperform?" *Financial Analysts Journal*, vol. 68, no. 6 (November/December): 75–93.

Ang, Andrew. 2014. Asset Management. New York: Oxford University Press.

Asness, Clifford S., Andrea Frazzini, and Lasse H. Pedersen. 2012. "Leverage Aversion and Risk Parity." *Financial Analysts Journal*, vol. 68, no. 1 (January/February): 47–59.

Athayde, Gustavo M. de, and Renato G. Flôres, Jr. 2003. "Incorporating Skewness and Kurtosis in Portfolio Optimization: A Multideminsional Efficient Set." In *Advances in Portfolio Construction and Implementation*, edited by Stephen Satchell and Alan Scowcroft. Oxford, UK: Butterworth–Heinemann.

Beardsley, Xiaoxin W., Brian Field, and Mingqing Xiao. 2012. "Mean–Variance-Skewness-Kurtosis Portfolio Optimization with Return and Liquidity." *Communications in Mathematical Finance*, vol. 1, no. 1: 13–49.

Black, Fischer. 1972. "Capital market equilibrium with restricted borrowing." *Journal of Business*, vol. 45, no. 3: 444–455.

Black, Fischer, and Robert Litterman. 1990. "Asset Allocation: Combining Investors Views with Market Equilibrium." Fixed Income Research, Goldman, Sachs & Company, September.

Black, Fischer, and Robert Litterman. 1991. "Global Asset Allocation with Equities, Bonds, and Currencies." Fixed Income Research, Goldman, Sachs & Company, October.

Black, Fischer, and Robert Litterman. 1992. "Global Portfolio Optimization." *Financial Analysts Journal*, vol. 48, no. 5 (September/October): 28–43.

Blanchett, David M., and Philip U. Straehl. 2015. "No Portfolio is an Island." *Financial Analysts Journal*, vol. 71, no. 3 (May/June): 15–33.

Briec, W., K. Kerstens, and O. Jokung. 2007. "Mean–Variance-Skewness Portfolio Performance Gauging: A General Shortage Function and Dual Approach." *Management Science*, vol. 53, no. 1 (January): 135–149.

Brunel, Jean L.P. 2003. "Revisiting the Asset Allocation Challenge through a Behavioral Finance Lens." *Journal of Wealth Management*, vol. 6, no. 2 (Fall): 10–20.

Brunel, Jean L.P. 2005. "A Behavioral Finance Approach to Strategic Asset Allocation—A Case Study." *Journal of Investment Consulting*, vol. 7, no. 3 (Winter): 61–69.

Chhabra, Ashvin. 2005. "Beyond Markowitz: A Comprehensive Wealth Allocation Framework for Individual Investors." *Journal of Wealth Management*, vol. 7, no. 4 (Spring): 8–34.

Chow, George, Eric Jacquier, Mark Kritzman, and Kenneth Lowry. 1999. "Optimal Portfolios in Good Times and Bad." *Financial Analysts Journal*, vol. 55, no. 3 (May/June): 65–73.

Curtis, Gregory. 2012. "Yale versus Norway." White Paper 55, Greycourt (September).

Das, Sanjiv, Harry Markowitz, Jonathan Scheid, and Meir Statman. 2010. "Portfolio Optimization with Mental Accounts." *Journal of Financial and Quantitative Analysis*, vol. 45, no. 2 (April): 311–334.

Das, Sanjiv, Harry Markowitz, Jonathan Scheid, and Meir Statman. 2011. "Portfolios for Investors Who Want to Reach Their Goals While Staying on the Mean–Variance Efficient Frontier." *Journal of Wealth Management*, vol. 14, no. 2 (Fall): 25–31.

Davies, Ryan, Harry M. Kat, and Sa Lu. 2009. "Fund of Hedge Funds Portfolio Selection: A Multiple-Objective Approach." *Journal of Derivatives & Hedge Funds*, vol. 15, no. 2: 91–115.

DeMiguel, V., L. Garlappi, and R. Uppal. 2009. "Optimal versus Naive Diversification: How Inefficient Is the 1/*N* Portfolio Strategy?" *Review of Financial Studies*, vol. 22, no. 5: 1915–1953.

DiBartolomeo, Dan. 1993. "Portfolio Optimization: The Robust Solution." Prudential Securities Quantitative Conference. Available online at http://www.northinfo.com/documents/45.pdf

Doeswijk, Ronald, Trevin Lam, and Laurens Swinkels. 2014. "The Global Multi-Asset Market Portfolio, 1959–2012." *Financial Analysts Journal*, vol. 70, no. 2 (March/April): 26–41.

Dybvig, Philip H. 2005. "Mean-variance portfolio rebalancing with transaction costs." Working paper, Washington University in Saint Louis.

Elton, Edwin J, and Martin J. Gruber. 1992. "Optimal Investment Strategies with Investor Liabilities." *Journal of Banking & Finance*, vol. 16, no. 5: 869–890.

Gannon, James A., and Bob Collins. 2009. "Liability-Responsive Asset Allocation." Russell Research Viewpoint.

Goldberg, Lisa R., Michael Y. Hayes, and Ola Mahmoud. 2013. "Minimizing Shortfall." *Quantitative Finance*, vol. 13, no. 10: 1533–1545.

Grable, John E. 2008. "RiskCAT: A Framework for Identifying Maximum Risk Thresholds in Personal Portfolios." *Journal of Financial Planning*, vol. 21, no. 10: 52–62.

Grable, John E., and Soo-Hyun Joo. 2004. "Environmental and Biopsychosocial Factors Associated with Financial Risk Tolerance." *Financial Counseling and Planning*, vol. 15, no. 1: 73–88.

Harvey, Campbell R., John C. Liechty, Merrill W. Liechty, and Peter Müller. 2010. "Portfolio Selection with Higher Moments." *Quantitative Finance*, vol. 10, no. 5 (May): 469–485.

Idzorek, Thomas. 2008. "Lifetime Asset Allocations: Methodologies for Target Maturity Funds." Ibbotson Associates Research Report.

Idzorek, Thomas M., and Maciej Kowara. 2013. "Factor-Based Asset Allocation vs. Asset-Class-Based Asset Allocation." *Financial Analysts Journal*, vol. 69, no. 3 (May/June): 19–29.

Jobson, David J., and Bob Korkie. 1980. "Estimation for Markowitz Efficient Portfolios." *Journal of the American Statistical Association*, vol. 75, no. 371 (September): 544–554.

Jobson, David J., and Bob Korkie. 1981. "Putting Markowitz Theory to Work." *Journal of Portfolio Management*, vol. 7, no. 4 (Summer): 70–74.

Jorion, Phillipe. 1992. "Portfolio Optimization in Practice." *Financial Analysts Journal*, vol. 48, no. 1 (January/February): 68–74.

Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica*, vol. 47, no. 2: 263–292.

Kat, Harry M. 2003. "10 Things That Investors Should Know about Hedge Funds." *Journal of Wealth Management*, vol. 5, no. 4 (Spring): 72–81.

Leibowitz, Martin L., and Roy D. Henriksson. 1988. "Portfolio Optimization Within a Surplus Framework." *Financial Analysts Journal*, vol. 44, no. 2: 43–51.

Leland, Hayne. 2000. "Optimal Portfolio Implementation with Transaction Costs and Capital Gains Taxes." Working paper, University of California, Berkeley.

Luenberger, David G. 2013. *Investment Science*, 2nd ed. New York: Oxford University Press.

Markowitz, Harry M. 1952. "Portfolio Selection." *Journal of Finance*, vol. 7, no. 1 (March): 77–91.

Markowitz, Harry M. 1959. *Portfolio Selection: Efficient Diversification of Investments*. New York: John Wiley & Sons.

Maslow, A. H. 1943. "A Theory of Human Motivation." *Psychological Review*, vol. 50, no. 4: 370–396.

Masters, Seth J. 2003. "Rebalancing." *Journal of Portfolio Management*, vol. 29, no. 3: 52–57.

McCalla, Douglas B. 1997. "Enhancing the Efficient Frontier with Portfolio Rebalancing." *Journal of Pension Plan Investing*, vol. 1, no. 4: 16–32.

Michaud, Richard O. 1998. *Efficient Asset Management*. Boston: Harvard Business School Press.

Mulvey, John M. 1989. "A Surplus Optimization Perspective." *Investment Management Review*, vol. 3: 31–39.

Mulvey, John M. 1994. "An Asset-Liability System." *Interfaces*, vol. 24, no. 3: 22–33.

Mulvey, J.M., and W. Kim. 2009. "Constantly Rebalanced Portfolio—Is Mean Reversion Necessary?" in Rama Cont, ed. *Encyclopedia of Quantitative Finance*, vol 2, Hoboken, NJ: John Wiley & Sons.

Mulvey, John M., Bill Pauling, and Ron E. Madey. 2003. "Advantages of Multi-Period Portfolio Models." *Journal of Portfolio Management*, vol. 29, no. 2 (Winter): 35–45.

Nevins, Daniel. 2004. "Goal-Based Investing: Integrating Traditional and Behavioral Finance." *Journal of Wealth Management*, vol. 6, no. 4 (Spring): 8–23.

Pompian, Michael M., and John B. Longo. 2004. "A New Paradigm for Practical Application of Behavioral Finance." *Journal of Wealth Management*, vol. 7, no. 2 (Fall): 9–15.

Rockafellar, R. Tyrrell, and Stanislav Uryasev. 2000. "Optimization of Conditional Value-at-Risk." *Journal of Risk*, vol. 2, no. 3 (Spring): 21–41.

Rudd, Andrew, and Laurence B. Siegel. 2013. "Using an Economic Balance Sheet for Financial Planning." *Journal of Wealth Management*, vol. 16, no. 2 (Fall): 15–23.

Scherer, Bernd. 2002. "Portfolio Resampling: Review and Critique." *Financial Analysts Journal*, vol. 58, no. 6 (November/December): 98–109.

Sharpe, William. 1974. "Imputing Expected Security Returns from Portfolio Composition." *Journal of Financial and Quantitative Analysis*, vol. 9, no. 3 (June): 463–472.

Sharpe, William, and Lawrence G. Tint. 1990. "Liabilities: A New Approach." *Journal of Portfolio Management*, vol. 16, no. 2: 5–10.

Shefrin, H., and M. Statman. 2000. "Behavioral Portfolio Theory." *Journal of Financial and Quantitative Analysis*, vol. 35, no. 2: 127–151.

Swensen, D. 2009. *Pioneering Portfolio Management: An Unconventional Approach to Institutional Investment*, 2nd ed. New York: Free Press.

Tversky, Amos, and Daniel Kahneman. 1992. "Advances in prospect theory: Cumulative representation of uncertainty." *Journal of Risk and Uncertainty*, vol. 5, no. 4: 297–323.

Willenbrock, Scott. 2011. "Diversification Return, Portfolio Rebalancing, and the Commodity Return Puzzle." *Financial Analysts Journal*, vol. 67, no. 4 (July/August): 42–49.

Winkelmann, Kurt. 2003. "Developing an Optimal Active Risk Budget," in *Modern Investment Management: An Equilibrium Approach* Bob Litterman, ed. New York: John Wiley & Sons.

Xiong, James X., and Thomas M. Idzorek. 2011. "The Impact of Skewness and Fat Tails on the Asset Allocation Decision." *Financial Analysts Journal*, vol. 67, no. 2 (March/April): 23–35.

Yale University. 2014. "The Yale Endowment 2014" (http://investments.yale.edu/s/Yale_Endowment_14.pdf).

PORTFOLIO MANAGEMENT
STUDY SESSION

9

Asset Allocation and Related Decisions in Portfolio Management (2)

In practice, the asset allocation decision is affected by numerous constraints that present practical challenges to asset allocation. Significant investor-based constraints include investable assets, liquidity needs, time horizon, and regulatory and tax environments.

This study session examines the effects of these constraints and presents adaptations to address them by institutional investor type. Also discussed are behavioral biases that influence the asset allocation process and ways to overcome these biases.

When the strategic asset allocation includes exposure to global markets, non-domestic currencies create additional sources of portfolio volatility and potential returns. How currency exposures can be managed to reflect a client's investment objectives and constraints is explored. To evaluate performance, the asset allocation strategy and its underlying exposures are often measured against specified benchmarks. The session concludes with coverage of market indexes, including their use as performance benchmarks.

READING ASSIGNMENTS

Reading 18	Asset Allocation with Real-World Constranits by Peter Mladina, Brian J. Murphy, CFA, and Mark Ruloff, FSA, EA, CERA
Reading 19	Currency Management: An Introduction by William A. Barker, PhD, CFA
Reading 20	Market Indexes and Benchmarks by C. Mitchell Conover, PhD, CFA, CIPM

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

18

Asset Allocation with Real-World Constraints

by Peter Mladina, Brian J. Murphy, CFA, and Mark Ruloff, FSA, EA, CERA

Peter Mladina is at Northern Trust (USA). Brian J. Murphy, CFA, is at Willis Towers Watson (USA). Mark Ruloff, FSA, EA, CERA (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss asset size, liquidity needs, time horizon, and regulatory or other considerations as constraints on asset allocation;
☐	**b.** discuss tax considerations in asset allocation and rebalancing;
☐	**c.** recommend and justify revisions to an asset allocation given change(s) in investment objectives and/or constraints;
☐	**d.** discuss the use of short-term shifts in asset allocation;
☐	**e.** identify behavioral biases that arise in asset allocation and recommend methods to overcome them.

INTRODUCTION

1

This reading illustrates ways in which the asset allocation process must be adapted to accommodate specific asset owner circumstances and constraints. It addresses adaptations to the asset allocation inputs given an asset owner's asset size, liquidity, and time horizon as well as external constraints that may affect the asset allocation choice (Section 2). We also discuss the ways in which taxes influence the asset allocation process for the taxable investor (Section 3). In addition, we discuss the circumstances that should trigger a re-evaluation of the long-term strategic asset allocation (Section 4), when and how an asset owner might want to make short-term shifts in asset allocation (Section 5), and how innate investor behaviors can interfere with successful long-term planning for the investment portfolio (Section 6). Throughout the reading, we illustrate the application of these concepts using a series of hypothetical investors.

© 2017 CFA Institute. All rights reserved.

2 CONSTRAINTS IN ASSET ALLOCATION

General asset allocation principles assume that all asset owners have equal ability to access the entirety of the investment opportunity set, and that it is merely a matter of finding that combination of asset classes that best meets the wants, needs, and obligations of the asset owner. In practice, however, it is not so simple. An asset owner must consider a number of constraints when modeling and choosing among asset allocation alternatives. Some of the most important are asset size, liquidity needs, taxes, and time horizon. Moreover, regulatory and other external considerations may influence the investment opportunity set or the optimal asset allocation decision.

2.1 Asset Size

The size of an asset owner's portfolio has implications for asset allocation. It may limit the opportunity set—the asset classes accessible to the asset owner—by virtue of the scale needed to invest successfully in certain asset classes or by the availability of investment vehicles necessary to implement the asset allocation.

Economies and diseconomies of scale are perhaps the most important factors relevant to understanding asset size as a constraint. The size of an asset owner's investment pool may be too small—or too large—to capture the returns of certain asset classes or strategies efficiently. Asset owners with larger portfolios can generally consider a broader set of asset classes and strategies. On the one hand, they are more likely to have sufficient governance capacity—sophistication and staff resources—to develop the required knowledge base for the more complex asset classes and investment vehicles. They also have sufficient size to build a diversified portfolio of investment strategies, many of which have substantial minimum investment requirements. On the other hand, some asset owners may have portfolios that are *too* large; their desired minimum investment may exhaust the capacity of active external investment managers in certain asset classes and strategies. Although "too large" and "too small" are not rigidly defined, the following example illustrates the difficulty of investing a very large portfolio. Consider an asset owner with an investment portfolio of US$25 billion who is seeking to make a 5% investment in global small-cap stocks:

- The median total market capitalization of the stocks in the S&P Global SmallCap is approximately US$555 million.
- Assume a small-cap manager operates a 50-stock portfolio and is willing to own 3% of the market cap of any one of its portfolio companies. Their average position size would be US$17 million, and an effective level of assets under management (AUM) would be on the order of US$850 million. Beyond that level, the manager may be forced to expand the portfolio beyond 50 stocks or to hold position sizes greater than 3% of a company's market cap, which could then create liquidity issues for the manager.
- Now, our US$25 billion fund is looking to allocate US$1.25 billion to small-cap stocks (US$25 billion × 5%). They want to diversify this allocation across three or four active managers—a reasonable allocation of governance resources in the context of all of the fund's investment activities. The average allocation per manager is approximately US$300 to US$400 million, which would constitute between 35% and 50% of each manager's AUM. This exposes both the asset owner and the investment manager to an undesirable level of operational risk.

Although many large asset owners have found effective ways to implement a small-cap allocation, this example illustrates some of the issues associated with managing a large asset pool. These include such practical considerations as the number of

investment managers that might need to be hired to fulfill an investment allocation and the ability of the asset owner to identify and monitor the required number of managers.

Research has shown that investment managers tend to incur certain disadvantages from increasing scale: Growth in AUM leads to larger trade sizes, incurring greater price impact; capital inflows may cause active investment managers to pursue ideas outside of their core investment theses; and organizational hierarchies may slow down decision making and reduce incentives.[1] Asset *owners,* however, are found to have *increasing* returns to scale, as discussed below.

A study of pension plan size and performance (using data spanning 1990–2008) found that large defined benefit plans outperformed smaller ones by 45–50 basis points per year on a risk-adjusted basis.[2] The gains are derived from a combination of cost savings related to internal management, a greater ability to negotiate fees with external managers, and the ability to support larger allocations to private equity and real estate investments. As fund size increases, the "per participant" costs of a larger governance infrastructure decline and the plan sponsor can allocate resources away from such asset classes as small-cap stocks, which are sensitive to diseconomies of scale, to such other areas as private equity funds or co-investments where they are more likely to realize scale-related benefits.

Whereas owners of large asset pools may achieve these operating efficiencies, scale may also impose obstacles related to the liquidity and trading costs of the underlying asset. Above some size, it becomes difficult to deploy capital effectively in certain active investment strategies. As illustrated in Exhibit 1, owners of very large portfolios may face size constraints in allocating to active equity strategies. The studies referenced earlier noted that these asset owners frequently choose to invest passively in developed equity markets where their size inhibits alpha potential. The asset owner's finite resources can then be allocated instead toward such strategies as private equity, hedge funds, and infrastructure, where their scale and resources provide a competitive advantage.

Exhibit 1 Asset Size and Investor Constraints

Asset Class	Investor Constraints by Size
■ Cash equivalents and money market funds	No size constraints.
■ Large-cap developed market equity ■ Small-cap developed market equity ■ Emerging market equity	Generally accessible to large and small asset owners, although the very large asset owner may be constrained in the amount of assets allocated to certain active strategies and managers.

(continued)

1 See Stein (2002); Chen, Hong, Huang, and Kubik (2004); and Pollet and Wilson (2008).

2 See Dyck and Pomorski (2011). The median plan in this study was just over US$2 billion. The 25th percentile plan was US$780 million, and the 75th percentile plan was US$6.375 billion.

Exhibit 1 (Continued)

Asset Class	Investor Constraints by Size
■ Developed market sovereign bonds ■ Investment-grade bonds ■ Non-investment-grade bonds ■ Private real estate equity	Generally accessible to large and small asset owners, although to achieve prudent diversification, smaller asset owners may need to implement via a commingled vehicle.
Alternative Investments ■ Hedge funds ■ Private debt ■ Private equity ■ Infrastructure ■ Timberland and farmland	May be accessible to large and small asset owners, although if offered as private investment vehicles, there may be legal minimum qualifications that exclude smaller asset owners. The ability to successfully invest in these asset classes may also be limited by the asset owner's level of investment understanding/expertise. Prudent diversification may require that smaller asset owners implement via a commingled vehicle, such as a fund of funds, or an ancillary access channel, such as a liquid alternatives vehicle or an alternatives ETF. For very large funds, the allocation may be constrained by the number of funds available.

Even in these strategies, very large asset owners may be constrained by scale. In smaller or less liquid markets, can a large asset owner invest enough that the exposure contributes a material benefit to the broader portfolio? For example, a sovereign wealth fund or large public pension plan may not find enough attractive hedge fund managers to fulfill their desired allocation to hedge funds. True alpha is rare, limiting the opportunity set. Asset owners who find that they have to split their mandate into many smaller pieces may end up with an index-like portfolio but with high active management fees; one manager's active bets may cancel out those of another active manager. A manager mix with no true alpha becomes index-like because the uncompensated, idiosyncratic return variation is diversified away. A much smaller allocation may be achievable, but it may be too small to meaningfully affect the risk and return characteristics of the overall portfolio. More broadly, a very large size makes it more difficult to benefit from opportunistic investments in smaller niche markets or from skilled investment managers who have a small set of unique ideas or concentrated bets. No hard and fast rules exist to determine whether a particular asset owner is too small or too large to effectively access an asset class. Greater governance resources more commonly found among owners of larger asset pools create the capacity to pursue the more complex investment opportunities, but the asset owner may still need to find creative ways to implement the desired allocation. Each asset owner has a unique set of knowledge and constraints that will influence the opportunity set.

Smaller asset owners (typically institutions with less than US$500 million in assets, and private wealth investors with less than US$25 million in assets) also find that their opportunity set may be constrained by the size of their investment portfolio. This is primarily a function of the more limited governance infrastructure typical of smaller asset owners: They may be too small to adequately diversify across the range of asset classes and investment managers or may have staffing constraints (insufficient asset size to justify a dedicated internal staff). Complex strategies may be beyond the reach of asset owners that have chosen not to develop investment expertise internally or where the oversight committee lacks individuals with sufficient investment understanding. In some asset classes and strategies, commingled investment vehicles can be used to achieve the needed diversification, provided the governing documents do not prohibit their use.

Access to other asset classes and strategies—private equity, private real estate, hedge funds, and infrastructure—may still be constrained for smaller asset owners. The commingled vehicles through which these strategies are offered typically require high minimum investments. For successful private equity and hedge fund managers, in particular, minimum investments can be in the tens of millions of (US) dollars, even for funds of funds.

Regulatory restrictions can also impose a size constraint. In the United Kingdom, for example, an asset owner in a private investment vehicle must qualify as an elective professional client, meaning they must meet two of the following three conditions:

1. The client has carried out transactions, in significant size, on the relevant market at an average frequency of 10 per quarter over the previous four quarters.
2. The size of the client's financial instrument portfolio exceeds €500,000.
3. The client works or has worked in the financial sector for at least one year in a professional position, which requires knowledge of the transactions or services envisaged.

In the United States, investors must be either accredited or qualified purchasers to invest in many private equity and hedge fund vehicles. To be a qualified purchaser, a natural person must have at least US$5 million in investments, a company must have at least US$25 million in investable assets, and an investment manager must have at least US$25 million under management. In Hong Kong, the Securities and Futures Commission requires that an investor must meet the qualifications of a "Professional Investor" to invest in certain categories of assets. A Professional Investor is generally defined as a trust with total assets of not less than HK$40 million, an individual with a portfolio not less than HK$8 million, or a corporation or partnership with a portfolio not less than HK$8 million or total assets of not less than HK$40 million. The size constraints related to these asset classes suggest that smaller asset owners have real challenges achieving an effective private equity or hedge fund allocation.

Asset size as a constraint is often a more acute issue for individual investors than institutional asset owners. Wealthy families may pool assets through such vehicles as family limited partnerships, investment companies, fund of funds, or other forms of commingled vehicles to hold their assets. These pooled vehicles can then access investment vehicles, asset classes, and strategies that individual family members may not have portfolios large enough to access on their own.

Where Asset Size Constrains Investment Opportunity

As of early 2016, the 10 largest sovereign wealth funds globally each exceed US$400 billion in assets. For a fund of this size, a 5% allocation to hedge funds (the average sovereign wealth fund allocation) would imply US$20 *billion* to be deployed. The global hedge fund industry manages approximately US$2.8 trillion in total; 73% of the funds manage less than US$100 million. The remaining 27% of the funds (roughly 3,000) manage 72% of the industry's AUM; their implied average AUM is therefore US$670 million. If we assume that the asset owner would want to be no more than 20% of a firm's AUM, we can infer that the average investment might be approximately US$130 million. With US$20 billion to deploy, the fund would need to invest with nearly 150 funds to achieve a 5% allocation to hedge funds.

Sources: Sovereign Wealth Fund Institute, BarclayHedge, Eurekahedge (2016).

EXAMPLE 1

Asset Size Constraints in Asset Allocation

1 Akkarat Aromdee is the recently retired President of Alpha Beverage, a producer and distributor of energy drinks throughout Southeast Asia. Upon retiring, the company provided a lump sum retirement payment of THB880,000,000 (equivalent to €20 million), which was rolled over to a tax-deferred individual retirement savings plan. Aside from these assets, Aromdee owns company stock worth about THB70,000,000. The stock is infrequently traded. He has consulted with an investment adviser, and they are reviewing the following asset allocation proposal:

Global equities	40%
Global high-yield bonds	15%
Domestic intermediate bonds	30%
Hedge funds	10%
Private equity	5%

Describe asset size constraints that Aromdee might encounter in implementing this asset allocation. Discuss possible means to address them.

2 The CAF$40 billion Government Petroleum Fund of Cafastan is overseen by a nine-member Investment Committee. The chief investment officer has a staff with sector heads in global equities, global bonds, real estate, hedge funds, and derivatives. The majority of assets are managed by outside investment managers. The Investment Committee, of which you are a member, approves the asset allocation policy and makes manager selection decisions. Staff has recommended an increase in the private equity allocation from its current 0% to 15%, to be implemented over the next 12 to 36 months. The head of global equities will oversee the implementation of the private equity allocation.

Given the asset size of the fund, formulate a set of questions regarding the feasibility of this recommendation that you would like staff to address at the next Investment Committee meeting.

3 The Courneuve University Endowment has US$250 million in assets. The current allocation is 65% global large-capitalization stocks and 35% high-quality bonds, with a duration target of 5.0 years. The University has adopted a 5% spending policy. University enrollment is stable and expected to remain so. A capital spending initiative of US$100 million for new science buildings in the next three to seven years is being discussed, but it has not yet been approved. The University has no dedicated investment staff and makes limited use of external resources. Investment recommendations are formulated by the University's treasurer and approved by the Investment Committee, composed entirely of external board members.

The new president of the University has stated that he feels the current policy is overly restrictive, and he would like to see a more diversified program that takes advantage of the types of investment strategies used by large endowment programs. Choosing from among the following asset classes, propose a set of asset classes to be considered in the revised asset allocation. Justify your response.

- Cash equivalents and money market funds
- Large-cap developed market equity
- Small-cap developed market equity
- Emerging market equity
- Developed market sovereign bonds
- Investment-grade bonds
- Non-investment-grade bonds
- Private real estate equity
- Hedge funds
- Private debt
- Private equity

Solution to 1:

With a THB88 million (€2 million) allocation to hedge funds and a THB44 million (€1 million) allocation to private equity funds, Aromdee may encounter restrictions on his eligibility to invest in the private investment vehicles typically used for hedge fund and private equity investment. To the extent he is eligible to invest in hedge funds and/or private equity funds, a fund-of-funds or similar commingled arrangement would be essential to achieving an appropriate level of diversification. Additionally, it is essential that he and his adviser develop the necessary level of expertise to invest in these alternative assets. To achieve a prudent level of diversification, the allocation to global high-yield bonds would most likely need to be accomplished via a commingled investment vehicle.

Solution to 2:

Questions regarding the feasibility of the recommendation include the following:

- How many private equity funds do you expect to invest in to achieve the 15% allocation to private equity?
- What is the anticipated average allocation to each fund?
- Are there a sufficient number of high-quality private equity funds willing to accept an allocation of that size?
- What expertise exists at the staff or board level to conduct due diligence on private equity investment funds?
- What resources does the staff have to oversee the increased allocation to private equity?

Solution to 3:

Asset size and limited governance resources are significant constraints on the investment opportunity set available to the Endowment. The asset allocation should emphasize large and liquid investments, such as cash equivalents, developed and emerging market equity, and sovereign and investment-grade bonds. Some small portion of assets, however, could be allocated to commingled investments in real estate, private equity, or hedge funds. Given the University's limited staff resources, it is necessary to ensure that the board members have the level of expertise necessary to select and monitor these more complex asset classes. The Endowment might also consider engaging an outside expert to advise on investment activities in these asset classes.

2.2 Liquidity

Two dimensions of liquidity must be considered when developing an asset appropriate allocation solution: the liquidity needs of the asset owner and the liquidity characteristics of the asset classes in the opportunity set. Integrating the two dimensions is an essential element of successful investment planning.

The need for liquidity in an investment portfolio will vary greatly by asset owner and by the goals the assets are set aside to achieve. For example, a bank will typically have a very large portfolio supporting its day-to-day operations. That portfolio is likely to experience very high turnover and a very high need for liquidity; therefore, the investment portfolio must hold high-quality, very short-term, and highly liquid assets.

The same bank may have another designated investment pool one level removed from operating assets. Although the liquidity requirements for this portfolio may be lower, the investments most likely feature a high degree of liquidity—a substantial allocation to investment-grade bonds, perhaps with a slight extension of maturity. For its longer-term investment portfolio, the bank may choose to allocate some portion of its portfolio to less liquid investments. The opportunity set for each portfolio will be constrained by applicable banking laws and regulations.

Long-term investors, such as sovereign wealth funds and endowment funds, can generally exploit illiquidity premiums available in such asset classes as private equity, real estate, and infrastructure investments. However, pension plans may be limited in the amount of illiquidity they can absorb. For example, a frozen pension plan may anticipate the possibility of eliminating its pension obligation completely by purchasing a group annuity and relinquishing the responsibility for making pension payments to an insurance company. If there is a significant probability that the company will take this step in the near term, liquidity of plan assets will become a primary concern; and if there is a substantial allocation to illiquid assets, the plan sponsor may be unable to execute the desired annuity purchase transaction.

Liquidity needs must also consider the particular circumstances and financial strength of the asset owner and what resources they may have beyond those held in the investment portfolio. The following examples illustrate this point:

- A university must consider its prospects for future enrollments and the extent to which it relies on tuition to meet operating needs. If the university experiences a significant drop in enrollment, perhaps because of a poor economic environment, or takes on a new capital improvement project, the asset allocation policy for the endowment should reflect the increased probability of higher outflows to support university operations.
- A foundation whose mission supports medical research in a field in which a break-through appears imminent may desire a higher level of liquidity to fund critical projects than would a foundation that supports ongoing community efforts.
- An insurance company whose business is predominantly life or auto insurance, where losses are actuarially predictable, can absorb more liquidity risk than a property/casualty reinsurer whose losses are subject to unpredictable events, such as natural disasters.
- A family with several children nearing college-age will have higher liquidity needs than a couple of the same age and circumstances with no children.

When assessing the appropriateness of any given asset class for a given asset owner, it is wise to evaluate potential liquidity needs in the context of an extreme market stress event. The market losses of the 2008–2009 global financial crisis were extreme. Simultaneously, other forces exacerbated investors' distress: Many university endowments were called upon to provide an increased level of operating support; insurers dipped into reserves to offset operating losses; community foundations found their beneficiaries in even greater need of financial support; and some individual investors experienced setbacks that caused them to move, if only temporarily, from being net contributors to net spenders of financial wealth. A successful asset allocation effort will stress the proposed allocation; it will anticipate, where possible, the likely behavior of other facets of the saving/spending equation during times of stress.

It is also important to consider the intersection of asset class and investor liquidity in the context of the asset owner's governance capacity. Although the mission of the organization or trust may allow for a certain level of illiquidity, if those responsible for the oversight of the investment program do not have the mental fortitude or discipline to maintain course through the crisis, illiquid and less liquid investments are unlikely to produce the rewards typically expected of these exposures. Although rates of return may be mean-reverting, wealth is not. Losses resulting from panic selling during times of stress become permanent losses; there are fewer assets left to earn returns in a post-crash recovery.

The Case of Vanishing Liquidity

In the global financial crisis of 2008–2009, many investors learned painful truths about liquidity. When most needed—whether to rebalance or to meet spending obligations—it can evaporate. As investors liquidated their most liquid assets to meet financial obligations (or to raise cash in fear of further market declines), the remaining less liquid assets in their portfolios became an ever-larger percentage of the portfolio. Many investors were forced to sell private partnership interests on the secondary market at steeply discounted prices. Others defaulted on outstanding private fund capital commitments.[3]

Similarly, illiquidity became a substantial problem during the Asian currency crisis of 1997–1998 and again with the Russian debt default and Long-Term Capital Management (LTCM) crisis of 1998. In the following paragraphs, we describe several "liquidity crises" that are often used in stress testing asset allocation choices.

The Asian Currency Crisis of 1997

In the spring of 1997, Thailand spent billions to defend the Thai baht against speculative attacks, finally capitulating and devaluing the baht in July 1997. This triggered a series of moves throughout the region to defend currencies against speculators. Ultimately, these efforts were unsuccessful and many countries abandoned the effort and allowed their currencies to float freely. The Philippines, Indonesia, and South Korea abandoned their pegs against the US dollar. On 27 October 1997, rattled by the currency crisis, the Hong Kong market fell by about 6% and Asian and European markets declined in advance of the opening of the US markets. The S&P 500 declined nearly 7%, and trading on US stock markets was suspended.

The Russian Debt/LTCM Crisis of August 1998

On 17 August 1998, the Russian government defaulted on its short-term debt. This unprecedented default of a sovereign debtor roiled the global bond markets. A global flight-to-quality ensued, which caused credit spreads to widen and liquidity to evaporate. Highly levered investors experienced significant losses. Long-Term Capital Management, with reported notional exposure of over US$125 billion (a 25-to-1 leverage ratio), exacerbated these price declines as they faced their own liquidity crisis and were forced to liquidate large relative value, distressed, convertible arbitrage, merger arbitrage, and equity positions. Ultimately, the magnitude of the liquidity squeeze for LTCM and the risk of potential disruption to global markets caused the New York branch of the Federal Reserve Bank to orchestrate a disciplined, structured bailout of the LTCM fund.

Financial markets are increasingly linked across borders and asset classes; as a result, changes in liquidity conditions in one country can directly affect liquidity conditions elsewhere. These linkages do improve access to financing and capital markets, but they

3 As an example, Endowment Fund A (EFA) committed US$10 million to Private Equity Fund A (PEF-A) two years ago. Since then, the manager of PEF-A called US$8 million from EFA to make private equity investments. EFA still has a contractual obligation to contribute US$2 million as PEF-A finds investments it plans to add to its portfolio. EFA informs PEF-A that it will not honor the remaining US$2 million capital commitment.

also show that a liquidity problem in one part of the world can ripple across the globe—increasing volatility, creating higher execution costs for investors, and possibly leading to a reduction in credit availability and a decline in economic activity.

EXAMPLE 2

Liquidity Constraints in Asset Allocation

The Frentel Furniture Pension Fund has £200 million frozen in a defined benefit pension plan that is 85% funded. The plan has a provision that allows employees to elect a lump sum distribution of their pension benefit at retirement. The company is strong financially and is committed to fully funding the pension obligations over time. However, they also want to minimize cash contributions to the plan. Few governance resources are allocated to the pension fund, and there is no dedicated staff for pension investment activities. The current asset allocation is as shown:

Global equities	20%
Private equity	10%
Real estate	10%
Infrastructure	5%
Hedge funds	15%
Bonds	40%

The company expects to reduce their employee headcount sometime in the next three to five years, and they are tentatively planning incentives to encourage employees to retire early.

Discuss the appropriateness of the current asset allocation strategy for the pension fund, including benefits and concerns.

Solution:

In addition to the size constraints a £200 million (≈ US$250 million) plan faces when attempting to invest in real estate, private equity, infrastructure, and hedge funds, the likelihood of early retirement incentives and lump-sum distribution requests in the next three to five years indicates a need for increased sensitivity to liquidity concerns. Investments in private equity, infrastructure, and real estate may be unsuitable for the plan given their less liquid nature. Although hedge fund investments would likely be accessible via a commingled vehicle, the liquidity of the commingled vehicle should be evaluated to determine if it is consistent with the liquidity needs of the plan.

2.3 Time Horizon

An asset owner's time horizon is a critical constraint that must be considered in any asset allocation exercise. A liability to be paid at a given point in the future or a goal to be funded by a specified date each define the asset owner's horizon, thus becoming a basic input to the asset allocation solution. The changing composition of the asset owner's assets and liabilities must also be considered. As time progresses, the character of both *assets* (human capital) and *liabilities* changes.

Changing Human Capital When asset allocation considers such extended portfolio assets as human capital, the optimal allocation of financial capital can change through time (Bodie, Merton, and Samuelson 1992). Assuming no change in the investor's utility function, as human capital—with its predominately bond-like risk—declines over time, the asset allocation for financial capital would reflect an increasing allocation to bonds. This is a prime example of how time horizon can influence asset allocation.

Changing Character of Liabilities The changing character of liabilities through time will also affect the asset allocation aligned to fund those liabilities.

As an example, the term structure of liabilities changes as they approach maturity. A pension benefit program is a simple way to illustrate this point. When the employee base is young and retirements are far into the future, the liability can be hedged with long-term bonds. As the employee base ages and prospective retirements are not so far into the future, the liability is more comparable to intermediate- or even short-term bonds. When retirements are imminent, the structure of the liabilities can be characterized as cash-like, and an optimal asset allocation would also have cash-like characteristics.

Similarly, the overall profile of an individual investor's liabilities changes with the progression of time, particularly for investors with finite investment horizons. Nearer-term goals and liabilities move from partially funded to fully funded, while other, longer-term goals and liabilities move progressively closer to funding. As the relative weights of the goals to be funded shift and the time horizon associated with certain goals shortens, the aggregate asset allocation must be adapted if it is to remain aligned with the individual's goals.

Time horizon is also likely to affect the manner in which an investor prioritizes certain goals and liabilities. This will influence the desired risk profile of the assets aligned to fund them. Consider a 75-year-old retired investor with two goals:

1. Fund consumption needs through age 95
2. Fund consumption needs from age 95 through age 105

He most likely assigns a much higher priority to funding goal 1, given the lower probability that he will live beyond age 95.[4] Let's also assume that he has sufficient assets to fund goal 1 and to partially fund goal 2. The higher priority assigned to goal 1 indicates he is less willing to take risk, and this sub-portfolio will be invested more conservatively. Now consider goal 2: Given the low probability of living past 95 and the fact that he does not currently have sufficient assets to fund that goal, the sub-portfolio assigned to goal 2 is likely to have a more growth-oriented asset allocation. The priority of a given goal can change as the investor's time horizon shortens—or lengthens.

Consider the hypothetical investors Ivy and Charles Lee from the reading "Introduction to Asset Allocation." Ivy is a 54-year-old life science entrepreneur. Charles is a 55-year-old orthopedic surgeon. They have two unmarried children aged 25 (Deborah) and 18 (David). Deborah has a daughter with physical limitations. Four goals have been identified for the Lees:

1. Lifestyle/future consumption needs
2. College education for son David, 18 years old
3. Charitable gift to a local art museum in 5 years
4. Special needs trust for their granddaughter, to be funded at the death of Charles

4 A 75-year-old US American male has a life expectancy of 11.3 years, per the Social Security Administration's 2013 "Actuarial Life Tables," https://www.ssa.gov/oact/STATS/table4c6.html.

The lifestyle/consumption goal is split into three components: required minimum consumption requirements (a worst-case scenario of reduced lifestyle), baseline consumption needs (maintaining current standard of living), and aspirational consumption needs (an improved standard of living). At age 54, the risk preferences assigned to these goals might look something like the following:

Lifestyle Goals	Risk Preference	Asset Allocation	Sub-Portfolio as % of Total*
Required minimum	Conservative	100% bonds and cash	65%
Baseline	Moderate	60% equities/40% bonds	10%
Aspirational	Aggressive	100% equities	4%
College education	Conservative	100% bonds and cash	1%
Charitable gift (aspirational)	Aggressive	100% equities	5%
Special needs trust	Moderate	60% equities/40% bonds	15%
Aggregate portfolio		≈ 25% equities/75% bonds and cash	100%

* The present value of each goal as a proportion of the total portfolio.

The asset allocation for the total portfolio aggregates the asset allocations for each of the goal-aligned sub-portfolios, weighted by the present value of each goal. For the Lees, this is an overall asset allocation of about 25% equities and 75% bonds and cash. (Each goal is discounted to its present value by expected return of its respective goal-aligned sub-portfolio.)

Move forward 20 years. The Lees are now in their mid-70s, and their life expectancy is about 12 years. Their son has completed his college education and is successfully established in his own career. The charitable gift has been made. These two goals have been realized. The assets needed to fund the baseline consumption goal are significantly reduced because fewer future consumption years need to be funded. The special needs trust for their granddaughter remains a high priority. Although the Lee's risk preferences for these goals have not changed, the overall asset allocation *will* change because the total portfolio is an aggregated mix of the remaining goal-aligned sub-portfolios, weighted by their current present values:

Lifestyle Goals	Risk Preference	Asset Allocation	Sub-Portfolio as % of Total*
Required minimum	Conservative	100% bonds and cash	54%
Baseline	Moderate	60% equities/40% bonds	9%
Aspirational	Aggressive	100% equities	3%
Special needs trust	Moderate	60% equities/40% bonds	34%
Aggregate portfolio		≈ 30% equities/70% bonds and cash	100%

* The present value of each goal as a proportion of the total portfolio. The implied assumption is that current assets are sufficient to fund all goals, provided the Lees adopt an aggressive asset allocation strategy for the aspirational and charitable gifting goals. If the value of current assets exceeds the present value of all goals, the Lees would have greater flexibility to adopt a lower risk preference for some or all goals.

Although for ease of illustration our example assumed the Lee's risk preferences remained the same, this is not likely to be the case in the real world. Required minimum and baseline consumption goals would remain very important; there is less flexibility to withstand losses caused by either reduced earnings potential or lower likelihood of the market regaining lost ground within the shorter horizon. The aspirational lifestyle goal is likely to be a much lower priority, and it may have been eliminated altogether. The special needs trust may have a higher (or lower) priority as the needs of the granddaughter and the ability of her parents to provide for her needs after their death become more evident. The preferred asset allocation for each of these goals will shift over the course of the investor's lifetime.

As an investor's time horizon shifts, both human capital and financial market considerations, along with changes in the investor's priorities, will most likely lead to different asset allocation decisions.

EXAMPLE 3

Time Horizon Constraints in Asset Allocation

Akkarat Aromdee, the recently retired President of Alpha Beverage, is 67 years old with a remaining life expectancy of 15 years. Upon his retirement two years ago, he established a charitable foundation and funded it with THB600 million (≈ US$17.3 million). The remaining financial assets, THB350 million (≈ US$10 million), were transferred to a trust that will allow him to draw a lifetime income. The assets are invested 100% in fixed-income securities, consistent with Aromdee's desire for a high level of certainty in meeting his goals. He is a widower with no children. His consumption needs are estimated at THB20 million annually. Assets remaining in the trust at his death will pass to the charities named in the trust.

While vacationing in Ko Samui, Aromdee met and later married a 45-year-old woman with two teenage children. She has limited financial assets of her own. Upon returning from his honeymoon, Aromdee meets with his investment adviser. He intends to pay the college expenses of his new stepchildren—THB2 million annually for eight years, beginning five years from now. He would also like to ensure that his portfolio can provide a modest lifetime income for his wife after his death.

Discuss how these changed circumstances are likely to influence Aromdee's asset allocation.

Solution:

At the time Aromdee established the trust, the investment horizon was 15 years and his annual consumption expenditures could easily be funded from the trust. His desire to support his new family introduces two new horizons to be considered: In five years, the trust will begin making annual payments of THB2 million to fund college expenses, and the trust will continue to make distributions to his wife after his death, though at a reduced rate. When the trust needed to support only his consumption requirements, a conservative asset allocation was appropriate. However, the payment of college expenses will reduce his margin of safety and the lengthening of the investment horizon suggests that he should consider adding equity-oriented investments to the asset mix to provide for growth in assets over time.

Time Diversification of Risk

In practice, investors often align lower risk/lower return assets with short-term goals and liabilities and higher risk/higher return assets with long-term goals and liabilities. It is generally believed that longer-horizon goals can tolerate the higher volatility associated with higher risk/higher return assets as below average and above average returns even out over time. This is the notion of time diversification.

Mean–variance optimization, typically conducted using a multi-year time horizon, assumes that asset returns follow a random walk; returns in Year X are independent of returns in Year X – 1. Under this baseline assumption, there *is* no reduction in risk with longer time horizons.[5] Although the *probability* of reduced wealth or of a shortfall in funding a goal or liability (based on the mean of the distribution of possible outcomes) may be lower at longer time horizons, the dispersion of possible outcomes widens as the investment horizon expands. Thus, the *magnitude* of potential loss or shortfall can be greater.

Consider the choice of investing US$100,000 in an S&P 500 Index fund with a 10% expected return and 15% standard deviation versus a risk-free asset with a 3% annual return.[6] The table below compares the return of the risk-free asset over various time horizons, with the range of predicted returns for the S&P 500 Index fund at a 95% confidence interval. Although the *mean* return of the distribution of S&P 500 returns exceeds that of the risk-free asset in each time period (thus the notion that the volatility of higher risk, higher return assets evens out over time), the lower boundary of expected S&P 500 returns is less than the initial investment for all periods less than 10 years! The lower boundary of the S&P 500 outcomes does not exceed the ending wealth of the risk-free investment until the investment horizon is extended to 20 years. If the confidence interval is expanded to 99%, the lower boundary of S&P 500 outcomes falls below the initial investment up until and through 20 years!

	Ending Wealth (US$)		
	S&P 500 95% Confidence Interval		
	Lower Boundary	Upper Boundary	Risk-Free Asset
1 year	81,980	147,596	103,000
5 years	83,456	310,792	115,927
10 years	102,367	657,196	134,392
15 years	133,776	130,4376	155,797
20 years	180,651	2,565,345	180,611

Although one-year returns are largely independent, there is some evidence that risky asset returns can display mean-reverting tendencies over intermediate to longer time horizons. An assumption of mean-reverting risky asset returns would support the conventional arguments for funding long-term goals and liabilities with higher risk/higher return assets, and it would also support a reduction in the allocation to these riskier assets as the time horizon shortens.

2.4 Regulatory and Other External Constraints

Just as an integrated asset/liability approach to asset allocation is likely to result in a different allocation decision than what might have been selected in an asset-only context, external considerations may also influence the asset allocation decision.

5 See Samuelson (1963) and Samuelson (1969).
6 This example is drawn from Kritzman (2015).

Local laws and regulations can have a material effect on an investor's asset allocation decisions. As an example, the capital controls in China make it nearly impossible for Chinese investors to invest in non-domestic equities and bonds.

Pension funds, insurance companies, sovereign wealth funds, and endowments and foundations are each subject to externally imposed constraints that are likely to tilt their asset allocation decision away from what may have been selected in a pure asset/liability context.

2.4.1 *Insurance Companies*

Unlike pension fund or endowment assets—which are legally distinct from the assets of the sponsoring entity—insurance companies' investment activities are an integral part of their day-to-day operations. Although skilled underwriting may be the focus of the firm as the key to profitability, investment returns are often a material contributor to profits or losses. Regulatory requirements and accounting treatment vary from country to country, but insurers are most often highly focused on matching assets to the projected, probabilistic cash flows of the risks they are underwriting. Fixed-income assets, therefore, are typically the largest component of an insurance company's asset base, and investing with skill in this asset class is a key to competitive pricing and success. In some regions, the relevant accounting treatment may be a book value approach, rendering variability in the market pricing of assets to be a secondary consideration as long as an asset does not have to have its book value written down as "other than temporarily impaired" ("OTTI"). Risk considerations for an insurance company include the need for capital to pay policyholder benefits and other factors that directly influence the company's financial strength ratings. Some of the key considerations are risk-based capital measures, yield, liquidity, the potential for forced liquidation of assets to fund negative claims development, and credit ratings.

Additionally, allocations to certain asset classes are often constrained by a regulator. For example, the maximum limit on equity exposure is often 10%, but it ranges as high as 30% in Switzerland and 40% in Chile. Israel and Korea impose a limit of 15% on real estate investments. Restrictions on non-publicly traded securities might also limit the allocation to such assets as private equity, for example, and there may also be limits on the allocation to high-yield bonds. Insurance regulators generally set a minimum capital level for each insurer based on that insurer's mix of assets, liabilities, and risk. Many countries are moving to Solvency II regulatory standards designed to harmonize risk-based capital requirements for insurance companies across countries.[7] Asset classes are often treated differently for purposes of determining whether an insurer meets risk-based capital requirements.

2.4.2 *Pension Funds*

Pension fund asset allocation decisions may be constrained by regulation and influenced by tax rules. Some countries regulate maximum or minimum percentages in certain asset classes. For example, Japanese pension funds must hold a certain minimum percentage of assets in Japanese bonds in order to maintain their tax-exempt status. Mexico limits a plan's investment in foreign securities to no more than 20%; Brazil limits real estate investments to 8%; and China allows real estate investments only through bonds and shares of property companies. Ukraine limits bond investments to no more than 40%.[8]

7 Solvency II is an EU legislative program implemented in all 28 member states, including the United Kingdom, in January 2016. It introduces a new, harmonized EU-wide insurance regulatory regime.
8 OECD, "Annual Survey of Investment Regulation of Pension Funds" (2014).

Pension funds are also subject to a wide array of funding, accounting, reporting, and tax constraints that may influence the asset allocation decision. (For example, US public pension funding and public and corporate accounting rules favor equity investments—higher equity allocations support a higher discount rate—and thus lower pension cost. Loss recognition is deferred until later through the smoothing mechanism.) The plan sponsor's appetite for risk is defined in part by these constraints, and the choice among asset allocation alternatives is often influenced by funding and financial statement considerations, such as the anticipated contributions, the volatility of anticipated contributions, or the forecasted pension expense or income under a given asset allocation scenario. The specific constraints vary by jurisdiction, and companies with plans in multiple jurisdictions must satisfy the rules and regulations of each jurisdiction while making sound financial decisions for the organization as a whole.

Exhibit 2 illustrates how funding considerations may affect the asset allocation decision. In this chart, risk is defined as the probability of contributions exceeding some threshold amount. In this case, the risk threshold is specified as the 95th percentile of the present value of contributions—that point on the distribution of possible contributions (using Monte Carlo simulation) where the plan sponsor can be 95% certain that contributions will not exceed that amount.

Assume that an allocation of 70% equities/30% aggregate bonds represents the most efficient portfolio for the plan sponsor's desired level of risk in an asset optimization framework. In Exhibit 2, we can see that the 70% equity/30% aggregate bond mix (Portfolio A) is associated with a present value (PV) of expected contributions of approximately US$51 million (y-axis) and a 95% confidence level that contributions will not exceed approximately US$275 million (x-axis)—Portfolio A in Exhibit 2. If the plan sponsor were to shift to longer-duration bonds (from aggregate to long bonds) to better match the duration of liabilities—Portfolio D_1 on Exhibit 2—the PV of expected contributions declines by approximately US$5 million and the 95% confidence threshold improves to approximately US$265 million. In fact, Portfolio D_1 results in nearly the lowest PV of contributions for this plan sponsor. (Note that the vertical axis is ordered from highest contributions at the bottom and lowest contributions at the top, consistent with the notion of lower contributions as a better outcome.)

Exhibit 2 Efficient Frontiers Where Risk Is Defined as the Risk of Large Contributions

Now consider Portfolio D_2, 60% equities/40% long bonds. Reducing the equity exposure from 70% to 60% lowers the contribution risk significantly, with only marginally higher expected PV of contributions than Portfolio A. (A lower equity allocation implies a lower expected rate of return, which increases the PV of contributions. However, the lower equity allocation also reduces the probability that less-than-expected returns will lead to unexpectedly large contributions.) The sponsor that wishes to reduce contribution risk is likely to give serious consideration to moving from Portfolio A to Portfolio D_2.

By iterating through various efficient frontiers using different definitions of risk, the sponsor is able to better understand the risk and reward trade-offs of alternative asset allocation choices. The regulatory or tax constraints on minimum and maximum contributions, or on minimum required funded levels, or other values that are important to the plan sponsor, can be factored into the simulations so the sponsor can better understand how these constraints might affect the risk and reward trade-offs.

2.4.3 *Endowments and Foundations*

Endowments and foundations are often established with the expectation that they will exist in perpetuity and thus can invest with a long investment horizon. In addition, the sponsoring entity often has more flexibility over payments from the fund than does a pension plan sponsor or insurance company. As a result, endowments and foundations generally can adopt a higher-risk asset allocation than other institutions. However, two categories of externally imposed constraints may influence the asset allocation decisions of an endowment or foundation: tax incentives and credit-worthiness considerations.

- *Tax incentives.* Although some endowments and foundations—US public foundations and some Austrian and Asian foundations, for example—are not required to make minimum distributions, many countries provide tax benefits tied to certain minimum spending requirements. For example, a private foundation may be subject to a requirement that it make charitable expenditures equal to at least 5% of the market value of its assets each year or risk losing its tax-favored status. These spending requirements may be relaxed if certain types

of socially responsible investments are made, which can, in turn, create a bias toward socially responsible investments for some endowments and foundations, irrespective of their merits in an asset allocation context.

- *Credit considerations.* Although endowments and foundations typically have a very long investment horizon, sometimes external factors may restrict the level of risk-taking in the portfolio. For example, endowment or foundation assets are often used to support the balance sheet and borrowing capabilities of the university or the foundation organization. Lenders often require that the borrower maintain certain minimum balance sheet ratios. Therefore, the asset allocation adopted by the organization will consider the risks of breaking these bond covenants or otherwise negatively affecting the borrowing capabilities of the organization.

As an example, although a hospital foundation fund would normally have a long investment horizon and the ability to invest in less liquid asset classes, it might limit the allocation to illiquid assets in order to support certain liquidity and balance sheet metrics specified by its lender(s).

2.4.4 *Sovereign Wealth Funds*

Although every sovereign wealth fund (SWF) is unique with respect to its mission and objectives, some broad generalizations can be made with respect to the external constraints that may affect a fund's asset allocation choices. In general, SWFs are government-owned pools of capital invested on behalf of the peoples of their states or countries, investing with a long-term orientation. They are not generally seeking to defease a set of liabilities or known obligations as is common with pension funds and, to a lesser extent, endowment funds.

The governing entities adopt regulations that constrain the opportunity set for asset allocation. For example, the Chilean SWF may hold no more than 7% in equities; the Korean SWF KIC cannot invest in Korean won-denominated assets; and the Norwegian SWF NBIM is not permitted to invest in any alternative asset class other than real estate, which is limited to no more than 10% of assets. Furthermore, as publicly owned entities, SWFs are typically subject to broad public scrutiny and tend to adopt a lower-risk asset allocation than might otherwise be considered appropriate given their long-term investment horizon in order to avoid reputation risk.

In addition to the broad constraints of asset size, liquidity, time horizon, and regulations, there may be cultural or religious factors which also constrain the asset allocation choices. Environmental, social, and governance (ESG) considerations are becoming increasingly important to institutional and individual investors alike. Sharia law, for example, prohibits investment in any business that has links to pork, alcohol, tobacco, pornography, prostitution, gambling, or weaponry, and it constrains investments in most businesses that operate on interest payments (like major Western banks and mortgage providers) and in businesses that transfer risk (such as major Western insurers).[9]

ESG goals are not typically modeled during the asset allocation decision process. Instead, these goals may be achieved through the implementation of the asset allocation, or the asset owner may choose to set aside a targeted portion of the assets for these missions. The asset allocation process would treat this "set-aside" in much the same way that a concentrated stock position might be handled: The risk, return, and correlation characteristics of this holding are specified; the "set aside" asset becomes an asset class in the investor's opportunity set; and the asset allocation constraints will designate a certain minimum investment in this asset class.

9 Islamic Investment Network (www.islamicinvestmentnetwork.com/sharialaw.php).

EXAMPLE 4

External Constraints and Asset Allocation

1 An insurance company has traditionally invested its pension plan using the asset allocation strategy adopted for its insurance assets: The pension assets are 95% invested in high-quality intermediate duration bonds and 5% in global equities. The duration of pension liabilities is approximately 25 years. Until now, the company has always made contributions sufficient to maintain a fully funded status. Although the company has a strong capability to fund the plan adequately and a relatively high tolerance for variability in asset returns, as part of a refinement in corporate strategy, management is now seeking to reduce long-term expected future cash contributions. Management is willing to accept more risk in the asset return, but they would like to limit contribution risk and the risk to the plan's funded status. The Investment Committee is considering three asset allocation proposals for the pension plan:

   A Maintain the current asset allocation with the same bond portfolio duration.

   B Increase the equity allocation and lengthen the bond portfolio duration to increase the hedge of the duration risk in the liabilities.

   C Maintain the current asset allocation of 95% bonds and 5% global equities, but increase the duration of bond investments.

   Discuss the merits of each proposal.

2 A multinational corporation headquartered in Mexico has acquired a former competitor in the United States. It will maintain both the US pension plan with US$250 million in assets and the Mexican pension plan with MXN$18,600 million in assets (≈ US$1 billion). Both plans are 95% funded and have similar liability profiles. The Mexican pension trust has an asset allocation policy of 30% equities (10% invested in the Mexican equity market and 20% in equity markets outside Mexico), 10% hedge funds, 10% private equity, and 50% bonds. The treasurer has proposed that the company adopt a consistent asset allocation policy across all of the company's pension plans worldwide.

   Critique the treasurer's proposal.

Solution to 1:

Given the intermediate duration bond allocation, Proposal A fails to consider the mismatch between pension assets and liabilities and risks a reduction in the funded status and *increased* contributions if bond yields decline. (If yields decline across the curve, the shorter duration bond portfolio will fail to hedge the increase in liabilities.) To meet the objective of lower future contributions, the asset allocation must include a higher allocation to equities. Proposal B has this higher allocation, and the extension of duration in the bond portfolio in Proposal B reduces balance sheet and surplus risk relative to the pension liabilities. The net effect could be a reduction in short-term contribution risk; moreover, if the greater expected return on equities is realized, it should result in reduced contributions to the plan over the long term. Proposal C improves the hedging of the liabilities, and it may result in a modest improvement in the expected return on assets if the yield curve is upward-sloping. However, the expected return on Proposal C is likely lower than the expected return of

Proposal B and is therefore unlikely to achieve the same magnitude of reduction in future cash contributions. Proposal C would be appropriate if the goal was focused on reducing surplus risk rather than reducing long-term contributions.

Solution to 2:

The treasurer's proposal fails to consider the relative asset size of the two pension plans as well as the likelihood that plans in different jurisdictions may be subject to different funding, regulatory, and financial reporting requirements. The US pension plan may be unable to effectively access certain alternative asset classes, such as private equity, infrastructure, and hedge funds. Although economies of scale may be realized if management of the pension assets is consolidated under one team, the legal and regulatory differences of the markets in which they operate mean that the asset allocation policy must be customized to each plan.

3 ASSET ALLOCATION FOR THE TAXABLE INVESTOR

Portfolio theory developed in a frictionless world. But in the real world, taxes on income and capital gains can erode the returns achieved by taxable investors. The asset owner who ignores taxes during the asset allocation process is overlooking an economic variable that can materially alter the outcome. Although tax adjustments can be made after the asset allocation has been determined, this is a suboptimal approach because the pre-tax and after-tax risk and return characteristics of each asset class can be materially different.

Some assets are less tax efficient than others because of the character of their returns—the contribution of interest, dividends, and realized or unrealized capital gains to the total return. Interest income is usually taxed in the tax year it is received, and it often faces the highest tax rates. Therefore, assets that generate returns largely comprised of interest income tend to be less tax efficient in many countries.[10] Jurisdictional rules can also affect how the returns of certain assets are taxed. In the United States, for example, the interest income from state and local government bonds is generally exempt from federal income taxation. As a result, these bonds often constitute a large portion of a US high-net-worth investor's bond allocation. Preferred stocks, often used in lieu of bonds as an income-producing asset, are also eligible for more favorable tax treatment in many jurisdictions, where the income from preferred shares may be taxed at more favorable dividend tax rates.

The tax environment is complex. Different countries have different tax rules and rates, and these rules and rates can change frequently. However, looking across the major economies, there are some high-level commonalities in how investment returns are taxed. Interest income is taxed typically (but not always) at progressively higher income tax rates. Dividend income and capital gains are taxed typically (but not always) at lower tax rates than those applied to interest income and earned income (wages and salaries, for example). Capital losses can be used to offset capital gains (and sometimes income). Generally, interest income incurs the highest tax rate, with dividend income taxed at a lower rate in some countries, and long-term capital gains receive the most favorable tax treatment in many jurisdictions. Once we move beyond these general commonalities, however, the details of tax treatment among countries quickly diverge.

10 See Deloitte's tax guides and country highlights: https://dits.deloitte.com/#TaxGuides.

Entities and accounts can be subject to different tax rules. For example, retirement savings accounts may be tax deferred or tax exempt, with implications for the optimal asset allocation solution. These rules provide opportunities for strategic asset *location*—placing less tax-efficient assets in tax-advantaged accounts.

We will provide a general framework for considering taxes in asset allocation. We will not survey global tax regimes or incorporate all potential tax complexities into the asset allocation solution. When considering taxes in asset allocation, the objective is to model material investment-related taxes, thereby providing a closer approximation to economic reality than is represented when ignoring taxes altogether.

For simplicity, we will assume a basic tax regime that represents no single country but includes the key elements of investment-related taxes that are roughly representative of what a typical taxable asset owner in the major developed economies must contend with.

3.1 After-Tax Portfolio Optimization

After-tax portfolio optimization requires adjusting each asset class's expected return and risk for expected tax. The expected after-tax return is defined in Equation 1:

$$r_{at} = r_{pt}(1 - t) \tag{1}$$

where

r_{at} = the expected after-tax return
r_{pt} = the expected pre-tax (gross) return
t = the expected tax rate

This can be straightforward for bonds in cases where the expected return is driven by interest income. Take, for example, an investment-grade par bond with a 3% coupon expected to be held to maturity. If interest income is subject to a 40% expected tax rate, the bond has an expected after-tax return of 1.80% [0.03(1 – 0.40) = 0.018].

The expected return for equity typically includes both dividend income and price appreciation (capital gains). Equation 2 expands Equation 1 accordingly:

$$r_{at} = p_d r_{pt}(1 - t_d) + p_a r_{pt}(1 - t_{cg}) \tag{2}$$

where

p_d = the proportion of r_{pt} attributed to dividend income
p_a = the proportion of r_{pt} attributed to price appreciation
t_d = the dividend tax rate
t_{cg} = the capital gains tax rate

The treatment of the capital gains portion of equity returns can be more complex. Assuming no dividend income, a stock with an 8% expected pre-tax return that is subject to a 25% capital gains tax rate has an expected after-tax return of 6% [0.08(1 – 0.25) = 0.06]. This is an approximation satisfactory for modeling purposes.[11]

11 A more precise estimation of the expected after-tax return also takes into account the effect of the holding period on the capital gains tax. The 6% expected after-tax return in the example assumes the capital gain is realized and taxed at the end of a 1-year holding period. If the holding period is materially longer than one year, an economic benefit accrues to the investor from the compounding of the deferred capital gains tax liability. This equates to a reduction in the *implied annual* capital gains tax rate that can be used in place of t_{cg} in Equation 2. Other tax complexities can be factored into asset class assumptions—for example, various taxes and tax treatments, expenses, withholding taxes on foreign investments for otherwise tax-exempt investors, and portfolio turnover rates—but these issues are beyond the scope of this reading. For those interested in a more detailed discussion of these issues, see Mladina (2011).

Taxable assets may have existing unrealized capital gains or losses (i.e., the cost basis is below or above market value), which come with embedded tax liabilities (or tax assets). Although there is not a clear consensus on how best to deal with existing unrealized capital gains (losses), many approaches adjust the asset's current market value for the value of the embedded tax liability (asset) to create an after-tax value. Reichenstein (2006) approximates the after-tax value by subtracting the value of the embedded capital gains tax from the market value, as if the asset were sold today. Horan and Al Zaman (2008) assume the asset is sold in the future and discount the tax liability to its present value using the asset's after-tax return as the discount rate. Turvey, Basu, and Verhoeven (2013) argue that the after-tax risk-free rate is the more appropriate discount rate because the embedded tax liability is analogous to an interest-free loan from the government, where the tax liability can be arbitraged away by dynamically investing in the risk-free asset. We will discuss how to incorporate after-tax values into the portfolio optimization process in Section 3.3, where we address strategies to reduce the impact of taxes.

The ultimate purpose of an asset can be a consideration when modeling tax adjustments. In the preceding material on asset allocation, we discussed goals-based investing. If the purpose of a given pool of assets is to fund consumption in 10 years, then that 10-year holding period may influence the estimated implied annual capital gains tax rate. If the purpose of the specified pool of assets is to fund a future gift of appreciated stock to a tax-exempt charity, then capital gains tax may be ignored altogether. Through this alignment of goals with assets, goals-based investing facilitates more-precise tax adjustments.

Although correlation assumptions need not be adjusted when modeling asset allocation choices for the taxable asset owner (taxes are proportional to return, after-tax co-movements are the same as pre-tax co-movements), taxes do affect the standard deviation assumption for each asset class. The expected after-tax standard deviation is defined in Equation 3:

$$\sigma_{at} = \sigma_{pt}(1 - t) \tag{3}$$

where

σ_{at} = the expected after-tax standard deviation
σ_{pt} = the expected pre-tax standard deviation

Taxes alter the distribution of returns by both reducing the expected mean return and muting the dispersion of returns. Taxes truncate both the high and low ends of the distribution of returns, resulting in lower highs and higher lows. The effect of taxes is intuitive when considering a positive return, but the same economics apply to a negative return: Losses are muted by the same $(1 - t)$ tax adjustment. The investor is not taxed on losses but instead receives the economic benefit of a capital loss, whether realized or not. In many countries, a realized capital loss can offset a current or future realized capital gain. An unrealized capital loss captures the economic benefit of a cost basis that is above the current market value, making a portion of expected future appreciation tax free.

How does the optimal asset allocation along a pre-tax efficient frontier compare with the optimal asset allocation along an after-tax efficient frontier? Let's assume all investment assets are taxable and that cost bases equal current market values. Assume also that interest income is taxed at 40%, and dividend income and capital gains are taxed at 25%.

The asset classes we will consider include investment-grade (IG) bonds, high-yield (HY) bonds, and equity. Exhibit 3 shows the expected pre-tax returns and standard deviations for each asset class as well as the correlation matrix.[12]

Exhibit 3 Expected Pre-Tax Return and Risk

	Return	Std. Dev.
IG bonds	3.0%	4.0%
HY bonds	5.0%	10.0%
Equity	8.0%	20.0%

Correlations	IG Bonds	HY Bonds	Equity
IG bonds	1.0	0.2	0.0
HY bonds	0.2	1.0	0.7
Equity	0.0	0.7	1.0

Employing mean–variance portfolio optimization with these pre-tax inputs, we obtain the optimal asset allocations in Exhibit 4, which shows the allocations for portfolios P1 (lowest risk), P25, P50 (median risk), P75, and P100 (highest risk)—each on an efficient frontier comprised of 100 portfolios.

Exhibit 4 Optimal Pre-Tax Asset Mixes

	$P1_{pt}$	$P25_{pt}$	$P50_{pt}$	$P75_{pt}$	$P100_{pt}$
IG bonds	93%	52%	25%	0%	0%
HY bonds	5%	18%	26%	33%	0%
Equity	2%	30%	49%	67%	100%

Using Equations 1, 2, and 3, we calculate the expected after-tax returns and standard deviations displayed in Exhibit 5. No adjustments are made to correlations.

Exhibit 5 Expected After-Tax Return and Risk

	Return	Std. Dev.
IG bonds	1.8%	2.4%
HY bonds	3.0%	6.0%
Equity	6.0%	15.0%

12 For ease of illustration, we have assumed that the investment-grade (IG) and high-yield (HY) bond returns are comprised of 100% interest income. In practice, where bonds may be purchased at a discount or sold in the future for an expected capital gain (or loss), some portion of the expected return would be eligible for capital gains tax treatment. Equation 3 can be modified to accommodate the dual tax treatment of interest income and capital gains, although it would be necessary to make certain assumptions regarding the proportion of returns attributable to capital gains.

Portfolio optimization using these after-tax inputs produces the optimal asset allocations shown in Exhibit 6.

Exhibit 6 Optimal After-Tax Asset Mixes

	$P1_{at}$	$P25_{at}$	$P50_{at}$	$P75_{at}$	$P100_{at}$
IG bonds	92%	60%	38%	16%	0%
HY bonds	7%	7%	7%	7%	0%
Equity	1%	33%	55%	77%	100%

In Exhibit 7, we compare the pre-tax and after-tax efficient frontiers from these previous exhibits. Note that the portfolios at either extreme (P1 and P100) are essentially unchanged after taxes are factored into the assumptions. In portfolios P25, P50, and P75, however, you can see a significant reduction in the allocation to high-yield bonds. This is because of the heavier tax burden imposed on high-yield bonds. Although investment-grade bonds receive the same tax treatment, they are less risky than high-yield bonds and demonstrate a lower correlation with equity, so they continue to play the important role of portfolio risk reduction.

Exhibit 7 Pre-Tax and After-Tax Asset Allocation Comparisons

The optimal after-tax asset allocation depends on the interaction of after-tax returns, after-tax risk, and correlations. If an asset class or strategy is tax inefficient, it can still play a diversifying role in an optimal after-tax asset allocation if the asset or strategy offers sufficiently low correlations. After-tax portfolio optimization helps answer that question.

3.2 Taxes and Portfolio Rebalancing

Among tax-exempt institutional asset owners, periodic portfolio rebalancing—reallocating assets to return the portfolio to its target strategic asset allocation—is an integral part of sound portfolio management. This is no less true for taxable asset owners, but with the important distinction that more frequent rebalancing exposes the taxable asset owner to realized taxes that could have otherwise been deferred or even avoided. Whereas the tax burden incurred by liquidating assets to fund-required

consumption cannot be avoided, rebalancing is discretionary; thus, the taxable asset owner should consider the trade-off between the benefits of tax minimization and the merits of maintaining the targeted asset allocation by rebalancing. The decision to rebalance and incur taxes is driven by each asset owner's unique circumstances.

Because after-tax volatility is less than pre-tax volatility (Equation 3) and asset class correlations remain the same, it takes larger asset class movements to materially alter the risk profile of the taxable portfolio. This suggests that rebalancing ranges for a taxable portfolio can be wider than those of a tax-exempt portfolio with a similar risk profile.

For example, consider a portfolio with a 50% allocation to equity, where equity returns are subject to a 25% tax rate. A tax-exempt investor may establish a target allocation to equities of 50%, with an acceptable range of 40% to 60% (50% plus or minus 10%). A taxable investor with the same target equity allocation can achieve a similar risk constraint with a range of 37% to 63% (50% plus or minus 13%). The equivalent rebalancing range for the taxable investor is derived by adjusting the permitted 10% deviation (up or down) by the tax rate, as shown in Equation 4:

$$R_{at}=R_{pt}/(1-t) \tag{4}$$

where

R_{at} = the after-tax rebalancing range
R_{pt} = the pre-tax rebalancing range

In our example, the 10% rebalancing range for a tax-exempt investor becomes a 13.3% rebalancing range for a taxable investor (when ranges are viewed and monitored from the same gross return perspective):

$$0.10/(1-0.25) = 13.3\%$$

Broader rebalancing ranges for the taxable investor reduce the frequency of trading and, consequently, the amount of taxable gains.

3.3 *Strategies to Reduce Tax Impact*

Additional strategies can be used to reduce taxes, including tax-loss harvesting and choices in the placement of certain types of assets in taxable or tax-exempt accounts (strategic asset location). Tax-loss harvesting is intentionally trading to realize a capital loss, which is then used to offset a current or future realized capital gain in another part of the portfolio, thereby reducing the taxes owned by the investor. It is discussed elsewhere in the curriculum, but we address strategic asset location strategies here.

Strategic asset location refers to placing (or locating) less tax-efficient assets in accounts with more favorable tax treatment, such as retirement savings accounts.

Aggregating assets across accounts with differing tax treatment requires modifying the asset value inputs to the portfolio optimization. Assets held in tax-*exempt* accounts require no tax adjustment to their market values. Assets in tax-*deferred* accounts grow tax free but are taxed upon distribution. Because these assets cannot be distributed (and consumed) without incurring the tax, the tax burden is inseparable from the economic value of the assets. Thus, the after-tax value of assets in a tax-deferred account is defined by Equation 5:

$$v_{at} = v_{pt}(1-t_i) \tag{5}$$

where

v_{at} = the after-tax value of assets
v_{pt} = the pre-tax market value of assets
t_i = the expected income tax rate upon distribution

In our earlier example, we had three asset classes: investment-grade bonds, high-yield bonds, and equities. If we assume that each of these three asset classes can be held in either of two account types—taxable or tax-deferred—then our optimization uses six different after-tax asset classes (three asset classes times two account types). The three asset classes in taxable accounts use the after-tax return and risk inputs derived earlier. The three asset classes in tax-deferred accounts (which grow tax free) use expected pre-tax return and risk inputs. The optimization adds constraints based on the after-tax value of the assets currently available in each account type and derives the optimal after-tax asset allocation and asset location simultaneously.

As a general rule, the portion of a taxable asset owner's assets that are eligible for lower tax rates and deferred capital gains tax treatment should first be allocated to the investor's taxable accounts. For example, equities should generally be held in taxable accounts, while taxable bonds and high-turnover trading strategies should generally be located in tax-exempt and tax-deferred accounts to the extent possible.

One important exception to this general rule regarding asset location applies to assets held for near-term liquidity needs. Because tax-exempt and tax-deferred accounts may not be immediately accessible without tax penalty, a portion of the bond allocation may be held in taxable accounts if its role is to fund near-term consumption requirements.

EXAMPLE 5

Asset Allocation and the Taxable Investor

1 Sarah Moreau, 45 years old, is a mid-level manager at a consumer products company. Her investment portfolio consists entirely of tax-deferred retirement savings accounts. Through careful savings and investments, she is on track to accumulate sufficient assets to retire at age 60. Her portfolio is currently allocated as indicated below:

Investment-grade bonds	20%
High-yield bonds	20%
Common stock–dividend income strategy	30%
Common stock–total return (capital gain) strategy	30%
Total portfolio	100%

The common stock–dividend income strategy focuses on income-oriented, high-dividend-paying stocks; the common stock–total return strategy focuses on stocks that represent good, long-term opportunities but pay little to no dividend. For the purposes of this example, we will assume that the expected long-term return is equivalent between the two strategies. Moreau has a high comfort level with this portfolio and the overall level of risk it entails.

Moreau has recently inherited additional monies, doubling her investable assets. She intends to use this new, taxable portfolio to support causes important to her personally over her lifetime. There is no change in her risk tolerance. She is interviewing prospective investment managers and has asked each to recommend an asset allocation strategy for the new portfolio using the same set of asset classes. She has received the following recommendations:

	Recommendation		
	A	B	C
Investment-grade bonds	20%	40%	30%
High-yield bonds	20%	0%	0%
Common stock–dividend income strategy	30%	30%	0%
Common stock–total return (capital gain) strategy	30%	30%	70%
Total portfolio	100%	100%	100%

Which asset allocation is *most* appropriate for the new portfolio? Justify your response.

2 How should Moreau distribute these investments among her taxable and tax-exempt accounts?

3 You are a member of the Investment Committee for a multinational corporation, responsible for the supervision of two portfolios. Both portfolios were established to fund retirement benefits: One is a tax-exempt defined benefit pension fund, and the other is taxable, holding assets intended to fund non-exempt retirement benefits. The pension fund has a target allocation of 70% equities and 30% fixed income, with a +/– 5% rebalancing range. There is no formal asset allocation policy for the taxable portfolio; it has simply followed the same allocation adopted by the pension portfolio. Because of recent strong equity market returns, both portfolios are now allocated 77% to equities and 23% to bonds. Management expects that the equity markets will continue to produce strong returns in the near term. Staff has offered the following options for rebalancing the portfolios:

A Do not rebalance.

B Rebalance both portfolios to the 70% equity/30% fixed-income target allocation.

C Rebalance the tax-exempt portfolio to the 70% equity/30% fixed-income target allocation, but expand the rebalancing range for the taxable portfolio.

Which recommendation is *most* appropriate? Justify your response.

Solution to 1:

Recommendation C would be the most appropriate asset allocation for the new portfolio. The high-yield bond and common stock–dividend income strategies are tax disadvantaged in a taxable portfolio. (Although investment-grade bonds are also tax disadvantaged, they maintain the role of controlling portfolio risk to maintain Moreau's risk preference.) By shifting this equity-like risk to the total return common stock strategy, Moreau should achieve a greater after-tax return. Given the lower standard deviation characteristics of after-tax equity returns when held in the taxable portfolio, a higher allocation to common stocks may be justified without exceeding Moreau's desired risk level. Recommendations A and B do not consider the negative tax implications of holding the high-yield and/or common stock–dividend income strategies in a taxable portfolio. Recommendation B also fails to consider Moreau's overall risk tolerance: The

volatility of the common stock–capital gain strategy is lower when held in a taxable portfolio, thus a higher allocation to this strategy can enhance returns while remaining within Moreau's overall risk tolerance.[13]

Solution to 2:

If Moreau is willing to think of her investable portfolio as a single portfolio, rather than as independent "retirement" and "important causes" portfolios, she should hold the allocation to high-yield bonds and dividend-paying stocks in her tax-exempt retirement portfolio. In addition, subject to the overall volatility of the individual tax-exempt and taxable portfolios, it would be sensible to bear any increased stock risk in the taxable portfolio. A new optimization for *all* of Moreau's assets—using pre-tax and after-tax risk and return assumptions and subject to the constraint that half of the assets are held in a taxable portfolio and half are held in the tax-exempt portfolio—would more precisely allocate investments across portfolio (account) types.

Asset Location for Optimal Tax Efficiency

	Tax Advantaged Retirement Account	Taxable Account
Investment-grade bonds	X	
High-yield bonds	X	
Common stock–dividend income strategy	X	
Common stock–total return (capital gain) strategy		X

Solution to 3:

Recommendation C is the most appropriate course of action. Rebalancing of the tax-exempt portfolio is unencumbered by tax considerations, and rebalancing maintains the desired level of risk. The rebalancing range for the taxable portfolio can be wider than that of the tax-exempt portfolio based on the desire to minimize avoidable taxes and the lower volatility of after-tax equity returns. Recommendation A (no rebalancing) does not address the increased level of risk in the tax-exempt portfolio that results from the increase in the stock allocation. Recommendation B would create an unnecessary tax liability for the company, given that the portfolio is still operating in a reasonable range of risk when adjusted for taxes.

13 Investment-grade bonds also have lower after-tax volatility. The equivalent risk portfolios in pre-tax and after-tax environments are a function of a complex interaction of after-tax returns, standard deviations, and correlations.

Increasing Allocations to Fixed Income in Corporate Pension Plans

Increasing allocations to fixed income by defined benefit pension funds worldwide have been driven largely by a desire to better hedge plan liabilities. In some countries, accounting standards discourage de-risking. De-risking, however, is not the only argument in favor of a higher fixed-income allocation.

De-risking

There has been much discussion globally of pension plans "de-risking"—moving toward larger fixed-income allocations to better hedge liabilities, thereby reducing contribution uncertainty. Some countries' accounting rules, however—most notably those in the United States—discourage companies from moving in that direction. Under US GAAP accounting rules, for example, a higher allocation to equities allows the plan sponsor to employ a higher return assumption, thereby reducing pension cost, a non-cash expense that directly affects reported income.

For underfunded pension plans, de-risking leads to higher pension contributions. If a company has a weak core business with a higher-than-average probability of going bankrupt and makes only the minimum required contribution, it might be argued that the asset allocation decision was contrary to the interests of plan participants. If the company were to go bankrupt, the participants would get only the benefits covered by any government guaranty program. Had the company taken equity risk in the plan, there would have been a possibility of closing the funding gap, resulting in higher benefit payments.

Efficient Allocation of Risk

A higher allocation to fixed income—and a lower allocation to equity—might also be driven by corporate governance considerations. Pension investment activities are not a core competency of many companies, especially non-financial companies. Assuming that the company has a limited appetite for risk, shareholders might prefer that management allocate its risk budget to the core business of the company where they are expected to have skill, rather than to the pension fund. The rewards per unit of risk should presumably be greater in the company's core business, and the improved profitability should offset the increase in pension contributions required as a result of the lower equity allocation.

A Holistic Approach to Asset Location

Finally, some have argued that an asset allocation of 100% fixed-income securities can be justified on the premise that the company is acting as an agent for the benefit of all stakeholders, including shareholders and plan participants. This argument centers on tax-efficient asset location. A taxable investor—the shareholder and plan participant—should prefer to take his long-term equity risk in that portion of his overall portfolio where he will receive the benefit of lower capital gains rates rather than in tax-deferred accounts, the proceeds of which will be taxed at income tax rates. Consider a small business owner with US$3 million in total assets. The assets are split between a pension fund of which he is the sole participant (US$1 million) and a taxable portfolio (US$2 million). Assume that the asset allocation that represents his preferred level of risk is 67% equities and 33% fixed income. Where should this individual hold his equity exposure? As discussed, the more favorable tax treatment of equity returns argues for holding the equity exposure in his taxable account, while the investments subject to the higher tax rate should be held in the tax-deferred account—the pension plan. Theoretically, this tax efficiency argument can be extended to pension funds operated by publicly traded companies.[14]

14 For those interested in a more detailed discussion of this concept, see "The Case against Stock in Public Pension Funds" (Bader and Gold 2007) or the UBS Q-Series article, "Pension Fund Asset Allocation" (Cooper and Bianco 2003).

4 REVISING THE STRATEGIC ASSET ALLOCATION

An asset owner's strategic asset allocation is not a static decision. Circumstances often arise that justify revisiting the original decision, either to confirm its appropriateness or to consider a change to the current allocation strategy. It is sound financial practice to periodically re-examine the asset allocation strategy even in the absence of one of the external factors discussed next. Many institutional asset owners typically revisit the asset allocation policy at least once every five years through a formal asset allocation study, and all asset owners should affirm annually that the asset allocation remains appropriate given their needs and circumstances.

The circumstances that might trigger a special review of the asset allocation policy can generally be classified as relating to a change in *goals*, a change in *constraints*, or a change in *beliefs*. Among the reasons to review the strategic asset allocation are the following:

Goals

- Changes in business conditions affecting the organization supporting the fund and, therefore, expected changes in the cash flows
- A change in the investor's personal circumstances that may alter her risk appetite or risk capacity

Over an individual's lifespan, or throughout the course of an institutional fund's lifespan, it is unlikely that the investment goals and objectives will remain unchanged. An individual may get married, have children, or become disabled, for example, each of which may have implications for the asset allocation strategy.

Significant changes in the core business of an organization supporting or benefiting from the trust might prompt a re-examination of the asset allocation strategy. For example, an automobile manufacturer that has historically generated a significant portion of its revenues from its consumer finance activities may find that technology is disrupting this source of revenue as more online tools become available to car buyers. With greater uncertainty in its revenue stream, company management may move to reduce risk-taking in the pension fund in order to achieve a goal of reducing the variability in year-to-year contributions.

A university may embark on a long-term capital improvement plan that is reliant on the endowment fund for financial support. Or the university may be experiencing declining enrollments and must lean more heavily on the endowment fund to support its ongoing operational expenditures. The source of funds to a sovereign wealth fund may shrink considerably or even evaporate. When any of these, or similar, events occur or are anticipated, the existing asset allocation policy should be re-evaluated.

Constraints A material change in any one of the constraints mentioned earlier—time horizon, liquidity needs, asset size, or regulatory or other external constraints—is also reason to re-examine the existing asset allocation policy. Some of these changes might include the following:

- Changes in the expected payments from the fund
- A significant cash inflow or unanticipated expenditure
- Changes in regulations governing donations or contributions to the fund
- Changes in time horizon resulting from the adoption of a lump sum distribution option at retirement
- Changes in asset size as a result of the merging of pension plans

Changes in the expected payments from the fund can materially affect the asset allocation strategy. For example, a university reduces its spending policy from 5% to 4% of assets annually; an individual retires early, perhaps for health reasons or an involuntary late-career layoff; or a US corporate pension sponsor reduces or freezes pension benefits because it can no longer afford increasing Pension Benefit Guaranty Corporation[15] premiums. Faced with lower payouts, the university endowment may have greater latitude to invest in less liquid segments of the market. Decisions as to how and where to invest given this greater flexibility should be made within the framework of an asset allocation study to ensure the resulting allocation achieves the optimal trade-off of risk and return.

Similarly, a significant cash inflow has the potential to materially affect the asset allocation strategy. If a university endowment fund with £500 million in assets receives a gift of £100 million, the new monies *could* be invested in parallel with the existing assets, but that fails to consider the increased earning potential of the fund and any spending requirements associated with the donation. Pausing to formally reassess the fund's goals, objectives, constraints, and opportunities through an asset allocation study allows the asset owner to consider more broadly how best to maximize this additional wealth.

A change in regulations may also give rise to a change in asset allocation policy. Examples of regulatory changes that could trigger a re-examination of the asset allocation include the following:

- Regulatory changes in the United States in 2006 mandated a change in the liability discount rate, which resulted in larger pension contributions. With higher required contributions, there was less need to reach for higher investment returns. Many US corporate pension plans began de-risking (adopting an asset allocation strategy focused on hedging the liabilities) to reduce contribution volatility.
- UK tax incentives (30% of social impact investment costs can be deducted from income tax) and relaxed regulations for institutional investors were instituted to encourage socially responsible (impact) investing.

Again, an asset allocation study to objectively evaluate the effect of these changes on the investment opportunity set can help ensure that any new investment strategies adopted are consistent with the fund's overarching goals and objectives.

Beliefs Investment beliefs are a set of guiding principles that govern the asset owner's investment activities. Beliefs are not static, however, and changes in the economic environment and capital market expectations or a change in trustees or committee members are two factors that may lead to an altering of the principles that guide investment activities.[16]

An integral aspect of any asset allocation exercise is the forecasting of expected returns, volatilities, and correlations of the asset classes in the opportunity set. It follows, then, that a material change in the outlook for one or more of the asset classes may heavily influence the asset allocation outcome.

Consider the current environment relative to the environment that prevailed in 1984–2014. The 1984–2014 investing environment was characterized by declining inflation and interest rates (from the extraordinarily high levels of the 1970s and early 1980s); strong global GDP growth, aided by favorable demographics; gains in productivity; and rapid growth in China. Corporate profit growth was extremely robust, reflecting revenue growth from new markets, declining corporate taxes over

15 The Pension Benefit Guaranty Corporation insures certain US pension plan benefits.

16 For an example of an investment belief statement, see www.uss.co.uk/how-uss-invests/investment-approach/investment-beliefs-and-principles.

the period, and improved efficiencies. Despite increased market turbulence, returns on US and Western European equities and bonds during the past 30 years were considerably higher than the long-run trend.

The environment of 2015–2016 was much less favorable for investors. The dramatic decline in inflation and interest rates ended, and labor force expansion and productivity gains stalled, with negative implications for GDP growth. The largest developed-country companies that generated much of the profits of the past 30 years were faced with competitive pressures as emerging-market companies expanded and technology advances changed the competitive landscape. In April 2016, McKinsey Global Institute published a projection of stocks and bonds under two growth scenarios—a slow growth scenario and a moderate growth scenario (Exhibit 8). In neither instance do the expected returns of the next 30 years come close to the returns of the past 30 years.[17] Clearly, an asset allocation developed in 2010 built on return expectations based on the prior 26 years would look materially different than an asset allocation developed using more current, forward-looking return assumptions.

Exhibit 8 A Major Shift in Underlying Return Assumptions

Notes:
Numbers for growth-recovery and slow-growth scenarios reflect the range between the low end of the slow-growth scenario and the high end of the growth-recovery scenario.
European equities: Weighted average real returns based on each year's Geary-Khamis purchasing power parity GDP for 14 countries in Western Europe.
US and European government bonds: Bond duration for United States is primarily 10 years; for Europe, duration varies by country but is typically 20 years.
Source: McKinsey Global Institute (www.mckinsey.com/industries/private-equity-and-principal-investors/our-insights/why-investors-may-need-to-lower-their-sights).

Finally, as new advisers or members join the Investment Committee, they bring their own beliefs and biases regarding certain investment activities. Conducting an asset allocation study to educate these new members of the oversight group and introduce them to the investment philosophy and process that has been adopted by the organization will smooth their integration into the governance system and ensure that they have a holistic view of the asset owner's goals and objectives.

17 McKinsey Global Institute, "Diminishing Returns: Why Investors May Need to Lower Their Expectations" (May 2016).

In some instances, a change to an asset allocation strategy may reasonably be implemented without a formal asset allocation study. Certain milestones are reasonable points at which to implement a change in the policy, in most instances, reducing the level of risk. (For pension funds, these "milestones" are typically related to changes in the plan's funded status.) Anticipating these milestones by putting an asset allocation policy in place that anticipates these changes allows the investor to respond more quickly to changing circumstances and in a non-reactive and objective manner. This rebalancing policy is frequently referred to as a "glide path." Target-date mutual funds common in retirement investing for individuals are one example of this approach to asset allocation. Exhibit 9 illustrates one fund company's approach to migrating the asset allocation away from equities and towards bonds as retirement approaches.

Exhibit 9 An Asset Allocation Glide Path

Source: Vanguard, "Target-Date Funds: A Solid Foundation for Retirement Investors" (May 2009): www.vanguard.com/jumppage/targetretirement/TRFCOMM.pdf.

In an institutional framework, the Investment Committee may specify certain funding levels it seeks to achieve. At the start of the period, an underfunded pension plan might adopt a higher equity allocation in an attempt to reduce the underfunding. If this is successful, the plan becomes better funded and there is less of a desire or need to take the higher level of equity risk. A pension fund may quickly implement "pre-programmed" asset allocation changes as the funded status of a pension plan improves. Typically, these planned reallocations are spelled out in an Investment Policy Statement.

EXAMPLE 6

Revising the Strategic Asset Allocation

1 Auldberg University Endowment Fund (AUE) has assets totaling CAF$200 million. The current asset allocation is as follows:

- CAF$100 million in domestic equities
- CAF$60 million in domestic government debt
- CAF$40 million in Class B office real estate

AUE has historically distributed to the University 5% of the 36-month moving average of net assets, contributing approximately CAF$10 million of Auldberg University's CAF$60 million annual operating budget. Real estate income (from the University's CAF$350 million direct investment in domestic commercial real estate assets, including office buildings and industrial parks, much of it near the campus) and provincial subsidies have been the main source of income to the University. Admission is free to all citizens who qualify academically.

Growth in the Cafastan economy has been fueled by low interest rates, encouraging excess real estate development. There is a strong probability that the economy will soon go into recession, negatively impacting both the property values and the income potential of the University's real estate holdings.

Gizi Horvath, a University alumnus, has recently announced an irrevocable CAF$200 million gift to AUE, to be paid in equal installments over the next five years. AUE employs a well-qualified staff with substantial diverse experience in equities, fixed income, and real estate. Staff has recommended that the gift from Ms. Horvath be invested using the same asset allocation policy that the endowment has been following successfully for the past five years. They suggest that the asset allocation policy should be revisited once the final installment has been received.

Critique staff's recommendation, and identify the case facts that support your critique.

2 The Government Petroleum Fund of Cafastan (GPFC) is operating under the following asset allocation policy, which was developed with a 20-year planning horizon. Target weights and actual weights are given:

	Target Asset Allocation	Current Asset Allocation
Global equities	30%	38%
Global high-yield bonds	10%	15%
Domestic intermediate bonds	30%	25%
Hedge funds	15%	15%
Private equity	15%	7%

When this asset allocation policy was adopted 5 years ago, the petroleum revenues that support the sovereign wealth fund were projected to continue to grow for at least the next 25 years and intergenerational distributions were expected to begin in 20 years. However, since the adoption of this policy, alternate fuel sources have eroded both the price and quantity of oil exports, the economy is undergoing significant restructuring, inflows to the fund have been suspended, and distributions are expected to begin within 5 years.

What are the implications of this change in the liquidity constraints for the current asset allocation policy?

3 O-Chem Corp has a defined benefit pension plan with US$1.0 billion in assets. The plan is closed, the liabilities are frozen, and the plan is currently 65% funded. The company intends to increase cash contributions to improve the funded status of the plan and then purchase annuities to fully address all of the plan's pension obligations. As part of an asset allocation analysis conducted every five years, the company has recently decided to allocate 80% of assets to liability-matching bonds and the remaining 20%

to a mix of global equities and real estate. An existing private equity portfolio is in the midst of being liquidated. This allocation reflects a desired reduction in the level of investment risk.

O-Chem has just announced an ambitious US$15 billion capital investment program to build new plants for refining and production. The CFO informed the Pension Committee that the company will be contributing to the plan only the minimum funding required by regulations for the foreseeable future. It is estimated that achieving fully funded status for the pension plan under minimum funding requirements and using the current asset allocation approach will take at least 10 years.

What are the implications of this change in funding policy for the pension plan's asset allocation strategy?

Solution to 1:

The size of the anticipated contributions will double AUE's assets over the next five years, potentially increasing the opportunity set of asset classes suitable for their investment program. Given that a typical asset allocation study encompasses a long investment horizon—10 years, 20 years, or more—staff should begin to evaluate the opportunities available to them today in *anticipation* of the future cash flows. Given the material change in the economic balance sheet along with changes in the asset size, liquidity, and time horizon constraints, AUE should plan on a regular, more frequent, formal review of the asset allocation policy until the situation stabilizes. The asset allocation study should explore the feasibility of adding new asset classes as well as the ability to improve diversification within existing categories, perhaps by including non-domestic equities and bonds. Furthermore, the forecast economic environment may materially alter the outflows from the fund in support of the University's day-to-day operations. Cash flows from the University's real estate holdings are likely to decline, as are the values of those real estate assets. Given the outlook for real estate, a strong case can be made to limit or reduce the endowment's investment in real estate; moreover, consideration should be given to the effect of declining income from the current real estate investment.

Solution to 2:

GPFC had adopted a long-range asset allocation policy under the expectation of continuing net cash inflows and no immediate liquidity constraints. With the change in circumstances, the need for liquidity in the fund has increased significantly. The current asset allocation policy allocates 40% of the fund's assets to less liquid asset classes—high-yield bonds, hedge funds, and private equity. Although the allocation to private equity has not been fully implemented, the fund is overweight high-yield bonds and at the target weight for hedge funds. These asset classes—or the size of the allocation to these asset classes—may no longer be appropriate for the fund given the change in circumstances.

Solution to 3:

The Investment Committee should conduct a new asset allocation study to address the changes in cash flow forecasts. The lower contributions imply that the pension plan will need to rely more heavily on investment returns to reach its funding objectives. A higher allocation to return-seeking assets, such as public and private equities, is warranted. The company should suspend the current private equity liquidation plan until the new asset allocation study has been completed. A liability-matching bond portfolio is still appropriate, although less than the current 80% of assets should be allocated to this portfolio.

5 SHORT-TERM SHIFTS IN ASSET ALLOCATION

Strategic asset allocation (SAA), or policy asset allocation, represents long-term investment policy targets for asset class weights, whereas tactical asset allocation (TAA) allows short-term deviations from SAA targets.[18] TAA moves might be justified based on cyclical variations within a secular trend (e.g., stage of business or monetary cycle) or temporary price dislocations in capital markets. TAA has the objective of increasing return, or risk-adjusted return, by taking advantage of short-term economic and financial market conditions that appear more favorable to certain asset classes. In seeking to capture a short-term return opportunity, TAA decisions move the investor's risk away from the targeted risk profile. TAA is predicated on a belief that investment returns, in the short run, are predictable. (This contrasts with the random walk assumption more strongly embedded in most SAA processes.) Using either short-term views or signals, the investor actively re-weights broad asset classes, sectors, or risk factor premiums. TAA is not concerned with individual security selection. In other words, generating alpha through TAA decisions is dependent on successful market or factor timing rather than security selection. TAA is an asset-only approach. Although tactical asset allocation shifts must still conform to the risk constraints outlined in the investment policy statement, they do not expressly consider liabilities (or goals in goals-based investing).

The SAA policy portfolio is the benchmark against which TAA decisions are measured. Tactical views are developed and bets are sized relative to the asset class targets of the SAA policy portfolio. The sizes of these bets are typically subject to certain risk constraints. The most common risk constraint is a pre-established allowable range around each asset class's policy target. Other risk constraints may include either a predicted tracking error budget versus the SAA or a range of targeted risk (e.g., an allowable range of predicted volatility).

The success of TAA decisions can be evaluated in a number of ways. Three of the most common are

- a comparison of the Sharpe ratio realized under the TAA relative to the Sharpe ratio that would have been realized under the SAA;
- evaluating the information ratio or the t-statistic of the average excess return of the TAA portfolio relative to the SAA portfolio; and
- plotting the realized return and risk of the TAA portfolio versus the realized return and risk of portfolios along the SAA's efficient frontier. This approach is particularly useful in assessing the risk-adjusted TAA return. The TAA portfolio may have produced a higher return or a higher Sharpe ratio than the SAA portfolio, but it could be less optimal than other portfolios along the investor's efficient frontier of portfolio choices.

The composition of the portfolio's excess return over the SAA portfolio return can also be examined more closely using attribution analysis, evaluating the specific overweights and underweights that led to the performance differential.

Tactical investment decisions may incur additional costs—higher trading costs and taxes (in the case of taxable investors). Tactical investment decisions can also increase the concentration of risk relative to the policy portfolio. For example, if the tactical decision is to overweight equities, not only is the portfolio risk increased but

18 SAA and TAA are distinct from GTAA (global tactical asset allocation), an opportunistic investment strategy that seeks to take advantage of pricing or valuation anomalies across multiple asset classes, typically equities, fixed income, and currencies.

also the diversification of risk contributions is reduced. This is particularly an issue when the SAA policy portfolio relies on uncorrelated asset classes. These costs should be weighed against the predictability of short-term returns.

There are two broad approaches to TAA. The first is discretionary, which relies on a qualitative interpretation of political, economic, and financial market conditions. The second is systematic, which relies on quantitative signals to capture documented return anomalies that may be inconsistent with market efficiency.

5.1 Discretionary TAA

Discretionary TAA is predicated on the existence of manager skill in predicting and timing short-term market moves away from the expected outcome for each asset class that is embedded in the SAA policy portfolio. In practice, discretionary TAA is typically used in an attempt to mitigate or hedge risk in distressed markets while enhancing return in positive return markets (i.e., an asymmetric return distribution).

Short-term forecasts consider a large number of data points that provide relevant information about current and expected political, economic, and financial market conditions that may affect short-term asset class returns. Data points might include valuations, term and credit spreads, central bank policy, GDP growth, earnings expectations, inflation expectations, and leading economic indicators. Price-to-earnings ratios, price-to-book ratios, and the dividend yield are commonly used valuation measures that can be compared to historical averages and across similar assets to inform short-to-intermediate-term tactical shifts. Term spreads provide information about the business cycle, inflation, and potential future interest rates. Credit spreads gauge default risk, borrowing conditions, and liquidity. Other data points are more directly related to current and expected GDP and earnings growth.

Short-term forecasts may also consider economic sentiment indicators. TAA often assumes a close relationship between the economy and capital market returns. Because consumer spending is a major driver of GDP in developed countries, consumer sentiment is a key consideration. Consumer confidence surveys provide insight as to the level of optimism regarding the economy and personal finances.

TAA also considers market sentiment—indicators of the optimism or pessimism of financial market participants. Data points considered in gauging market sentiment include margin borrowing, short interest, and a volatility index.

- Margin borrowing measures give an indication of the current level of bullishness, and the capacity for more or less margin borrowing has implications for future bullishness. Higher prices tend to inspire confidence and spur more buying; similarly, more buying on margin tends to spur higher prices. The aggregate level of margin can be an indicator that bullish sentiment is overdone, although the level of borrowing must be considered in the context of the rate of change in borrowing.
- Short interest measures give an indication of current bearish sentiment and also have implications for future bearishness. Although rising short interest indicates increasing negative sentiment, a high short interest ratio may be an indication of the extreme pessimism that often occurs at market lows.
- The volatility index, commonly known as the fear index, is a measure of market expectations of near-term volatility. VDAX-NEW in Germany, V2X in the United Kingdom, and VIX in the United States each measure the level of expected volatility of their respective indexes as implied by the bid/ask quotations of index options; it rises when put option buying increases and falls when call buying activity increases.

Different approaches to discretionary TAA may include different data points and relationships and also may prioritize and weight those data points differently depending on both the approach and the prevailing market environment. Despite the plethora of data inputs, the interpretation of this information is qualitative at its core.

5.2 Systematic TAA

Using signals, systematic TAA attempts to capture asset class level return anomalies that have been shown to have some predictability and persistence. Value and momentum, for example, are factors that have been determined to offer some level of predictability, both among securities within asset classes (for security selection) and at the asset class level (for asset class timing).

The value factor is the return of value stocks over the return of growth stocks. The momentum factor is the return of stocks with higher prior returns over the return of stocks with lower prior returns. Value and momentum (and size) factors have been determined to have some explanatory power regarding the relative returns of equity securities within the equity asset class. Value and momentum phenomena are also present at the asset class level and can be used in making tactical asset allocation decisions across asset classes.

Valuation ratios have been shown to have some explanatory power in predicting variation in future equity returns. Predictive measures for equities include dividend yield, cash flow yield, and Shiller's earnings yield (the inverse of Shiller's P/E[19]). Sometimes these yield measures are defined as the excess of the yield over the local risk-free rate or inflation.[20]

Other asset classes have their own value signals, such as yield and carry in currencies, commodities, and/or fixed income. Carry in currencies uses short-term interest rate differentials to determine which currencies (or currency-denominated assets) to overweight (or own) and which to underweight (or sell short). Carry in commodities compares positive (backwardation) and negative (contango) roll yields to determine which commodities to own or short. And for bonds, yields-to-maturity and term premiums (yields in excess of the local risk-free rate) signal the relative attractiveness of different fixed-income markets.

Asset classes can trend positively or negatively for some time before changing course. Trend following is an investment or trading strategy based on the expectation that asset class (or asset) returns will continue in the same upward or downward trend that they have most recently exhibited.[21] A basic trend signal is the most recent 12-month return: The expectation is that the direction of the most recent 12-month returns can be expected to persist for the next 12 months. Shorter time frames and different weighting schemes can also be used. For example, another trend signal is the moving-average crossover, where the moving average price of a shorter time frame is compared with the moving average price of a longer time frame. This signals an upward (downward) trend when the moving average of the shorter time frame is above (below) the moving average of the longer time frame. Trend signals are widely used in systematic TAA. Asset classes may be ranked or categorized into positive or negative buckets based on their most recent prior 12-month performance and over- or

19 A price-to-earnings ratio based on the average inflation-adjusted earnings of the previous 10 years.

20 Return predictability for equity markets is driven by historical mean-reversion, which tends to occur over the intermediate-term. These valuation measures are often used as signals for TAA, but they can also be used to shape return expectations for SAA.

21 Trend following is also called time-series momentum. Cross-sectional momentum describes the relative momentum returns of securities within the same asset class.

underweighted accordingly. More-complex signals for both momentum/trend signals (such as those that use different lookback periods or momentum signals correlated with earnings momentum) and value/carry are also used.

EXAMPLE 7

Short-Term Shifts in Asset Allocation

1 The investment policy for Alpha Beverage Corporation's pension fund allows staff to overweight or underweight asset classes, within pre-established bands, using a TAA model that has been approved by the Investment Committee. The asset allocation policy is reflected in Exhibit 10, and the output of the TAA model is given in Exhibit 11. Using the data presented in Exhibits 10 and 11, recommend a TAA strategy for the pension fund and justify your response.

Exhibit 10 Strategic Asset Allocation Policy

SAA Policy	Current Weight	Target Allocation	Upper Policy Limit	Lower Policy Limit
Investment-grade bonds	45%	40%	45%	35%
High-yield bonds	10%	10%	15%	5%
Developed markets equity	35%	40%	45%	35%
Emerging markets equity	10%	10%	15%	5%

Exhibit 11 Trend Signal (the positive or negative trailing 12-month excess return)

	12-Month Return	Risk-Free Return	Excess Return	Signal
Investment-grade bonds	4%	1%	3%	Long
High-yield bonds	–2%	1%	–3%	Short
Developed markets equity	5%	1%	4%	Long
Emerging markets equity	–10%	1%	–11%	Short

2 One year later, the Investment Committee for Alpha Beverage Corporation is conducting its year-end review of pension plan performance. Staff has prepared the following exhibits regarding the tactical asset allocation decisions taken during the past year. Assume that all investments are implemented using passively managed index funds. Evaluate the effectiveness of the TAA decisions.

Exhibit 12A

Asset Class	Asset Allocation	Calendar Year Return
Investment-grade bonds	45%	3.45%
High-yield bonds	5%	–6.07%
Developed markets equity	45%	–0.32%
Emerging markets equity	5%	–14.60%

Exhibit 12B

	Policy Portfolio	Realized Results
12-month return	–0.82%	0.38%
Risk-free rate	0.50%	0.50%
Standard deviation	5.80%	6.20%
Sharpe ratio	–0.23	–0.02

Exhibit 12C

Solution to 1:

The TAA decision must be taken in the context of the SAA policy constraints. Thus, although the signals for high-yield bonds and emerging market equities are negative, the minimum permissible weight in each is 5%. Similarly, although the signals for investment-grade bonds and developed markets equities are positive, the maximum permissible weight in each is 45%. Asset classes can be over- or underweighted to the full extent of the policy limits. Based on the trend signals and the policy constraints, the recommended tactical asset allocation is as follows:

- Investment-grade bonds 45% *(overweight by 5%)*
- High-yield bonds 5% *(underweight by 5%)*
- Developed markets equity 45% *(overweight by 5%)*
- Emerging markets equity 5% *(underweight by 5%)*

Solution to 2:

The decision to overweight investment grade bonds and underweight emerging markets equity and high-yield bonds was a profitable one. The chosen asset allocation added approximately 120 basis points to portfolio return over the year. Although portfolio risk was elevated relative to the policy portfolio (standard deviation of 6.2% versus 5.8% for the policy portfolio), the portfolio positioning improved the fund's Sharpe ratio relative to allocations they might have selected along the efficient frontier.

A Silver Lining to the 2008–2009 Financial Crisis

Prior to 2008, corporate pension plans had begun to shift the fixed-income component of their policy portfolios from an intermediate maturity bond index to a long bond index. Despite the relatively low interest rates at the time, this move was made to better align the plans' assets with the long duration liability payment stream. The fixed-income portfolios were typically benchmarked against a long government and credit index that included both government and corporate bonds. Swaps or STRIPS* were sometimes used to extend duration.

During the financial crisis that began in 2008, these heavier and longer-duration fixed-income positions performed well relative to equities (the long government and credit index was up 8%, whereas the S&P 500 Index was down 37% in 2008), providing plan sponsors with a level of investment protection that had not been anticipated. Additionally, with its exposure to higher-returning government bonds that benefited from investors' flight to safety, this fixed-income portfolio often outperformed the liabilities. (Recall from the earlier discussion on pension regulation that pension liabilities are typically measured using corporate bond yields. Thus, liabilities rose in the face of declining corporate bond yields while the liability-hedging asset rose even further given its overall higher credit quality.) This was an unintended asset/liability mismatch that had very positive results. Subsequent to this rally in bonds, some plan sponsors made a tactical asset allocation decision—to move out of swaps and government bonds and into physical corporate bonds (non-derivative fixed-income exposure)—locking in the gains and better hedging the liability.

* Treasury STRIPS are fixed-income securities with no interest payments that are sold at a discount to face value and mature at par. STRIPS is an acronym for Separate Trading of Registered Interest and Principal of Securities.

DEALING WITH BEHAVIORAL BIASES IN ASSET ALLOCATION

6

Although global capital markets are competitive pricing engines, human behavior can be less rational than most economic models assume. Behavioral finance—the hybrid study of financial economics and psychology—has documented a number

of behavioral biases that commonly arise in investing. The CFA Program reading "The Behavioral Biases of Individuals" discusses 16 common behavioral biases. The biases most relevant in asset allocation include loss aversion, the illusion of control, mental accounting, representative bias, framing, and availability bias. An effective investment program will address these decision-making risks through a formal asset allocation process with its own objective framework, governance, and controls. An important first step toward mitigating the negative effects of behavioral biases is simply acknowledging that they exist; just being aware of them can reduce their influence on decision making. It is also possible to incorporate certain behavioral biases into the investment decision-making process to produce better outcomes. This is most commonly practiced in goals-based investing. We will discuss strategies that help deal with these common biases.

6.1 Loss Aversion

Loss-aversion bias is an emotional bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains. A number of studies on loss aversion suggest that, psychologically, losses are significantly more powerful than gains. The utility derived from a gain is much lower than the utility given up with an equivalent loss. This behavior is related to the marginal utility of wealth, where each additional dollar of wealth is valued incrementally less with increasing levels of wealth.

A diversified multi-asset class portfolio is generally thought to offer an approximately symmetrical distribution of returns around a positive expected mean return. Financial market theory suggests that a rational investor would think about risk as the dispersion or uncertainty (variance) around the mean (expected) outcome. However, loss aversion suggests the investor assigns a greater weight to the negative outcomes than would be implied by the actual shape of the distribution. Looking at this another way, risk is not measured relative to the expected mean return but rather on an absolute basis, relative to a 0% return. The loss-aversion bias may interfere with an investor's ability to maintain his chosen asset allocation through periods of negative returns.

In goals-based investing, loss-aversion bias can be mitigated by framing risk in terms of shortfall probability or by funding high-priority goals with low-risk assets.

Shortfall probability is the probability that a portfolio will not achieve the return required to meet a stated goal. Where there are well-defined, discrete goals, sub-portfolios can be established for each goal and the asset allocation for that sub-portfolio would use shortfall probability as the definition of risk.

Similarly, by segregating assets into sub-portfolios aligned to goals designated by the client as high-priority and investing those assets in risk-free or low risk assets of similar duration, the adviser mitigates the loss-aversion bias associated with this particular goal—freeing up other assets to take on a more appropriate level of risk. Riskier assets can then be used to fund lower-priority and aspirational goals.

In institutional investing, loss aversion can be seen in the herding behavior among plan sponsors. Adopting an asset allocation not too different from the allocation of one's peers minimizes reputation risk.

6.2 Illusion of Control

The illusion of control is a cognitive bias—the tendency to overestimate one's ability to control events. It can be exacerbated by overconfidence, an emotional bias. If investors believe they have more or better information than what is reflected in the market, they have (excessive) confidence in their ability to generate better outcomes. They may perceive *information* in what are random price movements, which may lead

to more frequent trading, greater concentration of portfolio positions, or a greater willingness to employ tactical shifts in their asset allocation. The following investor behaviors might be attributed to this illusion of control:

- Alpha-seeking behaviors, such as attempted market timing in the form of extreme tactical asset allocation shifts or all in/all out market calls—the investor who correctly anticipated a market reversal now believes he has superior insight on valuation levels.
- Alpha-seeking behaviors based on a belief of superior resources—the institutional investor who believes her internal resources give her an edge over other investors in active security selection and/or the selection of active investment managers.
- Excessive trading, use of leverage, or short selling—the long/short equity investor who moves from a normal exposure range of 65% long/20% short to 100% long/50% short.
- Reducing, eliminating, or even shorting asset classes that are a significant part of the global market portfolio based on non-consensus return and risk forecasts—the chair of a foundation's investment committee who calls for shortening the duration of the bond portfolio from six years to six months based on insights drawn from his position in the banking industry.
- Retaining a large, concentrated legacy asset that contributes diversifiable risk—the employee who fails to diversify her holding of company stock.

Hindsight bias—the tendency to perceive past investment outcomes as having been predictable—exacerbates the illusion of control.

In the asset allocation process, an investor who believes he or she has better information than others may use estimates of return and risk that produce asset allocation choices that are materially different from the market portfolio. This can result in undiversified portfolios with outsized exposures to just one or two minor asset classes, called extreme corner portfolios. Using such biased risk and return estimates results in a biased asset allocation decision—precisely what an objective asset allocation process seeks to avoid.

The illusion of control can be mitigated by using the global market portfolio as the starting point in developing the asset allocation. Building on the basic principles of CAPM, Markowitz's mean–variance theory, and efficient market theory, the global market portfolio offers a theoretically sound benchmark for asset allocation. Deviations from this baseline portfolio must be thoughtfully considered and rigorously vetted, ensuring the asset allocation process remains objective. A formal asset allocation process that employs long-term return and risk forecasts, optimization constraints anchored around asset class weights in the global market portfolio, and strict policy ranges will significantly mitigate the illusion of control bias in asset allocation.

6.3 Mental Accounting

Mental accounting is an information-processing bias in which people treat one sum of money differently from another sum based solely on the mental account the money is assigned to. Investors may separate assets or liabilities into buckets based on subjective criteria. For example, an investor may consider his retirement investment portfolio independent of the portfolio that funds his child's education, even if the combined asset allocation of the two portfolios is sub-optimal. Or an employee with significant exposure to her employer's stock through vested stock options may fail to consider this exposure alongside other assets when establishing a strategic asset allocation.

Goals-based investing incorporates mental accounting directly into the asset allocation solution. Each goal is aligned with a discrete sub-portfolio, and the investor can specify the acceptable level of risk for each goal. Provided each of the sub-portfolios lies along the same efficient frontier, the sum of the sub-portfolios will also be efficient.[22]

Concentrated stock positions also give rise to another common mental accounting issue that affects asset allocation. For example, the primary source of an entrepreneur's wealth may be a concentrated equity position in the publicly traded company he founded. The entrepreneur may prefer to retain a relatively large exposure to this one security within his broader investment portfolio despite the inherent risk. Although there may be rational reasons for this preference—including ownership control, an information advantage, and tax considerations—the desire to retain this riskier exposure is more often the result of a psychological loyalty to the asset that generated his wealth. This mental accounting bias is further reinforced by the endowment effect—the tendency to ascribe more value to an asset already owned rather than another asset one might purchase to replace it.

The concentrated stock/mental accounting bias can be accommodated in goals-based asset allocation by assigning the concentrated stock position to an aspirational goal—one that the client would *like* to achieve but to which he or she is willing to assign a lower probability of success. Whereas lifetime consumption tends to be a high-priority goal requiring a well-diversified portfolio to fund it with confidence, an aspirational goal such as a charitable gift may be an important but much less highly valued goal. It can reasonably be funded with the concentrated stock position. (This could have the additional benefit of avoiding capital gains tax altogether!)

6.4 Representative Bias

Representative, or recency, bias is the tendency to overweight the importance of the most recent observations and information relative to a longer-dated or more comprehensive set of long-term observations and information. Tactical shifts in asset allocation, those undertaken in response to recent returns or news—perhaps shifting the asset allocation toward the highest or lowest allowable ends of the policy ranges—are particularly susceptible to recency bias. Return chasing is a common manifestation of recency bias, and it results in overweighting asset classes with good recent performance.

It is believed that asset prices largely follow a random walk; past prices cannot be used to predict future returns. If this is true, then shifting the asset allocation in response to recent returns, or allowing recent returns to unduly influence the asset class assumptions used in the asset allocation process, will likely lead to sub-optimal results. *If,* however, asset class returns exhibit trending behavior, the recent past *may* contain information relevant to tactical shifts in asset allocation. And if asset class returns are mean-reverting, comparing current valuations to historical norms may signal the potential for a reversal or for above-average future returns.

Recency bias is not uniformly negative. Random walk, trending, and mean-reversion may be simultaneously relevant to the investment decision-making process, although their effect on asset prices will unfold over different time horizons. The strongest defenses against recency bias are an objective asset allocation process and a strong governance framework. It is important that the investor objectively evaluate the motivation underlying the response to recent market events. A formal asset allocation policy with pre-specified allowable ranges will constrain recency bias. A strong

22 This condition holds when the asset allocation process is unconstrained. With a long-only constraint, some efficiency is lost but the effect is much less significant than the loss of efficiency from inaccurately specifying risk aversion (which goals-based approaches to asset allocation attempt to mitigate). See Das, Markowitz, Scheid, and Statman (2010) and Das et al. (2011).

governance framework with the appropriate level of expertise and well-documented investment beliefs increases the likelihood that shifts in asset allocation are made objectively and in accordance with those beliefs.

6.5 Framing Bias

Framing bias is an information-processing bias in which a person may answer a question differently based solely on the way in which it is asked. One example of framing bias is common in committee-oriented decision-making processes. In instances where one individual frequently speaks first and speaks with great authority, the views of other committee members may be suppressed or biased toward this first position put on the table.

A more nuanced form of framing bias can be found in asset allocation. The investor's choice of an asset allocation may be influenced merely by the manner in which the risk-to-return trade-off is presented.

Risk can mean different things to different investors: volatility, tail risk, the permanent loss of capital, or a failure to meet financial goals. These definitions are all closely related, but the relative importance of each of these aspects can influence the investor's asset allocation choice. Further, the investor's perception of each of these risks can be influenced by the manner in which they are presented—gain and loss potential framed in money terms versus percentages, for example.

Investors are often asked to evaluate portfolio choices using expected return, with standard deviation as the sole measure of risk. Standard deviation measures the dispersion or volatility around the mean (expected) return. Other measures of risk may also be used. Value at risk (VaR) is a loss threshold: "If I choose this asset mix, I can be pretty sure that my losses will not exceed X, most of the time." More formally, VaR is the minimum loss that would be expected a certain percentage of the time over a certain period of time given the assumed market conditions. Conditional value at risk (CVaR) is the probability-weighted average of losses when the VaR threshold is breached. VaR and CVaR both measure downside or tail risk.

Exhibit 13 shows the expected return and risk for five portfolios that span an efficient frontier from P1 (lowest risk) to P100 (highest risk). A normal distribution of returns is assumed; therefore, the portfolio's VaR and CVaR are a direct function of the portfolio's expected return and standard deviation. In this case, standard deviation, VaR, and CVaR measure precisely the same risk but frame that risk differently. Standard deviation presents that risk as volatility, while VaR and CVaR present it as risk of loss. When dealing with a normal distribution, as this example presumes, the 5% VaR threshold is simply the point on the distribution 1.65 standard deviations below the expected mean return.

Exhibit 13 There's More Than One Way to Frame Risk

	P1	P25	P50	P75	P100
Return	3.2%	4.9%	6.0%	7.0%	8.0%
Std. Dev.	3.9%	7.8%	11.9%	15.9%	20.0%
VaR (5%)	–3.2%	–8.0%	–13.6%	–19.3%	–25.0%
CVaR (5%)	–4.8%	–11.2%	–18.5%	–25.8%	–33.2%

When viewing return and volatility alone, many investors may gravitate to P50 with its 6.0% expected return and 11.9% standard deviation. P50 represents the median risk portfolio that appeals to many investors in practice because it balances high-risk

and low-risk choices with related diversification benefits. However, loss-aversion bias suggests that some investors who gravitate to the median choice might actually find the –18.5% CVaR of P50 indicative of a level of risk they find very uncomfortable. The CVaR frame intuitively communicates a different perspective of exactly the same risk that is already fully explained by standard deviation—namely, the downside or tail-risk aspects of the standard deviation and mean. With this example, you can see that how risk is framed and presented can affect the asset allocation decision.

The framing effect can be mitigated by presenting the possible asset allocation choices with multiple perspectives on the risk/reward trade-off. The most commonly used risk measure—standard deviation—can be supplemented with additional measures, such as **shortfall probability** (the probability of failing to meet a specific liability or goal)[23] and tail-risk measures (e.g., VaR and CVaR). Historical stress tests and Monte Carlo simulations can also be used to capture and communicate risk in a tangible way. These multiple perspectives of the risk and reward trade-offs among a set of asset allocation choices compel the investor to consider more carefully what outcomes are acceptable or unacceptable.

6.6 Availability Bias

Availability bias is an information-processing bias in which people take a mental shortcut when estimating the probability of an outcome based on how easily the outcome comes to mind. Easily recalled outcomes are often perceived as being more likely than those that are harder to recall or understand. For example, more recent events or events in which the investor has personally been affected are likely to be assigned a higher probability of occurring again, regardless of the objective odds of the event actually occurring.

As an example, many private equity investors experienced a liquidity squeeze during the financial crisis that began in 2008. Their equity portfolios had suffered large losses, and their private equity investments were illiquid. Worse yet, they were contractually committed to additional capital contributions to those private equity funds. At the same time, their financial obligations continued at the same or an even higher pace. Investors who personally experienced this confluence of negative events are likely to express a strong preference for liquid investments, assigning a higher probability to such an event occurring again than would an investor who had cash available to acquire the private equity interests that were sold at distressed prices.

Familiarity bias stems from availability bias: People tend to favor the familiar over the new or different because of the ease of recalling the familiar. In asset allocation, familiarity bias most commonly results in a **home bias**—a preference for securities listed on the exchanges of one's home country. However, concentrating portfolio exposure in home country securities, particularly if the home country capital markets are small, results in a less diversified, less efficient portfolio. Familiarity bias can be mitigated by using the global market portfolio as the starting point in developing the asset allocation, where deviations from this baseline portfolio must be thoughtfully considered and rigorously vetted.

Familiarity bias may also cause investors to fall into the trap of comparing their investment decisions (and performance) to others', without regard for the appropriateness of those decisions for their own specific facts and circumstances. By avoiding

23 Shortfall risk and shortfall probability are often used to refer to the same concept. This author prefers shortfall probability because the measure refers to the probability of shortfall, not the magnitude of the potential shortfall. For example, you may have a low probability of shortfall but the size of the shortfall could be significant. In this case, it could be misleading to say the shortfall risk is low.

comparison of investment returns or asset allocation decisions with others, an organization is more capable of identifying the asset allocation that is best tailored to their needs.

Investment decision making is subject to a wide range of potential behavioral biases. This is true in both private wealth *and* institutional investing. Employing a formal asset allocation process using the global market portfolio as the starting point for asset allocation modeling is a key component of ensuring the asset allocation decision is as objective as possible.

A strong governance structure, such as that discussed in the overview reading on asset allocation, is a necessary first step to mitigating the effect that these behavioral biases may have on the long-term success of the investment program. Bringing a diverse set of views to the deliberation process brings more tools to the table to solve any problem and leads to better and more informed decision making. A clearly stated mission—a common goal—and a commitment from committee members and other stakeholders to that mission are critically important in constraining the influence of these biases on investment decisions.

Effective Investment Governance

Six critical elements of effective investment governance are

1. clearly articulated long- and short-term investment objectives of the investment program;
2. allocation of decision rights and responsibilities among the functional units in the governance hierarchy, taking account of their knowledge, capacity, time, and position in the governance hierarchy;
3. established processes for developing and approving the investment policy statement that will govern the day-to-day operation of the investment program;
4. specified processes for developing and approving the program's strategic asset allocation;
5. a reporting framework to monitor the program's progress toward the agreed-upon goals and objectives; and
6. periodic governance audits.

EXAMPLE 8

Mitigating Behavioral Biases in Asset Allocation

Ivy Lee, the retired founder of a publicly traded company, has two primary goals for her investment assets. The first goal is to fund lifetime consumption expenditures of US$1 million per year for herself and her husband; this is a goal the Lees want to achieve with a high degree of certainty. The second goal is to provide an end-of-life gift to Auldberg University. Ivy has a diversified portfolio of stocks and bonds totaling US$5 million and a sizable position in the stock of the company she founded. The following table summarizes the facts.

Investor Profile	
Annual consumption needs	US$1,000,000
Remaining years of life expectancy	40
Diversified stock holdings	US$3,000,000
Diversified bond holdings	US$2,000,000
Concentrated stock holdings	US$15,000,000
Total portfolio	US$20,000,000

Assume that a 60% equity/40% fixed-income portfolio represents the level of risk Ivy is willing to assume with respect to her consumption goal. This 60/40 portfolio offers an expected return of 6.0%. (For simplicity, this illustration ignores inflation and taxes.)

The present value of the expected consumption expenditures is US$15,949,075. This is the amount needed on hand today, which, if invested in a portfolio of 60% equities and 40% fixed income, would fully fund 40 annual cash distributions of US$1,000,000 each.[24]

The concentrated stock has a highly uncertain expected return and comes with significant idiosyncratic (stock-specific) risk. A preliminary mean–variance optimization using three "asset classes"—stocks, bonds, and the concentrated stock—results in a zero allocation to the concentrated stock position. But Ivy prefers to retain as much concentrated stock as possible because it represents her legacy and she has a strong psychological loyalty to it.

1. Describe the behavioral biases most relevant to developing an asset allocation recommendation for Ivy.
2. Recommend and justify an asset allocation for Ivy given the facts presented above.

Solution to 1:

Two behavioral biases that the adviser must be aware of in developing an asset allocation recommendation for Ivy are illusion of control and mental accounting. Because Ivy was the founder of the company whose stock comprises 75% of her investment portfolio, she may believe she has more or better information about the return prospects for this portion of the portfolio. The belief that she has superior information may lead to a risk assessment that is not reflective of the true risk in the holding. Using a goals-based approach to asset allocation may help Ivy more fully understand the risks inherent in the concentrated stock position. The riskier, concentrated stock position can be assigned to a lower-priority goal, such as the gift to Auldberg University.

Solution to 2:

	Beginning Asset Allocation	Recommended Asset Allocation
Diversified stocks	US$3,000,000	US$9,600,000
Diversified bonds	US$2,000,000	US$6,400,000
Funding of lifestyle goal		*US$16,000,000*

24 Assumes cash distributions occur at the beginning of the year and the expected return is the geometric average.

	Beginning Asset Allocation	Recommended Asset Allocation
Concentrated stock	US$15,000,000	US$4,000,000
Total portfolio	US$20,000,000	US$20,000,000

It is recommended that Ivy fully fund her high-priority lifestyle consumption needs (US$15,949,075) with US$16 million in a diversified portfolio of stocks and bonds. To achieve this, US$11 million of the concentrated stock position should be sold and the proceeds added to the diversified portfolio that supports lifestyle consumption needs. The remaining US$4 million of concentrated stock can be retained to fund the aspirational goal of an end-of-life gift to Auldberg University. In this example, the adviser has employed the mental accounting bias to achieve a suitable outcome: By illustrating the dollar value needed to fund the high-priority lifetime consumption needs goal, the adviser was able to clarify for Ivy the risks in retaining the concentrated stock position. The adviser might also simulate portfolio returns and the associated probability of achieving Ivy's goals using a range of scenarios for the performance of the concentrated stock position. Framing the effect this one holding may have on the likelihood of achieving her goals may help Ivy agree to reduce the position size. Consideration of certain behavioral biases like mental accounting can improve investor outcomes when they are incorporated in an objective decision-making framework.

SUMMARY

- The primary constraints on an asset allocation decision are asset size, liquidity, time horizon, and other external considerations, such as taxes and regulation.
- The size of an asset owner's portfolio may limit the asset classes accessible to the asset owner. An asset owner's portfolio may be too small—or too large—to capture the returns of certain asset classes or strategies efficiently.
- Complex asset classes and investment vehicles require sufficient governance capacity.
- Large-scale asset owners may achieve operating efficiencies, but they may find it difficult to deploy capital effectively in certain active investment strategies given liquidity conditions and trading costs.
- Smaller portfolios may also be constrained by size. They may be too small to adequately diversify across the range of asset classes and investment managers, or they may have staffing constraints that prevent them from monitoring a complex investment program.
- Investors with smaller portfolios may be constrained in their ability to access private equity, private real estate, hedge funds, and infrastructure investments because of the high required minimum investments and regulatory restrictions associated with those asset classes. Wealthy families may pool assets to meet the required minimums.
- The liquidity needs of the asset owner and the liquidity characteristics of the asset classes each influence the available opportunity set.
- Liquidity needs must also take into consideration the financial strength of the investor and resources beyond those held in the investment portfolio.

- When assessing the appropriateness of any given asset class for a given investor, it is important to evaluate potential liquidity needs in the context of an extreme market stress event.
- An investor's time horizon must be considered in any asset allocation exercise. Changes in human capital and the changing character of liabilities are two important time-related constraints of asset allocation.
- External considerations—such as regulations, tax rules, funding, and financing needs—are also likely to influence the asset allocation decision.
- Taxes alter the distribution of returns by both reducing the expected mean return and muting the dispersion of returns. Asset values and asset risk and return inputs to asset allocation should be modified to reflect the tax status of the investor. Correlation assumptions do not need to be adjusted, but taxes do affect the return and the standard deviation assumptions for each asset class.
- Periodic portfolio rebalancing to return the portfolio to its target strategic asset allocation is an integral part of sound portfolio management. Taxable investors must consider the tax implications of rebalancing.
- Rebalancing thresholds may be wider for taxable portfolios because it takes larger asset class movements to materially alter the risk profile of the taxable portfolio.
- Strategic asset location is the placement of less tax-efficient assets in accounts with more-favorable tax treatment.
- An asset owner's strategic asset allocation should be re-examined periodically, even in the absence of a change in the asset owner's circumstances.
- A special review of the asset allocation policy may be triggered by a change in goals, constraints, or beliefs.
- In some situations, a change to an asset allocation strategy may be implemented without a formal asset allocation study. Anticipating key milestones that would alter the asset owner's risk appetite, and implementing pre-established changes to the asset allocation in response, is often referred to as a "glide path."
- Tactical asset allocation (TAA) allows short-term deviations from the strategic asset allocation (SAA) targets and are expected to increase risk-adjusted return. Using either short-term views or signals, the investor actively re-weights broad asset classes, sectors, or risk-factor premiums. The sizes of these deviations from the SAA are often constrained by the Investment Policy Statement.
- The success of TAA decisions is measured against the performance of the SAA policy portfolio by comparing Sharpe ratios, evaluating the information ratio or the t-statistic of the average excess return of the TAA portfolio relative to the SAA portfolio, or plotting outcomes versus the efficient frontier.
- TAA incurs trading and tax costs. Tactical trades can also increase the concentration of risk.
- Discretionary TAA relies on a qualitative interpretation of political, economic, and financial market conditions and is predicated on a belief of persistent manager skill in predicting and timing short-term market moves.
- Systematic TAA relies on quantitative signals to capture documented return anomalies that may be inconsistent with market efficiency.
- The behavioral biases most relevant in asset allocation include loss aversion, the illusion of control, mental accounting, recency bias, framing, and availability bias.

- An effective investment program will address behavioral biases through a formal asset allocation process with its own objective framework, governance, and controls.
- In goals-based investing, loss-aversion bias can be mitigated by framing risk in terms of shortfall probability or by funding high-priority goals with low-risk assets.
- The cognitive bias, illusion of control, and hindsight bias can all be mitigated by using a formal asset allocation process that uses long-term return and risk forecasts, optimization constraints anchored around asset class weights in the global market portfolio, and strict policy ranges.
- Goals-based investing incorporates the mental accounting bias directly into the asset allocation solution by aligning each goal with a discrete sub-portfolio.
- A formal asset allocation policy with pre-specified allowable ranges may constrain recency bias.
- The framing bias effect can be mitigated by presenting the possible asset allocation choices with multiple perspectives on the risk/reward trade-off.
- Familiarity bias, a form of availability bias, most commonly results in an overweight in home country securities and may also cause investors to inappropriately compare their investment decisions (and performance) to other organizations. Familiarity bias can be mitigated by using the global market portfolio as the starting point in developing the asset allocation and by carefully evaluating any potential deviations from this baseline portfolio.
- A strong governance framework with the appropriate level of expertise and well-documented investment beliefs increases the likelihood that shifts in asset allocation are made objectively and in accordance with those beliefs. This will help to mitigate the effect that behavioral biases may have on the long-term success of the investment program.

REFERENCES

Bader, Lawrence N., and Jeremy Gold. 2007. "The Case against Stock in Public Pension Funds." *Financial Analysts Journal*, vol. 63, no. 1 (January/February): 55–62.

Bodie, Zvi, Robert C. Merton, and William F. Samuelson. 1992. "Labor Supply Flexibility and Portfolio Choice in a Life Cycle Model." *Journal of Economic Dynamics & Control*, vol. 16: 427–449.

Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey Kubik. 2004. "Does Fund Size Erode Mutual Fund Performance? The Role of Liquidity and Organization." *American Economic Review*, vol. 94, no. 5: 1276–1302.

Cooper, Stephen, and David Bianco. 2003. "Q-SeriesTM: Pension Fund Asset Allocation." UBS Investment Research (September).

Das, Sanjiv, Harry Markowitz, Jonathan Scheid, and Meir Statman. 2010. "Portfolio Optimization with Mental Accounts." *Journal of Financial and Quantitative Analysis*, vol. 45, no. 2: 311–334.

Das, Sanjiv, Harry Markowitz, Jonathan Scheid, and Meir Statman. 2011. "Portfolios for Investors Who Want to Reach Their Goals While Staying on the Mean–Variance Efficient Frontier." *Journal of Wealth Management*, vol. 14, no. 2 (Fall): 25–31.

Dyck, Alexander, and Lukasz Pomorski. 2011. "Is Bigger Better? Size and Performance in Pension Plan Management." Rotman School of Management Working Paper No. 1690724.

Horan, Stephen, and Ashraf Al Zaman. 2008. "Tax-Adjusted Portfolio Optimization and Asset Location: Extensions and Synthesis." *Journal of Wealth Management*, vol. 11, no. 3: 56–73.

Kritzman, Mark. 2015. "What Practitioners Need to Know about Time Diversification (corrected March 2015)." *Financial Analysts Journal*, vol. 71, no. 1 (January/February): 29–34.

Mladina, Peter. 2011. "Portfolio Implications of Triple Net Returns." *Journal of Wealth Management*, vol. 13, no. 4 (Spring): 51–59.

Pollet, Joshua, and Mungo Wilson. 2008. "How Does Size Affect Mutual Fund Behavior?" *Journal of Finance*, vol. 63, no. 6 (December): 2941–2969.

Reichenstein, William. 2006. "After-Tax Asset Allocation." *Financial Analysts Journal*, vol. 62, no. 4 (July/August): 14–19.

Samuelson, Paul A. 1963. "Risk and Uncertainty: A Fallacy of Large Numbers." *Scientia*, vol. 57, no. 98: 108–113.

Samuelson, Paul A. 1969. "Lifetime Portfolio Selection by Dynamic Stochastic Programming." *Review of Economics and Statistics*, vol. 51, no. 3: 239–246.

Stein, Jeremy. 2002. "Information Production and Capital Allocation: Decentralized versus Hierarchical Firms." *Journal of Finance*, vol. 57, no. 5 (October): 1891–1921.

Turvey, Philip, Anup Basu, and Peter Verhoeven. 2013. "Embedded Tax Liabilities and Portfolio Choice." *Journal of Portfolio Management*, vol. 39, no. 3: 93–101.

READING

19

Currency Management: An Introduction

by William A. Barker, PhD, CFA

William A. Barker, PhD, CFA (Canada).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** analyze the effects of currency movements on portfolio risk and return;
☐	**b.** discuss strategic choices in currency management;
☐	**c.** formulate an appropriate currency management program given financial market conditions and portfolio objectives and constraints;
☐	**d.** compare active currency trading strategies based on economic fundamentals, technical analysis, carry-trade, and volatility trading;
☐	**e.** describe how changes in factors underlying active trading strategies affect tactical trading decisions;
☐	**f.** describe how forward contracts and FX (foreign exchange) swaps are used to adjust hedge ratios;
☐	**g.** describe trading strategies used to reduce hedging costs and modify the risk–return characteristics of a foreign-currency portfolio;
☐	**h.** describe the use of cross-hedges, macro-hedges, and minimum-variance-hedge ratios in portfolios exposed to multiple foreign currencies;
☐	**i.** discuss challenges for managing emerging market currency exposures.

INTRODUCTION

1

Globalization has been one of the most persistent themes in recent history, and this theme applies equally to the world of finance. New investment products, deregulation, worldwide financial system integration, and better communication and information

© 2013 CFA Institute. All rights reserved.

networks have opened new global investment opportunities. At the same time, investors have increasingly shed their "home bias" and sought investment alternatives beyond their own borders.

The benefits of this trend for portfolio managers have been clear, both in terms of the broader availability of higher-expected-return investments as well as portfolio diversification opportunities. Nonetheless, investments denominated in foreign currencies also bring a unique set of challenges: measuring and managing foreign exchange risk. Buying foreign-currency denominated assets means bringing currency risk into the portfolio. Exchange rates are volatile and, at least in the short to medium term, can have a marked impact on investment returns and risks—*currency matters*. The key to the superior performance of global portfolios is the effective management of this currency risk.

This reading explores basic concepts and tools of currency management. Section 2 reviews some of the basic concepts of foreign exchange (FX) markets. The material in subsequent sections presumes an understanding of these concepts. Section 3 examines some of the basic mathematics involved in measuring the effects of foreign-currency investments on portfolio return and risk. Section 4 discusses the *strategic* decisions portfolio managers face in setting the target currency exposures of the portfolio. The currency exposures that the portfolio can accept range from a fully hedged position to active management of currency risk. Section 5 discusses some of the *tactical* considerations involving active currency management if the investment policy statement (IPS) extends some latitude for active currency management. A requisite to any active currency management is having a market view; so this section includes various methodologies by which a manager can form directional views on future exchange rate movements and volatility. Section 6 covers a variety of trading tools available to implement both hedging and active currency management strategies. Although the generic types of FX derivatives tools are relatively limited—spot, forward, option, and swap contracts—the number of variations within each and the number of combinations in which they can be used is vast. Section 7 examines some of the issues involved in managing the currency exposures of emerging market currencies—that is, those that are less liquid than the major currencies. Section 8 presents a summary.

2 REVIEW OF FOREIGN EXCHANGE CONCEPTS

We begin with a review of the basic trading tools of the foreign exchange market: spot, forward, FX swap, and currency option transactions. The concepts introduced in this section will be used extensively in our discussion of currency management techniques in subsequent sections.

Most people think only of spot transactions when they think of the foreign exchange market, but in fact the spot market accounts for less than 40% of the average daily turnover in currencies.[1] Although cross-border *business* may be transacted in the spot market (making and receiving foreign currency payments), the *risk management* of these flows takes place in FX derivatives markets (i.e., using forwards, FX swaps, and currency options). So does the hedging of foreign currency assets and liabilities. It is unusual for market participants to engage in any foreign currency transactions without also managing the currency risk they create. Spot transactions typically generate derivative transactions. As a result, understanding these FX derivatives markets, and their relation to the spot market, is critical for understanding the currency risk management issues examined in this reading.

1 2013 Triennial Survey, Bank for International Settlements (2013).

2.1 Spot Markets

In professional FX markets, exchange rate quotes are described in terms of the three-letter currency codes used to identify individual currencies. Exhibit 1 shows a list of some of the more common currency codes.

Exhibit 1 Currency Codes

USD	US dollar
EUR	Euro
GBP	British pound
JPY	Japanese yen
MXN	Mexican peso
CHF	Swiss franc
CAD	Canadian dollar
SEK	Swedish krona
AUD	Australian dollar
KRW	Korean won
NZD	New Zealand dollar
BRL	Brazilian real
RUB	Russian ruble
CNY	Chinese yuan
INR	Indian rupee
ZAR	South African rand

An exchange rate is the price of the base currency expressed in terms of the price currency. For example, a USD/EUR rate of 1.3650 means the euro, the base currency, costs 1.3650 US dollars. The exact notation used to represent exchange rates can vary widely between sources, and occasionally the same exchange rate notation will be used by different sources to mean completely different things. The reader should be aware that the notation used here may not be the same as that encountered elsewhere. To avoid confusion, this reading will identify exchange rates using the convention of "P/B," which refers to the price of one unit of the base currency "B" expressed in terms of the price currency "P."[2]

2 Notation is generally not standardized in global foreign exchange markets, and there are several common ways of expressing the same currency pair (e.g., JPY/USD, USD:JPY, $/¥). However, what is common in FX markets is the concept of a "base" and "price" currency when setting exchange rate prices. Later in the reading, we will sometimes switch to discussing a "domestic" and a "foreign" currency. This designation will only be used as an illustrative device for making the explanation of various theoretical concepts easier. The candidate should be aware that describing currency pairs in terms of "foreign" and "domestic" currencies is typically not done in professional FX markets because what is the "foreign" currency and what is the "domestic" currency depends on where one is located, which can lead to confusion. For example, what is "foreign" and what is "domestic" for an investor from the Middle East trading CHF against GBP with the New York branch of a European bank, with the trade ultimately booked at the bank's headquarters in Paris?

How the professional FX market quotes exchange rates—which is the base currency, and which is the price currency, in any currency pair—is not arbitrary but follows conventions that are broadly agreed on throughout the market. Generally, there is a hierarchy as to which currency will be quoted as the base currency in any given P/B currency pair:

1. Currency pairs involving the EUR will use the EUR as the base currency (for example, GBP/EUR).
2. Currency pairs involving the GBP, other than those involving the EUR, will use the GBP as the base currency (for example, CHF/GBP).
3. Currency pairs involving either the AUD or NZD, other than those involving either the EUR or GBP, will use these currencies as the base currency (for example, USD/AUD and NZD/AUD). The market convention between these two currencies is for a NZD/AUD quote.
4. All other currency quotes involving the USD will use USD as the base currency (for example, MXN/USD).

Readers are encouraged to familiarize themselves with the quoting conventions used in the professional FX market because they are the currency quotes that will be experienced in practice. Exhibit 2 lists some of the most commonly traded currency pairs in global FX markets and their market-standard quoting conventions. These market-standard conventions will be used for the balance of this reading.

Exhibit 2 Select Market-Standard Currency Pair Quotes

Quote convention	Market name
USD/EUR	Euro-dollar
GBP/EUR	Euro-sterling
USD/GBP	Sterling-dollar
JPY/USD	Dollar-yen
USD/AUD	Aussie-dollar
CHF/USD	Dollar-Swiss
CAD/USD	Dollar-Canada
JPY/EUR	Euro-yen
CHF/EUR	Euro-Swiss
JPY/GBP	Sterling-yen

Another convention used in professional FX markets is that most spot currency quotes are priced out to four decimal places: for example, a typical USD/EUR quote would be 1.3500 and not 1.35. The price point at the fourth decimal place is commonly referred to as a "pip." Professional FX traders also refer to what is called the "big figure" or the "handle," which is the integer to the left side of the decimal place as well as the first two decimal places of the quote. For example, for a USD/EUR quote of 1.3568, 1.35 is the handle and there are 68 pips.

There are exceptions to this four decimal place rule. First, forward quotes—discussed later—will often be quoted out to five and sometimes six decimal places. Second, because of the relative magnitude of some currency values, some currency

quotes will only be quoted out to two decimal places. For example, because it takes many Japanese yen to buy one US dollar, the typical spot quote for JPY/USD is priced out to only two decimal places (for example, 86.35 and not 86.3500).[3]

The spot exchange rate is usually for settlement on the second business day after the trade date, referred to as $T + 2$ settlement.[4] In foreign exchange markets—as in other financial markets—market participants confront a two-sided price in the form of a bid price and an offer price (also called an ask price) being quoted by potential counterparties. The **bid price** is the price, defined in terms of the price currency, at which the counterparty providing a two-sided price quote is willing to buy one unit of the **base** currency. Similarly, **offer price** is the price, in terms of the price currency, at which that counterparty is willing to sell one unit of the base currency. For example, given a price request from a client, a dealer might quote a two-sided price on the spot USD/EUR exchange rate of 1.3648/1.3652. This quote means that the dealer is willing to pay USD1.3648 to buy one euro (bid) and that the dealer will sell one euro (offer) for USD1.3652. The market width, usually referred to as dealer's spread or the bid–offer spread, is the difference between the bid and the offer. When transacting on a dealer's bid-offer two-sided price quote, a client is said to either "hit the bid" (selling the base currency) or "pay the offer" (buying the base currency).

An easy check to see whether the bid or offer should be used for a specific transaction is that the party *asking* the dealer for a price should be on the more expensive side of the market. For example, if one wants to buy 1 EUR, 1.3652 is more USD per EUR than 1.3648. Hence, paying the offer involves paying more EUR. Similarly, when selling 1 EUR, hitting the bid at 1.3648 means less USD received than 1.3652.

2.2 Forward Markets

Forward contracts are agreements to exchange one currency for another on a future date at an exchange rate agreed on today.[5] In contrast to spot rates, forward contracts are any exchange rate transactions that occur with settlement longer than the usual $T + 2$ settlement for spot delivery.

In professional FX markets, forward exchange rates are typically quoted in terms of "points." The points on a forward rate quote are simply the difference between the forward exchange rate quote and the spot exchange rate quote; that is, the forward premium or discount, with the points scaled so that they can be related to the last decimal place in the spot quote. Forward points are adjustments to the spot price of the base currency, using our standard price/base (P/B) currency notation.

This means that forward rate quotes in professional FX markets are typically shown as the bid–offer on the spot rate and the number of forward points at each maturity.[6] For illustration purposes, assume that the bid–offer for the spot and forward points for the USD/EUR exchange rate are as shown in Exhibit 3.

3 It should be mentioned that many electronic dealing platforms in the FX market are moving to five decimal place pricing for spot quotes, using what are referred to as "deci-pips." In this case, for example, a USD/EUR spot quote might be shown as 1.37645. Spot quotes for JPY/USD on these systems will be given out to three decimal places.

4 The exception among the major currencies is CAD/USD, for which standard spot settlement is $T + 1$.

5 These are sometimes called outright forwards to distinguish them from FX swaps, which are discussed later.

6 Maturity is defined in terms of the time between spot settlement, usually $T + 2$, and the settlement of the forward contract.

Exhibit 3 Sample Spot and Forward Quotes (Bid–Offer)

Maturity	Spot Rate or Forward Points
Spot (USD/EUR)	1.3549/1.3651
One month	–5.6/–5.1
Three months	–15.9/–15.3
Six months	–37.0/–36.3
Twelve months	–94.3/–91.8

To convert any of these quoted forward points into a forward rate, one would divide the number of points by 10,000 (to scale down to the fourth decimal place, the last decimal place in the USD/EUR spot quote) and then add the result to the spot exchange rate quote.[7] But one must be careful about which side of the market (bid or offer) is being quoted. For example, suppose a market participant was *selling* the EUR forward against the USD. Given the USD/EUR quoting convention, the EUR is the base currency. This means the market participant must use the *bid* rates (i.e., the market participant will "hit the bid") given the USD/EUR quoting convention. Using the data in Exhibit 3, the three-month forward *bid* rate in this case would be based on the bid for both the spot and the forward points, and hence would be:

$$1.3549 + \left(\frac{-15.9}{10{,}000}\right) = 1.35331$$

This result means that the market participant would be selling EUR three months forward at a price of USD1.35331 per EUR. Note that the quoted points are already scaled to each maturity—they are not annualized—so there is no need to adjust them.

Although there is no cash flow on a forward contract until settlement date, it is often useful to do a mark-to-market valuation on a forward position before then to (1) judge the effectiveness of a hedge based on forward contracts (i.e., by comparing the change in the mark-to-market of the underlying asset with the change in the mark-to-market of the forward), and (2) to measure the profitability of speculative currency positions at points before contract maturity.

As with other financial instruments, the mark-to-market value of forward contracts reflects the profit (or loss) that would be realized from closing out the position at current market prices. To close out a forward position, it must be offset with an equal and opposite forward position using the spot exchange rate and forward points available in the market when the offsetting position is created. When a forward contract is initiated, the forward rate is such that no cash changes hands (i.e., the mark-to-market value of the contract at initiation is zero). From that moment onward, however, the mark-to-market value of the forward contract will change as the spot exchange rate changes as well as when interest rates change in either of the two currencies.

Consider an example. Suppose that a market participant bought GBP10,000,000 for delivery against the AUD in six months at an "all-in" forward rate of 1.6100 AUD/GBP. (The all-in forward rate is simply the sum of the spot rate and the forward points, appropriately scaled to size.) Three months later, the market participant wants to close out this forward contract. To do that would require selling GBP10,000,000 three

7 Because the JPY/USD exchange rate is only quoted to two decimal places, forward points for the dollar/yen currency pair are divided by 100.

months forward using the AUD/GBP spot exchange rate and forward points in effect at that time.[8] Assume the bid–offer for spot and forward points three months prior to the settlement date are as follows:

Spot rate (AUD/GBP)	1.6210/1.6215
Three-month points	130/140

To sell GBP (the base currency in the AUD/GBP quote) means calculating the *bid* side of the market. Hence, the appropriate all-in three-month forward rate to use is

$$1.6210 + 130/10{,}000 = 1.6340$$

Thus, the market participant originally bought GBP10,000,000 at an AUD/GBP rate of 1.6100 and subsequently sold them at a rate of 1.6340. These GBP amounts will net to zero at settlement date (GBP10 million both bought and sold), but the AUD amounts will not net to zero because the forward rate has changed. The AUD cash flow at settlement date will be equal to

$$(1.6340 - 1.6100) \times 10{,}000{,}000 = \text{AUD}240{,}000$$

This amount is a cash *inflow* because the market participant was long the GBP with the original forward position and the GBP subsequently appreciated (the AUD/GBP rate increased).

This cash flow is paid at settlement day, which is still three months away. To calculate the mark-to-market value on the dealer's position, this cash flow must be discounted to the present. The present value of this amount is found by discounting the settlement day cash flow by the three-month discount rate. Because it is an AUD amount, the three-month AUD discount rate is used. If Libor is used and the three-month AUD Libor is 4.80% (annualized), the present value of this future AUD cash flow is then

$$\frac{\text{AUD}240{,}000}{1 + 0.048\left[\dfrac{90}{360}\right]} = \text{AUD}237{,}154$$

This is the mark-to-market value of the original long GBP10 million six-month forward contract when it is closed out three months prior to settlement.

To summarize, the process for marking-to-market a forward position is relatively straightforward:

1. Create an equal and offsetting forward position to the original forward position. (In the example earlier, the market participant is long GBP10 million forward, so the offsetting forward contract would be to sell GBP10 million.)
2. Determine the appropriate all-in forward rate for this new, offsetting forward position. If the base currency of the exchange rate quote is being sold (bought), then use the bid (offer) side of the market.
3. Calculate the cash flow at settlement day. This calculation will be based on the original contract size times the difference between the original forward rate and the rate calculated in Step 2. If the currency the market participant was originally long (short) subsequently appreciated (depreciated), then there will be

8 Note that the offsetting forward contract is defined in terms of the original position taken. The original position in this example was long GBP10 million, so the offsetting contract is short GBP10 million. But there is an ambiguity here: to be *long* GBP10 million at 1.6100 AUD/GBP is equivalent to being *short* AUD16,100,000 (10,000,000 × 1.6100) at the same forward rate. To avoid this ambiguity, for the purposes of this reading we will state what the relevant forward position is for mark-to-market purposes. The net gain or loss from the transaction will be reflected in the alternate currency.

a cash *inflow*. Otherwise, there will be a cash outflow. (In the earlier example, the market participant was long the GBP and it subsequently appreciated; this appreciation led to a cash inflow at the settlement day.)

4 Calculate the present value of this cash flow at the future settlement date. The currency of the cash flow and the discount rate must match. (In the example earlier, the cash flow at the settlement date is in AUD, so an AUD Libor rate is used to calculate the present value.)

Finally, we note that in the example, the mark-to-market value is given in AUD. It would be possible to translate this AUD amount into any other currency value using the current spot rate for the relevant currency pair.[9]

2.3 FX Swap Markets

An FX swap transaction consists of offsetting and simultaneous spot and forward transactions, in which the base currency is being bought (sold) spot and sold (bought) forward. These two transactions are often referred to as the "legs" of the swap. The two legs of the swap can either be of equal size (a "matched" swap) or one can be larger than the other (a "mismatched" swap). FX swaps are distinct from currency swaps. Similar to currency swaps, FX swaps involve an exchange of principal amounts in different currencies at swap initiation that is reversed at swap maturity. Unlike currency swaps, FX swaps have no interim interest payments and are nearly always of much shorter term than currency swaps.

FX swaps are important for managing currency risk because they are used to "roll" forward contracts forward as they mature. For example, consider the case of a trader who *bought* GBP1,000,000 one month forward against the CHF in order to set up a currency hedge. One month later, the forward contract will expire. To maintain this long position in the GBP against the CHF, two days prior to contract maturity, given $T + 2$ settlement, the trader must (1) sell GBP1,000,000 against the CHF spot, to settle the maturing forward contract; and (2) buy GBP1,000,000 against the CHF forward. That is, the trader is engaging in an FX swap (a matched swap in this case because the GBP currency amounts are equal).

If a trader wanted to adjust the size of the currency hedge (i.e., the size of the outstanding forward position), the forward leg of the FX swap can be of a different size than the spot transaction when the hedge is rolled. Continuing the previous example, if the trader wanted to increase the size of the long-GBP position by GBP500,000 as the outstanding forward contract expires, the transactions required would be to (1) sell GBP1,000,000 against the CHF spot, to settle the maturing forward contract; and (2) buy GBP1,500,000 against the CHF forward. This would be a mismatched swap.

The pricing of swaps will differ slightly depending on whether they are matched or mismatched swaps. If the amount of the base currency involved for the spot and forward legs of the swap are equal (a matched swap), then these are exactly offsetting transactions; one is a buy, the other a sell, and both are for the same amount. Because of this equality, a common *spot* exchange rate is typically applied to both legs of the swap transaction; it is standard practice to use the mid-market spot exchange rate for a matched swap transaction. However, the *forward* points will still be based on either

9 In the context of this example, an alternative and equivalent approach to re-denominate the mark-to-market value in another currency would be to sell the AUD forward. In our example, the cash flow is +AUD 240,000 in 90 days. If one wanted to redenominate the mark-to-market in USD, for example, one would sell this amount of AUD 90-days forward against the USD at the prevailing USD/AUD 90-day forward bid rate. This will produce a USD cash flow in 90 days. This USD amount can then be present-valued at the 90-day US Libor rate to get the USD mark-to-market value of the AUD/GBP forward position. The day-count convention used here is an "actual/360" basis.

the bid or offer, depending on whether the market participant is buying or selling the base currency forward. In the earlier example, the trader is *buying* the GBP (the base currency) forward and would hence pay the *offer* side of the market for forward points.

If the FX swap is mismatched, then pricing will need to reflect the difference in trade sizes between the two legs of the transaction. Continuing the example in which the trader increased the size of the long-GBP position by GBP500,000, this mismatched swap is equivalent to (1) a matched swap for a size of GBP1,000,000, and (2) an outright forward contract buying GBP500,000. Pricing for the mismatched swap must reflect this net GBP purchase amount. Because the matched swap would already price the forward points on the offer side of the market, typically this mismatched size adjustment would be reflected in the *spot* rate quoted as the base for the FX swap. Because a net amount of GBP is being *bought*, the spot quote would now be on the *offer* side of the CHF/GBP spot rate quote. (In addition, the trader would still pay the offer side of the market for the forward points.)

We will return to these topics later in the reading when discussing in more depth the use of forward contracts and FX swaps to adjust hedge ratios. (A **hedge ratio** is the ratio of the nominal value of the derivatives contract used as a hedge to the market value of the hedged asset.)

2.4 Currency Options

The final product type within FX markets is currency options. The market for currency options is, in many ways, similar to option markets for other asset classes, such as bonds and equities. As in other markets, the most common options in FX markets are call and put options, which are widely used for both risk management and speculative purposes. However, in addition to these vanilla options, the FX market is also characterized by active trading in exotic options. ("Exotic" options have a variety of features that make them exceptionally flexible risk management tools, compared with vanilla options.)

The risk management uses of both vanilla and exotic currency options will be examined in subsequent sections. Although daily turnover in FX options market is small in *relative* terms compared with the overall daily flow in global spot currency markets, because the overall currency market is so large, the *absolute* size of the FX options market is still very considerable.

CURRENCY RISK AND PORTFOLIO RETURN AND RISK 3

In this section, we examine the effect of currency movements on asset returns and portfolio risk. We then turn to how these effects help determine construction of a foreign asset portfolio.

3.1 Return Decomposition

In this section, we examine how international exposure affects a portfolio's return. A **domestic asset** is an asset that trades in the investor's **domestic currency** (or **home currency**). From a portfolio manager's perspective, the domestic currency is the one in which portfolio valuation and returns are reported. *Domestic* refers to a relation between the currency denomination of the asset and the investor; it is not an inherent property of either the asset or the currency. An example of a domestic

asset is a USD-denominated bond portfolio from the perspective of a US-domiciled investor. The return on a domestic asset is not affected by exchange rate movements of the domestic currency.

Foreign assets are assets denominated in currencies other than the investor's home currency. An example of a foreign asset is a USD-denominated bond portfolio from the perspective of a eurozone-domiciled investor (and for whom the euro is the home currency). The return on a foreign asset will be affected by exchange rate movements in the home currency against the **foreign currency**. Continuing with our example, the return to the eurozone-domiciled investor will be affected by the USD return on the USD-denominated bond as well as movements in the exchange rate between the home currency and the foreign currency, the EUR and USD respectively.

The return of the foreign asset measured in foreign-currency terms is known as the **foreign-currency return**. Extending the example, if the value of the USD-denominated bond increased by 10%, measured in USD, that increase is the foreign-currency return to the eurozone-domiciled investor. The **domestic-currency return** on a foreign asset will reflect both the foreign-currency return on that asset as well as percentage movements in the spot exchange rate between the home and foreign currencies. The domestic-currency return is multiplicative with respect to these two factors:

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1 \quad \textbf{(1)}$$

where R_{DC} is the domestic-currency return (in percent), R_{FC} is the foreign-currency return, and R_{FX} is the percentage change of the foreign currency against the domestic currency.

Returning to the example, the domestic-currency return for the eurozone-domiciled investor on the USD-denominated bond will reflect both the bond's USD-denominated return as well as movements in the exchange rate between the USD and the EUR. Suppose that the foreign-currency return on the USD-denominated bond is 10% and the USD appreciates by 5% against the EUR. In this case, the domestic-currency return to the eurozone investor will be:

$$(1 + 10\%)(1 + 5\%) - 1 = (1.10)(1.05) - 1 = 0.155 = 15.5\%$$

Although the concept is seemingly straightforward, the reader should be aware that Equation 1 hides a subtlety that must be recognized. The term R_{FX} is defined as the percentage change in the foreign currency against the domestic currency. However, this change is *not* always the same thing as the percentage change in the spot rate using market standard P/B quotes (for example, as shown in Exhibit 2). In other words, it is not always the case that $R_{FX} = \%\Delta S_{P/B}$, where the term on the right side of the equal sign is defined in standard FX market convention (note that $\%\Delta$ is percentage change).

This distinction is important because which currency is considered the domestic currency and whether it is either the base or the price currency in the market standard P/B quote will lead to completely different mathematical results. This happens in two ways. First, it determines the *sign*, or direction, of the exchange rate appreciation. For example, in the illustration earlier, the euro was the domestic currency. Note also that in the market standard USD/EUR quote, the euro is the base currency. In the illustration, the USD appreciated, and an appreciation of the USD means a *depreciation* of the USD/EUR quote.

Another way in which quoting conventions affect mathematical results involves the fact that the foreign exchange return, R_{FX} in Equation 1, is calculated with the investor's domestic currency as the price currency. Even if one gets the sign, or direction, of change right, it is not necessarily the case that one can simply "flip the sign" of the percentage change in market standard P/B to get the right answer. For example, in our earlier illustration, the euro was the investor's domestic currency and it is also the base currency in the market-standard USD/EUR quote. But note that a 5% move in USD/EUR in not the same as a 5% move in EUR/USD. Assume that the current USD/

EUR spot rate is 1.3510 (meaning that the EUR/USD rate is 0.7402). An appreciation of the USD, as in our illustration, is equivalent to a depreciation of the EUR. A 5% depreciation of USD/EUR leads to 1.2835. But a 5% appreciation of EUR/USD leads to 0.7772, which inverts to 1.2867—a different number. Hence, to be accurate, the foreign exchange calculation in Equation 1 must be quoted so that the "domestic" currency is always the price currency. One must be careful when using quote conventions and make adjustments as necessary to calculate the domestic-currency return properly.

With this nuance in mind, what holds for the domestic-currency return of a single foreign asset also holds for the returns on a multi-currency portfolio of foreign assets, except now the portfolio weights must be considered. More generally, the domestic-currency return on a portfolio of multiple foreign assets will be equal to

$$R_{DC} = \sum_{i=1}^{n} \omega_i \left(1 + R_{FC,i}\right)\left(1 + R_{FX,i}\right) - 1 \qquad (2)$$

where $R_{FC,i}$ is the foreign-currency return on the i-th foreign asset, $R_{FX,i}$ is the appreciation of the i-th foreign currency against the domestic currency, and ω_i are the portfolio weights of the foreign-currency assets (defined as the percentage of the aggregate domestic-currency value of the portfolio) and $\sum_{i=1}^{n} \omega_i = 1$. (Note that if short selling is allowed in the portfolio, some of the ω_i can be less than zero.) Again, it is important that the exchange rate notation in this expression (used to calculate $R_{FX,i}$) must be consistently defined with the domestic currency as the price currency.

Assume the following information for a portfolio held by an investor in India. Performance is measured in terms of the Indian rupee (INR) and the weights of the two assets in the portfolio, at the beginning of the period, are 80% for the GBP-denominated asset and 20% for the EUR-denominated asset, respectively. (Note that the portfolio weights are measured in terms of a common currency, the INR, which is the investor's domestic currency in this case.)

	One Year Ago	Today*
INR/GBP spot rate	84.12	85.78
INR/EUR spot rate	65.36	67.81
GBP-denominated asset value, in GBP millions	43.80	50.70
EUR-denominated asset value, in EUR millions	14.08	12.17
GBP-denominated asset value, in INR millions	3,684.46	
EUR-denominated asset value, in INR millions	920.27	
GBP-denominated assets, portfolio weight (INR)	80%	
EUR-denominated assets, portfolio weight (INR)	20%	

* Today's asset values are prior to rebalancing.

The domestic-currency return (R_{DC}) is calculated as follows:

$$R_{DC} = 0.80(1 + R_{FC,GBP})(1 + R_{FX,GBP}) + 0.20(1 + R_{FC,EUR})(1 + R_{FX,EUR}) - 1$$

Note that given the exchange rate quoting convention, the INR is the price currency in the P/B quote for both currency pairs. Adding the data from the table leads to:

$$R_{DC} = 0.80\left(\frac{50.70}{43.80}\right)\left(\frac{85.78}{84.12}\right) + 0.20\left(\frac{12.17}{14.08}\right)\left(\frac{67.81}{65.36}\right) - 1$$

This solves to 0.124 or 12.4%.

To get the *expected* future return on a foreign-currency asset portfolio, based on Equation 2, the portfolio manager would need a market opinion for the expected price movement in each of the foreign assets ($R_{A,i}$) and exchange rates ($R_{FX,i}$) in the portfolio. There are typically correlations between all of these variables—correlations between the foreign asset price movements across countries, correlations between movements among various currency pairs, and correlations between exchange rate movements and foreign-currency asset returns. The portfolio manager would need to account for these correlations when forming expectations about future asset price and exchange rate movements.

3.2 Volatility Decomposition

Now we will turn to examining the effect of currency movements on the volatility of domestic-currency returns. Equation 1 can be rearranged as

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1 = R_{FC} + R_{FX} + R_{FC}R_{FX}$$

When R_{FC} and R_{FX} are small, then the cross-term ($R_{FC}R_{FX}$) is small, and as a result this equation can be approximated as

$$R_{DC} \approx R_{FC} + R_{FX} \tag{3}$$

We return to the example in which the foreign-currency return on the USD-denominated bond was 10% and the USD appreciated by 5% against the EUR. In this example, the domestic-currency return for the Eurozone investor's holding in the USD-denominated bond was approximately equal to 10% + 5% = 15% (which is close to the exact value of 15.5%). We can combine the approximation of Equation 3 with the statistical rule that:

$$\sigma^2\left(\omega_x X + \omega_y Y\right) = \omega_x^2\sigma^2\left(X\right) + \omega_y^2\sigma^2\left(Y\right) + 2\omega_x\omega_y\sigma\left(X\right)\sigma\left(Y\right)\rho\left(X,Y\right) \tag{4}$$

where X and Y are random variables, ω are weights attached to X and Y, σ^2 is variance of a random variable, σ is the corresponding standard deviation, and ρ represents the correlation between two random variables. Applying this result to the domestic-currency return approximation of Equation 3 leads to:

$$\sigma^2(R_{DC}) \approx \sigma^2(R_{FC}) + \sigma^2(R_{FX}) + 2\sigma(R_{FC})\sigma(R_{FX})\rho(R_{FC},R_{FX}) \tag{5}$$

This equation is for the variance of the domestic-currency returns (R_{DC}), but risk is more typically defined in terms of standard deviation because mean and standard deviation are measured in the same units (percent, in this case). Hence, the total risk for domestic-currency returns—that is, $\sigma(R_{DC})$—is the square root of the results calculated in Equation 5.

Note as well that because Equation 5 is based on the addition of all three terms on the right side of the equal sign, exchange rate exposure will generally cause the variance of domestic-currency returns, $\sigma^2(R_{DC})$, to increase to more than that of the foreign-currency returns, $\sigma^2(R_{FC})$, considered on their own. That is, if there was no exchange rate risk, then it would be the case that $\sigma^2(R_{DC}) = \sigma^2(R_{FC})$. Using this as our base-case scenario, adding exchange rate risk exposure to the portfolio usually adds to domestic-currency return variance (the effect is indeterminate if exchange rate movements are negatively correlated with foreign asset returns).

These results on the variance of domestic-currency return can be generalized to a portfolio of foreign-currency assets. If we define the random variables X and Y in Equation 4 in terms of the domestic-currency return (R_{DC}) of two different foreign-currency investments, and the ω_i as portfolio weights that sum to one, then the result is the variance of the domestic-currency returns for the overall foreign asset portfolio:

$$\sigma^2\left(\omega_1 R_1 + \omega_2 R_2\right) \approx \omega_1^2\sigma^2\left(R_1\right) + \omega_2^2\sigma^2\left(R_2\right) + 2\omega_1\omega_2\sigma\left(R_1\right)\sigma\left(R_2\right)\rho\left(R_1,R_2\right) \tag{6}$$

where R_i is the domestic-currency return of the i-th foreign-currency asset. But as shown in Equation 3, the domestic-currency return of a foreign-currency asset (R_{DC}) is itself based on the sum of two random variables: R_{FC} and R_{FX}. This means that we would have to embed the variance expression shown in Equation 5 in *each* of the $\sigma^2(R_i)$ shown in Equation 6 to get the complete solution for the domestic-currency return variance of the overall portfolio. (We would also have to calculate the correlations between *all* of the R_i.) These requirements would lead to a very cumbersome mathematical expression for even a portfolio of only two foreign-currency assets; the expression would be far more complicated for a portfolio with many foreign currencies involved.

Thus, rather than attempt to give the complete mathematical formula for the variance of domestic-currency returns for a multi-currency portfolio, we will instead focus on the key intuition behind this expression. Namely, that the domestic-currency risk exposure of the overall portfolio—that is, $\sigma(R_{DC})$—will depend not only on the variances of *each* of the foreign-currency returns (R_{FC}) and exchange rate movements (R_{FX}) but also on how each of these *interacts* with the others. Generally speaking, negative correlations among these variables will help reduce the overall portfolio's risk through diversification effects.

Note as well that the overall portfolio's risk exposure will depend on the portfolio weights (ω_i) used. If short-selling is allowed in the portfolio, some of these ω_i can be negative as long as the total portfolio weights sum to one. So, for two foreign assets with a strong positive return correlation, short selling one can create considerable diversification benefits for the portfolio. (This approach is equivalent to trading movements in the price spread between these two assets.)

As before with the difference between realized and expected domestic-currency portfolio returns (R_{DC}), there is a difference between realized and expected domestic-currency portfolio risk, $\sigma(R_{DC})$. For Equation 6 to apply to the expected future volatility of the domestic-currency return of a multi-currency foreign asset portfolio, we would need to replace the observed, historical values of the variances and covariances in Equation 6 with their expected future values. This can be challenging, not only because it potentially involves a large number of variables but also because historical price patterns are not always a good guide to future price behavior. Variance and correlation measures are sensitive to the time period used to estimate them and can also vary over time. These variance and correlation measures can either drift randomly with time, or they can be subject to abrupt movements in times of market stress. It should also be clear that these observed, historical volatility and correlation measures need not be the same as the forward-looking *implied* volatility (and correlation) derived from option prices. Although sometimes various survey or consensus forecasts can be used, these too can be sensitive to sample size and composition and are not always available on a timely basis or with a consistent starting point. As with any forecast, they are also not necessarily an accurate guide to future developments; judgment must be used.

Hence, to calculate the expected future risk of the foreign asset portfolio, the portfolio manager would need a market opinion—however derived—on the variance of each of the foreign-currency asset returns (R_{FC}) over the investment horizon as well the variance of future exchange rate movements (R_{FX}) for each currency pair. The portfolio manager would also need a market opinion of how each of these future variables would interact with each other (i.e., their expected correlations). Historical price patterns can serve as a guide, and with computers and large databases, this modeling problem is daunting but not intractable. But the portfolio manager must always be mindful that historical risk patterns may not repeat going forward.

EXAMPLE 1

Portfolio Risk and Return Calculations

The following table shows current and future expected asset prices, measured in their domestic currencies, for both eurozone and Canadian assets (these can be considered "total return" indexes). The table also has the corresponding data for the CAD/EUR spot rate.

	Eurozone		Canada	
	Today	**Expected**	**Today**	**Expected**
Asset price	100.69	101.50	101.00	99.80
CAD/EUR	1.2925	1.3100		

1. What is the expected domestic-currency return for a eurozone investor holding the Canadian asset?
2. What is the expected domestic-currency return for a Canadian investor holding the eurozone asset?
3. From the perspective of the Canadian investor, assume that $\sigma(R_{FC}) = 3\%$ (the expected risk for the foreign-currency asset is 3%) and the $\sigma(R_{FX}) = 2\%$ (the expected risk of exchange rate movements is 2%). Furthermore, the expected correlation between movements in foreign-currency asset returns and movements in the CAD/EUR rate is +0.5. What is the expected risk of the domestic-currency return $[\sigma(R_{DC})]$?

Solution to 1:

For the eurozone investor, the $R_{FC} = (99.80/101.00) - 1 = -1.19\%$. Note that, given we are considering the eurozone to be "domestic" for this investor and given the way the R_{FX} expression is defined, we will need to convert the CAD/EUR exchange rate quote so that the EUR is the *price* currency. This leads to $R_{FX} = [(1/1.3100)/(1/1.2925)] - 1 = -1.34\%$. Hence, for the eurozone investor, $R_{DC} = (1 - 1.19\%)(1 - 1.34\%) - 1 = -2.51\%$.

Solution to 2:

For the Canadian investor, the $R_{FC} = (101.50/100.69) - 1 = +0.80\%$. Given that in the CAD/EUR quote the CAD is the price currency, for this investor the $R_{FX} = (1.3100/1.2925) - 1 = +1.35\%$. Hence, for the Canadian investor the $R_{DC} = (1 + 0.80\%)(1 + 1.35\%) - 1 = 2.16\%$.

Solution to 3:

Because this is a single foreign-currency asset we are considering (not a portfolio of such assets), we can use Equation 5:

$$\sigma^2(R_{DC}) \approx \sigma^2(R_{FC}) + \sigma^2(R_{FX}) + 2\sigma(R_{FC})\sigma(R_{FX})\rho(R_{FC},R_{FX})$$

Inserting the relevant data leads to

$$\sigma^2(R_{DC}) \approx (3\%)^2 + (2\%)^2 + 2(3\%)(2\%)(0.50) = 0.0019$$

Taking the square root of this leads to $\sigma(R_{DC}) \approx 4.36\%$. (Note that the units in these expressions are all in percent, so in this case 3% is equivalent to 0.03 for calculation purposes.)

CURRENCY MANAGEMENT: STRATEGIC DECISIONS

4

There are a variety of approaches to currency management, ranging from trying to avoid all currency risk in a portfolio to actively seeking foreign exchange risk in order to manage it and enhance portfolio returns.

There is no firm consensus—either among academics or practitioners—about the most effective way to manage currency risk. Some investment managers try to hedge all currency risk, some leave their portfolios unhedged, and others see currency risk as a potential source of incremental return to the portfolio and will actively trade foreign exchange. These widely varying management practices reflect a variety of factors including investment objectives, investment constraints, and beliefs about currency markets.

Concerning beliefs, one camp of thought holds that in the long run currency effects cancel out to zero as exchange rates revert to historical means or their fundamental values. Moreover, an efficient currency market is a zero-sum game (currency "A" cannot appreciate against currency "B" without currency "B" depreciating against currency "A"), so there should not be any long-run gains overall to speculating in currencies, especially after netting out management and transaction costs. Therefore, both currency hedging and actively trading currencies represent a cost to a portfolio with little prospect of consistently positive active returns.

At the other extreme, another camp of thought notes that currency movements can have a dramatic impact on short-run returns and return volatility and holds that there are pricing inefficiencies in currency markets. They note that much of the flow in currency markets is related to international trade or capital flows in which FX trading is being done on a need-to-do basis and these currency trades are just a spinoff of the other transactions. Moreover, some market participants are either not in the market on a purely profit-oriented basis (e.g., central banks, government agencies) or are believed to be "uninformed traders" (primarily retail accounts). Conversely, speculative capital seeking to arbitrage inefficiencies is finite. In short, marketplace diversity is believed to present the potential for "harvesting alpha" through active currency trading.

This ongoing debate does not make foreign-currency risk in portfolios go away; it still needs to managed, or at least, recognized. Ultimately, each portfolio manager or investment oversight committee will have to reach their own decisions about how to manage risk and whether to seek return enhancement through actively trading currency exposures.

Fortunately, there are a well-developed set of financial products and portfolio management techniques that help investors manage currency risk no matter what their individual objectives, views, and constraints. Indeed, the potential combinations of trading tools and strategies are almost infinite, and can shape currency exposures to custom-fit individual circumstance and market opinion. In this section, we explore various points on a spectrum reflecting currency exposure choices (a risk spectrum) and the guidance that portfolio managers use in making strategic decisions about where to locate their portfolios on this continuum. First, however, the implication of investment objectives and constraints as set forth in the investment policy statement must be recognized.

4.1 The Investment Policy Statement

The Investment Policy Statement (IPS) mandates the degree of discretionary currency management that will be allowed in the portfolio, how it will be benchmarked, and the limits on the type of trading polices and tools (e.g., such as leverage) than can be used.

The starting point for organizing the investment plan for any portfolio is the IPS, which is a statement that outlines the broad objectives and constraints of the beneficial owners of the assets. Most IPS specify many of the following points:

- the general objectives of the investment portfolio;
- the risk tolerance of the portfolio and its capacity for bearing risk;
- the time horizon over which the portfolio is to be invested;
- the ongoing income/liquidity needs (if any) of the portfolio; and
- the benchmark against which the portfolio will measure overall investment returns.

The IPS sets the guiding parameters within which more specific portfolio management policies are set, including the target asset mix; whether and to what extent leverage, short positions, and derivatives can be used; and how actively the portfolio will be allowed to trade its various risk exposures.

For most portfolios, currency management can be considered a sub-set of these more specific portfolio management policies within the IPS. The currency risk management policy will usually address such issues as the

- target proportion of currency exposure to be passively hedged;
- latitude for active currency management around this target;
- frequency of hedge rebalancing;
- currency hedge performance benchmark to be used; and
- hedging tools permitted (types of forward and option contracts, etc.).

Currency management should be conducted within these IPS-mandated parameters.

4.2 The Portfolio Optimization Problem

Having described the IPS as the guiding framework for currency management, we now examine the strategic choices that have to be made in deciding the benchmark currency exposures for the portfolio, and the degree of discretion that will be allowed around this benchmark. This process starts with a decision on the optimal foreign-currency asset and FX exposures.

Optimization of a multi-currency portfolio of foreign assets involves selecting portfolio weights that locate the portfolio on the efficient frontier of the trade-off between risk and expected return defined in terms of the investor's domestic currency. As a simplification of this process, consider the portfolio manager examining the expected return and risk of the multi-currency portfolio of foreign assets by using different combinations of portfolio weights (ω_i) that were shown in Equations 2 and 6, respectively, which are repeated here:

$$R_{DC} = \sum_{i=1}^{n} \omega_i \left(1 + R_{FC,i}\right)\left(1 + R_{FX,i}\right) - 1$$

$$\sigma^2\left(\omega_1 R_1 + \omega_2 R_2\right) \approx \omega_1^2 \sigma^2\left(R_1\right) + \omega_2^2 \sigma^2\left(R_2\right) + 2\omega_1 \sigma\left(R_1\right)\omega_2 \sigma\left(R_2\right)\rho\left(R_1, R_2\right)$$

Recall that the R_i in the equation for variance are the R_{DC} for each of the foreign-currency assets. Likewise, recall that the R_{FX} term is defined such that the investor's "domestic" currency is the price currency in the P/B exchange rate quote. In other words, this calculation may require using the algebraic reciprocal of the standard market quote convention. These two equations together show the domestic-currency return and risk for a multi-currency portfolio of foreign assets.

When deciding on an optimal investment position, these equations would be based on the *expected* returns and risks for each of the foreign-currency assets; and hence, including the *expected* returns and risks for each of the foreign-currency exposures. As we have seen earlier, the number of market parameters for which the portfolio manager would need to have a market opinion grows geometrically with the complexity (number of foreign-currency exposures) in the portfolio. That is, to calculate the expected efficient frontier, the portfolio manager must have a market opinion for *each* of the $R_{FC,i}$, $R_{FX,i}$, $\sigma(R_{FC,i})$, $\sigma(R_{FX,i})$, and $\rho(R_{FC,i}\ R_{FX,i})$, as well as for each of the $\rho(R_{FC,i}\ R_{FC,j})$ and $\rho(R_{FX,i}\ R_{FX,j})$. This would be a daunting task for even the most well-informed portfolio manager.

In a perfect world with complete (and costless) information, it would likely be optimal to *jointly* optimize all of the portfolio's exposures—over all currencies and all foreign-currency assets—simultaneously. In the real world, however, this can be a much more difficult task. Confronted with these difficulties, many portfolio managers handle asset allocation with currency risk as a two-step process: (1) portfolio optimization over fully hedged returns; and (2) selection of active currency exposure, if any. Derivative strategies can allow the various risk exposures in a portfolio to be "unbundled" from each other and managed separately. The same applies for currency risks. Because the use of derivatives allows the price risk ($R_{FC,i}$) and exchange rate risk ($R_{FX,j}$) of foreign-currency assets to be unbundled and managed separately, a starting point for the selection process of portfolio weights would be to assume a complete currency hedge. That is, the portfolio manager will choose the exposures to the foreign-currency assets first, and then decide on the appropriate currency exposures afterward (i.e., decide whether to relax the full currency hedge). These decisions are made to simplify the portfolio construction process.

If the currency exposures of foreign assets could be perfectly and costlessly hedged, the hedge would completely neutralize the effect of currency movements on the portfolio's domestic-currency return (R_{DC}).[10] In Equation 2, this would set $R_{FX} = 0$, meaning that the domestic-currency return is then equal to the foreign-currency return ($R_{DC} = R_{FC}$). In Equation 5, this would set $\sigma^2(R_{DC}) = \sigma^2(R_{FC})$, meaning that the domestic-currency return risk is equal to the foreign-currency return risk.

Removing the currency effects leads to a simpler, two-step process for portfolio optimization. First the portfolio manager could pick the set of portfolio weights (ω_i) for the foreign-currency assets that optimize the expected foreign-currency asset risk–return trade-off (assuming there is no currency risk). Then the portfolio manager could choose the desired currency exposures for the portfolio and decide whether and by how far to relax the constraint to a full currency hedge for each currency pair.

4.3 Choice of Currency Exposures

A natural starting point for the strategic decisions is the "currency-neutral" portfolio resulting from the two-step process described earlier. The question then becomes, How far along the risk spectrum between being fully hedged and actively trading currencies should the portfolio be positioned?

4.3.1 *Diversification Considerations*

The time horizon of the IPS is important. Many investment practitioners believe that in the long run, adding unhedged foreign-currency exposure to a portfolio does not affect expected long-run portfolio returns; hence in the long run, it would not matter if the portfolio was hedged. (Indeed, portfolio management costs would be reduced without a hedging process.) This belief is based on the view that in the long run,

10 A "costless" hedge in this sense would not only mean zero transaction costs, but also no "roll yield."

currencies "mean revert" to either some fair value equilibrium level or a historical average; that is, that the *expected* $\%\Delta S = 0$ for a sufficiently long time period. This view typically draws on the expectation that purchasing power parity (PPP) and the other international parity conditions that link movements in exchange rates, interest rates, and inflation rates will eventually hold over the long run.

Supporting this view, some studies argue that in the long-run currencies will in fact mean revert, and hence that currency risk is lower in the long run than in the short run (an early example is Froot 1993). Although much depends on how long run is defined, an investor (IPS) with a very long investment horizon and few immediate liquidity needs—which could potentially require the liquidation of foreign-currency assets at disadvantageous exchange rates—might choose to forgo currency hedging and its associated costs. Logically, this would require a portfolio benchmark index that is also unhedged against currency risk.

Although the international parity conditions may hold in the long run, it can be a *very* long time—possibly decades. Indeed, currencies can continue to drift away from the fair value mean reversion level for much longer than the time period used to judge portfolio performance. Such time periods are also typically longer than the patience of the portfolio manager's oversight committee when portfolio performance is lagging the benchmark. If this very long-run view perspective is not the case, then the IPS will likely impose some form of currency hedging.

Diversification considerations will also depend on the *asset composition* of the foreign-currency asset portfolio. The reason is because the foreign-currency asset returns (R_{FC}) of different asset classes have different correlation patterns with foreign-currency returns (R_{FX}). If there is a negative correlation between these two sets of returns, having at least some currency exposure may help portfolio diversification and moderate the domestic-currency return risk, $\sigma(R_{DC})$. (Refer to Equation 5 in Section 3.3.)

It is often asserted that the correlation between foreign-currency returns and foreign-currency asset returns tends to be greater for fixed-income portfolios than for equity portfolios. This assertion makes intuitive sense: both bonds and currencies react strongly to movements in interest rates, whereas equities respond more to expected earnings. As a result, the implication is that currency exposures provide little diversification benefit to fixed-income portfolios and that the currency risk should be hedged. In contrast, a better argument can be made for carrying currency exposures in global equity portfolios.

To some degree, various studies have corroborated this relative advantage to currency hedging for fixed income portfolios. But the evidence seems somewhat mixed and depends on which markets are involved. One study found that the hedging advantage for fixed-income portfolios is not always large or consistent (Darnell 2004). Other studies (Campbell 2010; Martini 2010) found that the optimal hedge ratio for foreign-currency equity portfolios depended critically on the investor's domestic currency. (Recall that the hedge ratio is defined as the ratio of the nominal value of the hedge to the market value of the underlying.) For some currencies, there was no risk-reduction advantage to hedging foreign equities (the optimal hedge ratio was close to 0%), whereas for other currencies, the optimal hedge ratio for foreign equities was close to 100%.

Other studies indicate that the optimal hedge ratio also seems to depend on *market conditions* and longer-term trends in currency pairs. For example, Campbell, Serfaty-de Medeiros, and Viceira (2007) found that there were no diversification benefits from currency exposures in foreign-currency bond portfolios, and hence to minimize the risk to domestic-currency returns these positions should be fully hedged. The authors also found, however, that during the time of their study (their data spanned 1975 to 2005), the US dollar seemed to be an exception in terms of its correlations with foreign-currency asset returns. Their study found that the US dollar tended to

appreciate against foreign currencies when global bond prices fell (for example, in times of global financial stress there is a tendency for investors to shift investments into the perceived safety of reserve currencies). This finding would suggest that keeping some exposure to the US dollar in a global bond portfolio would be beneficial. For non-US investors, this would mean under-hedging the currency exposure to the USD (i.e., a hedge ratio less than 100%), whereas for US investors it would mean over-hedging their foreign-currency exposures back into the USD.[11]

Given this diversity of opinions and empirical findings, it is not surprising to see actual hedge ratios vary widely in practice among different investors. Nonetheless, it is still more likely to see currency hedging for fixed-income portfolios rather than equity portfolios, although actual hedge ratios will often vary between individual managers.

4.3.2 *Cost Considerations*

The costs of currency hedging also guide the strategic positioning of the portfolio. Currency hedges are not a "free good" and they come with a variety of expenses that must be borne by the overall portfolio. Optimal hedging decisions will need to balance the benefits of hedging against these costs.

Hedging costs come mainly in two forms: trading costs and opportunity costs. The most immediate costs of hedging involve trading expenses, and these come in several forms:

- Trading involves dealing on the bid–offer spread offered by banks. Their profit margin is based on these spreads, and the more the client trades and "pays away the spread," the more profit is generated by the dealer. Maintaining a 100% hedge and rebalancing frequently with every minor change in market conditions would be expensive. Although the bid–offer spreads on many FX-related products (especially the spot exchange rate) are quite narrow, "churning" the hedge portfolio would progressively add to hedging costs and detract from the hedge's benefits.
- Some hedges involve currency options; a long position in currency options requires the payment of up-front premiums. If the options expire out of the money (OTM), this cost is unrecoverable.
- Although forward contracts do not require the payment of up-front premiums, they do eventually mature and have to be "rolled" forward with an FX swap transaction to maintain the hedge. Rolling hedges will typically generate cash inflows or outflows. These cash flows will have to be monitored, and as necessary, cash will have to be raised to settle hedging transactions. In other words, even though the currency hedge may *reduce* the volatility of the domestic mark-to-market value of the foreign-currency asset portfolio, it will typically *increase* the volatility in the organization's cash accounts. Managing these cash flow costs can accumulate to become a significant portion of the portfolio's value, and they become more expensive (for cash outflows) the higher interest rates go.
- One of the most important trading costs is the need to maintain an administrative infrastructure for trading. Front-, middle-, and back-office operations will have to be set up, staffed with trained personnel, and provided with specialized technology systems. Settlement of foreign exchange transactions in a variety of

11 Note that since the 2008 financial crisis, and more recently with the sovereign credit crisis in Europe, some currencies—the USD, JPY, and CHF in particular—seem to act as a safe haven and appreciate in times of market stress. Keeping some of these currency exposures in the portfolio—having hedge ratios that are not set at 100%—can help hedge losses on riskier assets, especially for foreign-currency equity portfolios (which are more risk exposed than bond portfolios). We will return to this topic in a later section when we discuss minimum-variance hedges and macro hedges.

currencies means having to maintain cash accounts in these currencies to make and receive these foreign-currency payments. Together all of these various overhead costs can form a significant portion of the overall costs of currency trading.

A second form of costs associated with hedging are the opportunity cost of the hedge. To be 100% hedged is to forgo any possibility of favorable currency rate moves. If skillfully handled, accepting and managing currency risk—or any financial risk—can potentially add value to the portfolio, even net of management fees. (We discuss the methods by which this might be done in Section 5.)

These opportunity costs lead to another motivation for having a strategic hedge ratio of less than 100%: regret minimization. Although it is not possible to accurately predict foreign exchange movements in advance, it is certainly possible to judge after the fact the results of the decision to hedge or not. Missing out on an advantageous currency movement because of a currency hedge can cause *ex post* regret in the portfolio manager or client; so too can having a foreign-currency loss if the foreign-currency asset position was unhedged. Confronted with this *ex ante* dilemma of whether to hedge, many portfolio managers decide simply to "split the difference" and have a 50% hedge ratio (or some other rule-of-thumb number). Both survey evidence and anecdotal evidence show that there is a wide variety of hedge ratios actually used in practice by managers, and that these variations cannot be explained by more "fundamental" factors alone. Instead, many managers appear to incorporate some degree of regret minimization into hedging decisions (for example, see Michenaud and Solnik 2008).

All of these various hedging expenses—both trading and opportunity costs—will need to be managed. Hedging is a form of insurance against risk, and in purchasing any form of insurance the buyer matches their needs and budgets with the policy selected. For example, although it may be possible to buy an insurance policy with full, unlimited coverage, a zero deductible, and no co-pay arrangements, such a policy would likely be prohibitively expensive. Most insurance buyers decide that it is not necessary to insure against every outcome, no matter how minor. Some minor risks can be accepted and "self-insured" through the deductible; some major risks may be considered so unlikely that they are not seen as worth paying the extra premium. (For example, most ordinary people would likely not consider buying insurance against being kidnapped.)

These same principles apply to currency hedging. The portfolio manager (and IPS) would likely not try to hedge every minor, daily change in exchange rates or asset values, but only the larger adverse movements that can materially affect the overall domestic-currency returns (R_{DC}) of the foreign-currency asset portfolio. The portfolio manager will need to balance the benefits and costs of hedging in determining both strategic positioning of the portfolio as well as any latitude for active currency management. However, around whatever strategic positioning decision taken by the IPS in terms of the benchmark level of currency exposure, hedging cost considerations alone will often dictate a *range* of permissible exposures instead of a single point. (This discretionary range is similar to the deductible in an insurance policy.)

4.4 Locating the Portfolio Along the Currency Risk Spectrum

The strategic decisions encoded in the IPS with regard to the trade-off between the benefits and costs of hedging, as well as the potential for incremental return to the portfolio from active currency management, are the foundation for determining specific currency management strategies. These strategies are arrayed along a spectrum from very risk-averse passive hedging, to actively seeking out currency risk in order to manage it for profit. We examine each in turn.

4.4.1 *Passive Hedging*

In this approach, the goal is to keep the portfolio's currency exposures close, if not equal to, those of a benchmark portfolio used to evaluate performance. Note that the benchmark portfolio often has no foreign exchange exposure, particularly for fixed-income assets; the benchmark index is a "local currency" index based only on the foreign-currency asset return (R_{FC}). However, benchmark indexes that have some foreign exchange risk are also possible.

Passive hedging is a rules-based approach that removes almost all discretion from the portfolio manager, regardless of the manager's market opinion on future movements in exchange rates or other financial prices. In this case, the manager's job is to keep portfolio exposures as close to "neutral" as possible and to minimize tracking errors against the benchmark portfolio's performance. This approach reflects the belief that currency exposures that differ from the benchmark portfolio inject risk (return volatility) into the portfolio without any sufficiently compensatory return. Active currency management—taking positional views on future exchange rate movements—is viewed as being incapable of consistently adding incremental return to the portfolio.

But the hedge ratio has a tendency to "drift" with changes in market conditions, and even passive hedges need periodic rebalancing to realign them with investment objectives. Often the management guidance given to the portfolio manager will specify the rebalancing period—for example, monthly. There may also be allowance for intra-period rebalancing if there have been large exchange rate movements.

4.4.2 *Discretionary Hedging*

This approach is similar to passive hedging in that there is a "neutral" benchmark portfolio against which actual portfolio performance will be measured. However, in contrast to a strictly rules-based approach, the portfolio manager now has some limited discretion on how far to allow actual portfolio risk exposures to vary from the neutral position. Usually this discretion is defined in terms of percentage of foreign-currency market value (the portfolio's currency exposures are allowed to vary plus or minus x% from the benchmark). For example, a eurozone-domiciled investor may have a US Treasury bond portfolio with a mandate to keep the hedge ratio within 95% to 105%. Assuming no change in the foreign-currency return (R_{FC}), but allowing exchange rates (R_{FX}) to vary, this means the portfolio can tolerate exchange rate movements between the EUR and USD of up to 5% before the exchange rate exposures in the portfolio are considered excessive. The manager is allowed to manage currency exposures within these limits without being considered in violation of the IPS.

This discretion allows the portfolio manager at least some limited ability to express directional opinions about future currency movements—to accept risk in an attempt to earn reward—in order to add value to the portfolio performance. Of course, the portfolio manager's actual performance will be compared with that of the benchmark portfolio.

4.4.3 *Active Currency Management*

Further along the spectrum between extreme risk aversion and purely speculative trading is active currency management. In principle, this approach is really just an extension of discretionary hedging: the portfolio manager is allowed to express directional opinions on exchange rates, but is nonetheless kept within mandated risk limits. The performance of the manager—the choices of risk exposures assumed—is benchmarked against a "neutral" portfolio. But for all forms of active management (i.e., having the discretion to express directional market views), there is no allowance for unlimited speculation; there are risk management systems in place for even the most

speculative investment vehicles, such as hedge funds. These controls are designed to prevent traders from taking unusually large currency exposures and risking the solvency of the firm or fund.

In many cases, the difference between discretionary hedging and active currency management is one of emphasis more than degree. The primary duty of the discretionary hedger is to protect the portfolio from currency risk. As a secondary goal, within limited bounds, there is some scope for directional opinion in an attempt to enhance overall portfolio returns. If the manager lacks any firm market conviction, the natural neutral position for the discretionary hedger is to be flat—that is, to have no meaningful currency exposures. In contrast, the active currency manager is supposed to take currency risks and manage them for profit. The primary goal is to add alpha to the portfolio through successful trading. Leaving actual portfolio exposures near zero for extended periods is typically not a viable option.

4.4.4 *Currency Overlay*

Active management of currency exposures can extend beyond limited managerial discretion within hedging boundaries. Sometimes accepting and managing currency risk for profit can be considered a portfolio objective. Active currency management is often associated with what are called **currency overlay programs**, although this term is used differently by different sources.

- In the most limited sense of the term, currency overlay simply means that the portfolio manager has outsourced managing currency exposures to a firm specializing in FX management.[12] This could imply something as limited as merely having the external party implement a fully passive approach to currency hedges. If dealing with FX markets and managing currency hedges is beyond the professional competence of the investment manager, whose focus is on managing foreign equities or some other asset class, then hiring such external professional help is an option.
- A broader view of currency overlay allows the externally hired currency overlay manager to take directional views on future currency movements (again, with the caveat that these be kept within predefined bounds). Sometimes a distinction is made between currency overlay and "foreign exchange as an asset class." In this classification, currency overlay is limited to the currency exposures already in the foreign asset portfolio. For example, if a eurozone-domiciled investor has GBP- and CHF-denominated assets, currency overlay risks are allowed only for these currencies.
- In contrast, the concept of foreign exchange as an asset class does not restrict the currency overlay manager, who is free to take FX exposures in any currency pair where there is value-added to be harvested, regardless of the underlying portfolio. In this sense, the currency overlay manager is very similar to an FX-based hedge fund. To implement this form of active currency management, the currency overlay manager would have a *joint* opinion on a range of currencies, and have market views not only on the expected movements in the spot rates but also the likelihood of these movements (the variance of the expected future spot rate distribution) as well as the expected correlation between future spot rate movements. Basically, the entire portfolio of currencies is actively managed and optimized over all of the expected returns, risks, and correlations among all of the currencies in the portfolio.

12 Typically currency overlay programs involve external managers. However, some large, sophisticated institutional accounts may have in-house currency overlay programs managed by a separate group of specialists within the firm.

We will focus on this latter form of currency overlay in this reading: active currency management conducted by external, FX-specialized sub-advisors to the portfolio.

It is quite possible to have the foreign-currency asset portfolio fully hedged (or allow some discretionary hedging internally) but then also to add an external currency overlay manager to the portfolio. This approach separates the hedging and alpha function mandates of the portfolio. Different organizations have different areas of expertise; it often makes sense to allocate managing the hedge (currency "beta") and managing the active FX exposures (currency "alpha") to those individuals with a comparative advantage in that function.

Adding this form of currency overlay to the portfolio (FX as an asset class) is similar in principle to adding any type of alternative asset class, such as private equity funds or farmland. In each case, the goal is the search for alpha. But to be most effective in adding value to the portfolio, the currency overlay program should add incremental returns (alpha) and/or greater diversification opportunities to improve the portfolio's risk–return profile. To do this, the currency alpha mandate should have minimum correlation with both the major asset classes and the other alpha sources in the portfolio.

Once this FX as an asset class approach is taken, it is not necessary to restrict the portfolio to a single overlay manager any more than it is necessary to restrict the portfolio to a single private equity fund. Different overlay managers follow different strategies (these are described in more detail in Section 5). Within the overall portfolio allocation to "currency as an alternative asset class", it may be beneficial to diversify across a range of active management styles, either by engaging several currency overlay managers with different styles or by applying a fund-of-funds approach, in which the hiring and management of individual currency overlay managers is delegated to a specialized external investment vehicle.

Whether managed internally or externally (via a fund of funds) it will be necessary to monitor, or benchmark, the performance of the currency overlay manager: Do they generate the returns expected from their stated trading strategy? Many major investment banks as well as specialized market-information firms provide a wide range of proprietary indexes that track the performance of the investible universe of currency overlay managers; sometimes they also offer sub-indexes that focus on specific trading strategies (for example, currency positioning based on macroeconomic fundamentals). However, the methodologies used to calculate these various indexes vary between suppliers. In addition, different indexes show different aspects of active currency management. Given these differences between indexes, there is no simple answer for which index is most suitable as a benchmark; much depends on the specifics of the active currency strategy.

EXAMPLE 2

Currency Overlay

Windhoek Capital Management is a South Africa-based investment manager that runs the Conservative Value Fund, which has a mandate to avoid all currency risk in the portfolio. The firm is considering engaging a currency overlay manager to help with managing the foreign exchange exposures of this investment vehicle. Windhoek does not consider itself to have the in-house expertise to manage FX risk.

Brixworth & St. Ives Asset Management is a UK-based investment manager, and runs the Aggressive Growth Fund. This fund is heavily weighted toward emerging market equities, but also has a mandate to seek out inefficiencies in the

global foreign exchange market and exploit these for profit. Although Brixworth & St. Ives manages the currency hedges for all of its investment funds in-house, it is also considering engaging a currency overlay manager.

1 Using a currency overlay manager for the Conservative Value Fund is *most likely* to involve:
   - **A** joining the alpha and hedging mandates.
   - **B** a more active approach to managing currency risks.
   - **C** using this manager to passively hedge their foreign exchange exposures.

2 Using a currency overlay manager for the Aggressive Growth Fund is *most likely* to involve:
   - **A** separating the alpha and hedging mandates.
   - **B** a less discretionary approach to managing currency hedges.
   - **C** an IPS that limits active management to emerging market currencies.

3 Brixworth & St. Ives is *more likely* to engage multiple currency overlay managers if:
   - **A** their returns are correlated with asset returns in the fund.
   - **B** the currency managers' returns are correlated with each other.
   - **C** the currency managers' use different active management strategies.

Solution to 1:

C is correct. The Conservative Value Fund wants to avoid all currency exposures in the portfolio and Windhoek believes that it lacks the currency management expertise to do this.

Solution to 2:

A is correct. Brixworth & St. Ives already does the FX hedging in house, so a currency overlay is more likely to be a pure alpha mandate. This should not change the way that Brixworth & St. Ives manages its hedges, and the fund's mandate to seek out inefficiencies in the global FX market is unlikely to lead to a restriction to actively manage only emerging market currencies.

Solution to 3:

C is correct. Different active management strategies may lead to a more diversified source of alpha generation, and hence reduced portfolio risk. Choices A and B are incorrect because a higher correlation with foreign-currency assets in the portfolio or among overlay manager returns is likely to lead to less diversification.

4.5 Formulating a Client-Appropriate Currency Management Program

We now try to bring all of these previous considerations together in describing how to formulate an appropriate currency management program given client objectives and constraints, as well as overall financial market conditions. Generally speaking, the *strategic* currency positioning of the portfolio, as encoded in the IPS, should be biased toward a more-fully hedged currency management program the more

- short term the investment objectives of the portfolio;
- risk averse the beneficial owners of the portfolio are (and impervious to *ex post* regret over missed opportunities);

- immediate the income and/or liquidity needs of the portfolio;
- fixed-income assets are held in a foreign-currency portfolio;
- cheaply a hedging program can be implemented;
- volatile (i.e., risky) financial markets are;[13] and
- skeptical the beneficial owners and/or management oversight committee are of the expected benefits of active currency management.

The relaxation of any of these conditions creates latitude to allow a more proactive currency risk posture in the portfolio, either through wider tolerance bands for discretionary hedging, or by introducing foreign currencies as a separate asset class (using currency overlay programs as an alternative asset class in the overall portfolio). In the latter case, the more currency overlay is expected to generate alpha that is uncorrelated with other asset or alpha-generation programs in the portfolio, the more it is likely to be allowed in terms of strategic portfolio positioning.

INVESTMENT POLICY STATEMENT

Kailua Kona Advisors runs a Hawaii-based hedge fund that focuses on developed market equities located outside of North America. Its investor base consists of local high-net-worth individuals who are all considered to have a long investment horizon, a high tolerance for risk, and no immediate income needs. In its prospectus to investors, Kailua Kona indicates that it actively manages both the fund's equity and foreign-currency exposures, and that the fund uses leverage through the use of loans as well as short-selling.

Exhibit 4 presents the hedge fund's currency management policy included in the IPS for this hedge fund.

Exhibit 4 Hedge Fund Currency Management Policy: An Example

Overall Portfolio Benchmark:	MSCI EAFE Index (local currency)
Currency Exposure Ranges:	Foreign-currency exposures, based on the USD market value of the equities actually held by the fund at the beginning of each month, will be hedged back into USD within the following tolerance ranges of plus or minus: ■ EUR: 20% ■ GBP: 15% ■ JPY: 10% ■ CHF: 10% ■ AUD: 10% ■ SEK: 10% Other currency exposures shall be left unhedged.
Rebalancing:	The currency hedges will be rebalanced at least monthly, to reflect changes in the USD-denominated market value of portfolio equity holdings.

(continued)

13 As we will see, this also increases hedging costs when currency options are used.

Exhibit 4 (Continued)

Hedging Instruments:	■ Forward contracts up to 12 months maturity; ■ European put and call options can be bought or written, for maturities up to 12 months; and ■ Exotic options of up to 12 months maturity can be bought or sold.
Reporting:	Management will present quarterly reports to the board detailing net foreign-currency exposures and speculative trading results. Speculative trading results will be benchmarked against a 100% hedged currency exposure.

With this policy, Kailua Kona Advisors is indicating that it is willing to accept foreign-currency exposures within the portfolio but that these exposures must be kept within pre-defined limits. For example, suppose that at the beginning of the month the portfolio held EUR10 million of EUR-denominated assets. Also suppose that this EUR10 million exposure, combined with all the other foreign-currency exposures in the portfolio, matches Kailua Kona Advisors' desired portfolio weights by currency (as a US-based fund, these desired percentage portfolio allocations across all currencies will be based in USD).

The currency-hedging guidelines indicate that the hedge (for example, using a short position in a USD/EUR forward contract) should be between EUR8 million and EUR12 million, giving some discretion to the portfolio manager on the size of the net exposure to the EUR. At the beginning of the next month, the USD values of the foreign assets in the portfolio are measured again, and the process repeats. If there has been either a large move in the foreign-currency value of the EUR-denominated assets and/or a large move in the USD/EUR exchange rate, it is possible that Kailua Kona Advisors' portfolio exposure to EUR-denominated assets will be too far away from the desired percentage allocation.[14] Kailua Kona Advisors will then need to either buy or sell EUR-denominated assets. If movements in the EUR-denominated value of the assets or in the USD/EUR exchange rate are large enough, this asset rebalancing may have to be done before month's end. Either way, once the asset rebalancing is done, it establishes the new EUR-denominated asset value on which the currency hedge will be based (i.e., plus or minus 20% of this new EUR amount).

If the portfolio is not 100% hedged—for example, continuing the Kailua Kona illustration, if the portfolio manager only hedges EUR9 million of the exposure and has a residual exposure of being long EUR1 million—the success or failure of the manager's tactical decision will be compared with a "neutral" benchmark. In this case, the comparison would be against the performance of a 100% fully hedged portfolio—that is, with a EUR10 million hedge.

14 The overall portfolio percentage allocations by currency will also depend on the price moves of all *other* foreign-currency assets and exchange rates as well, but we will simplify our example by ignoring this nuance.

CURRENCY MANAGEMENT: TACTICAL DECISIONS

5

The previous section discussed the *strategic* decisions made by the IPS on locating the currency management practices of the portfolio along a risk spectrum ranging from a very conservative approach to currency risk to very active currency management. In this section, we consider the case in which the IPS has given the portfolio manager (or currency overlay manager) at least some limited discretion for actively managing currency risk within these mandated strategic bounds. This then leads to *tactical* decisions: which FX exposures to accept and manage within these discretionary limits. In other words, tactical decisions involve active currency management.

A market view is a prerequisite to any form of active management. At the heart of the trading decision in FX (and other) markets, lies a view on future market prices and conditions. This market opinion guides all decisions with respect to currency risk exposures, including whether currency hedges should be implemented and, if so, how they should be managed.

In what follows, we will explore some of the methods used to form directional views about the FX market. However, a word of caution that cannot be emphasized enough: *There is no simple formula, model, or approach that will allow market participants to precisely forecast exchange rates (or any other financial prices) or to be able to be confident that any trading decision will be profitable.*

5.1 Active Currency Management Based on Economic Fundamentals

In this section, we lay out a framework for developing a view about future exchange rate movements based on underlying fundamentals. In contrast to other methods for developing a market view (which are discussed in subsequent sections), at the heart of this approach is the assumption that, in free markets, exchange rates are determined by logical economic relationships and that these relationships can be modeled.

The simple economic model described in this section is based on the assumption that in the long run, the real exchange rate will converge to its "fair value," but short- to medium-term factors will shape the convergence path to this equilibrium.[15]

Recall that the real exchange rate reflects the ratio of the real purchasing power between two countries; that is, the once nominal purchasing power in each country is adjusted by its respective price level as well as the spot exchange rate between the two countries. The long-run equilibrium level for the real exchange rate is determined by purchasing power parity or some other model of an exchange rate's fair value, and serves as the anchor for longer-term movements in exchange rates.

Over shorter time frames, movements in real exchange rates will also reflect movements in the real interest rate differential between countries. Recall that the real interest rate (r) is the nominal interest rate adjusted by the expected inflation rate, or $r = i - \pi^{\varepsilon}$, where i is the nominal interest rate and π^{ε} is the expected inflation rate over the same term as the nominal and real interest rates. Movements in risk premiums will also affect exchange rate movements over shorter-term horizons. The riskier a country's assets are perceived to be by investors, the more likely they are to move their investments out of that country, thereby depressing the exchange rate. Finally,

15 This model was derived and explained by Rosenberg and Barker (2012), which forms part of the Level II curriculum. Because of this prior coverage, we provide only an abbreviated summary of this simple economic model here.

our model also recognizes that there are two currencies involved in an exchange rate quote (the price and base currencies) and hence movements in exchange rates will reflect movements in the *differentials* between these various factors.

As a result, our model indicates that all else equal, the base currency's real exchange rate should appreciate if there is an upward movement in

- its long-run equilibrium real exchange rate;
- either its real or nominal interest rates, which should attract foreign capital;
- expected foreign inflation, which should cause the foreign currency to depreciate; and
- the foreign risk premium, which should make foreign assets less attractive compared with the base currency nation's domestic assets.

The real exchange rate should also increase if it is currently below its long-term equilibrium value. All of this makes intuitive sense.

In summary, our model is a mix of long-term, medium-term, and short-term factors. The long-run equilibrium real exchange rate is the anchor for exchange rates and the point of long-run convergence for exchange rate movements. Movements in the short- to medium-term factors (nominal interest rates, expected inflation) affect the timing and path of convergence to this long-run equilibrium. A stylized depiction of the price dynamics generated by this interaction between short-, medium-, and longer-term pricing factors is shown in Exhibit 5.

Exhibit 5 Interaction of Long-term and Short-term Factors in Exchange Rates

Source: Based on Rosenberg (2002), page 32.

It needs to be stressed that it can be very demanding to model how each of these separate effects—nominal interest rate, expected inflation, and risk premium differentials—change over time and affect exchange rates. It can also be challenging to model movements in the long-term equilibrium real exchange rate. A broad variety of factors, such as fiscal and monetary policy, will affect all of these variables in our simple economic model.[16]

16 A broader discussion of exchange rate economics can be found in Rosenberg and Barker (2012).

5.2 Active Currency Management Based on Technical Analysis

Another approach to forming a market view is based on technical analysis. This approach is based on quite different assumptions compared with modeling based on economic fundamentals. Whereas classical exchange rate economics tends to view market participants as rational, markets as efficient, and exchange rates as driven by underlying economic factors, technical analysis ignores economic analysis. Instead, technical analysis is based on three broad themes.[17]

First, market technicians believe that in a liquid, freely traded market the historical price data can be helpful in projecting future price movements.[18] The reason is because many traders have already used any useful data external to the market to generate their trading positions, so this information is already reflected in current prices. Therefore, it is not necessary to look outside of the market to form an opinion on future price movements. This means it is not necessary to examine interest rates, inflation rates, or risk premium differentials (the factors in our fundamentally based model) because exchange rates already incorporate these factors.

Second, market technicians believe that historical patterns in the price data have a tendency to repeat, and that this repetition provides profitable trade opportunities. These price patterns repeat because market prices reflect human behavior and human beings have a tendency to react in similar ways to similar situations, even if this repetitive behavior is not always fully rational. For example, when confronted with an upward price trend, many market participants eventually come to believe that it will extrapolate (an attitude of "irrational exuberance" or "this time it is different"). When the trend eventually breaks, a panicked position exit can cause a sharp overshoot of fair value to the downside. Broadly speaking, technical analysis can be seen as the study of market psychology and how market participant emotions—primarily greed and fear—can be read from the price data and used to predict future price moves.

Third, technical analysis does not attempt to determine where market prices *should* trade (fair value, as in fundamental analysis) but where they *will* trade. Because these price patterns reflect trader emotions, they need not reflect—at least immediately—any cool, rational assessment of the underlying economic or fundamental situation. Although market prices may eventually converge to fair value in the long run, the long run can be a very long time indeed. In the meanwhile, there are shorter-term trading opportunities available in trading the technical patterns in the price data.

Combined, these three principles of technical analysis define a discipline dedicated to identifying patterns in the historical price data, especially as it relates to identifying market trends and market turning points. (Technical analysis is less useful in a trendless market.) Technical analysis tries to identify when markets have become **overbought** or **oversold**, meaning that they have trended too far in one direction and are vulnerable to a trend reversal, or correction. Technical analysis also tries to identify what are called **support levels** and **resistance levels**, either within ongoing price trends or at their extremities (i.e., turning points). These support and resistance levels are price points on dealers' order boards where one would except to see clustering of bids and offers, respectively. At these exchange rate levels, the price action is expected to get "sticky" because it will take more order flow to pierce the wall of either bids or offers. But once these price points are breached, the price action can be expected to accelerate as **stops** are triggered. (Stops, in this sense, refer to stop-loss orders, in which traders leave resting bids or offers away from the current market price to be

17 Some material in this section is based on Sine and Strong (2012).

18 In many other asset classes, technical analysis is based on trade volume data as well as price data. But there are no reliable, timely, and high-frequency trade volume data that are publicly available for over-the-counter (OTC) FX markets.

filled if the market reaches those levels. A stop-loss order is triggered when the price action has gone against a trader's position, and it gets the trader out of that position to limit further losses.)

Technical analysis uses visual cues for market patterns as well as more quantitative technical indicators. There is a wide variety of technical indexes based on market prices that are used in this context. Some technical indicators are as simple as using moving averages of past price points. The 200-day moving average of daily exchange rates is often seen as an important indicator of likely support and resistance. Sometimes two moving averages are used to establish when a price trend is building momentum. For example, when the 50-day moving average crosses the 200-day moving average, this is sometimes seen as a price "break out" point.

Other technical indicators are based on more complex mathematical formulae. There is an extremely wide variety of these more mathematical indicators, some of them very esoteric and hard to connect intuitively with the behavior of real world financial market participants.

In summary, many FX active managers routinely use technical analysis—either alone or in conjunction with other approaches—to form a market opinion or to time position entry and exit points. Even though many technical indicators lack the intellectual underpinnings provided by formal economic modeling, they nonetheless remain a prominent feature of FX markets.

5.3 Active Currency Management Based on the Carry Trade

The **carry trade** is a trading strategy of borrowing in low-yield currencies and investing in high-yield currencies.[19] If technical analysis is based on ignoring economic fundamentals, then the carry trade is based on exploiting a well-recognized violation of one of the international parity conditions often used to describe these economic fundamentals: uncovered interest rate parity. Recall that uncovered interest rate parity asserts that, *on a longer-term average*, the return on an unhedged foreign-currency asset investment will be the same as a domestic-currency investment. Assuming that the base currency in the P/B quote is the low-yield currency, stated algebraically uncovered interest rate parity asserts that

$$\%\Delta S_{H/L} \approx i_H - i_L$$

where $\%\Delta S_{H/L}$ is the percentage change in the $S_{H/L}$ spot exchange rate (the low-yield currency is the base currency), i_H is the interest rate on the high-yield currency and i_L is the interest rate on the low-yield currency. If uncovered interest rate parity holds, the yield spread *advantage* for the high-yielding currency (the right side of the equation) will, on average, be matched by the *depreciation* of the high-yield currency (the left side of the equation; the low-yield currency is the base currency and hence a positive value for $\%\Delta S_{H/L}$ means a depreciation of the high-yield currency). According to the uncovered interest rate parity theorem, it is this offset between (1) the yield advantage and (2) the currency depreciation that equates, on average, the unhedged currency returns.

But in reality, the historical data show that there are persistent deviations from uncovered interest rate parity in FX markets, at least in the short to medium term. Indeed, high-yield countries often see their currencies *appreciate*, not depreciate, for extended periods of time. The positive returns from a combination of a favorable yield differential plus an appreciating currency can remain in place long enough to present attractive investment opportunities.

19 The term "carry" is related to what is known as the cost of carry—that is, of carrying or holding an investment. This investment has either an implicit or explicit cost (borrowing cost) but may also produce income. The net cost of carry is the difference between these two return rates.

This persistent violation of uncovered interest rate parity described by the carry trade is often referred to as the **forward rate bias**. An implication of uncovered interest rate parity is that the forward rate should be an unbiased predictor of future spot rates. The historical data, however, show that the forward rate is not the center of the distribution for future spot rates; in fact, it is a *biased* predictor (for example, see Kritzman 1999). Hence the name "forward rate bias." With the forward rate premium or discount defined as $F_{P/B} - S_{P/B}$ the "bias" in the forward rate bias is that the premium typically overstates the amount of appreciation of the base currency, and the discount overstates the amount of depreciation. Indeed, the forward discount or premium often gets even the *direction* of future spot rate movements wrong.

The carry trade strategy (borrowing in low-yield currencies, investing in high-yield currencies) is equivalent to a strategy based on trading the forward rate bias. Trading the forward rate bias involves buying currencies selling at a forward discount, and selling currencies trading at a forward premium. This makes intuitive sense: It is desirable to buy low and sell high.

To show the equivalence of the carry trade and trading the forward rate bias, recall that covered interest rate parity (which is enforced by arbitrage) is stated as

$$\frac{F_{P/B} - S_{P/B}}{S_{P/B}} = \frac{\left(i_p - i_B\right)\left(\frac{t}{360}\right)}{1 + i_B\left(\frac{t}{360}\right)}$$

This equation shows that when the base currency has a lower interest rate than the price currency (i.e., the right side of the equality is positive) the base currency will trade at a forward premium (the left side of the equality is positive). That is, being low-yield currency and trading at a forward premium is synonymous. Similarly, being a high-yield currency means trading at a forward discount. Borrowing in the low-yield currency and investing in the high-yield currency (the carry trade) is hence equivalent to selling currencies that have a forward premium and buying currencies that have a forward discount (trading the forward rate bias). We will return to these concepts in Section 6.1.2 when we discuss the roll yield in hedging with forward contracts. Exhibit 6 summarizes several key points about the carry trade.

Exhibit 6 The Carry Trade: A Summary

	Buy/Invest	Sell/Borrow
Implementing the carry trade	High-yield currency	Low-yield currency
Trading the forward rate bias	Forward discount currency	Forward premium currency

The gains that one can earn through the carry trade (or equivalently, through trading the forward rate bias) can be seen as the risk premiums earned for carrying an unhedged position—that is, for absorbing currency risk. (In efficient markets, there is no extra reward without extra risk.) Long periods of market stability can make these extra returns enticing to many investors, and the longer the yield differential persists between high-yield and low-yield currencies, the more carry trade positions will have a tendency to build up. But these high-yield currency advantages can be erased quickly, particularly if global financial markets are subject to sudden bouts of stress. This is especially true because the carry trade is a *leveraged* position: borrowing in the

low-yielding currency and investing in the high-yielding currency. These occasional large losses mean that the return distribution for the carry trade has a pronounced negative skew.

This negative skew derives from the fact that the **funding currencies** of the carry trade (the low-yield currencies in which borrowing occurs) are typically the safe haven currencies, such as the USD, CHF, and JPY. In contrast, the **investment currencies** (the high-yielding currencies) are typically currencies perceived to be higher risk, such as several emerging market currencies. Any time global financial markets are under stress there is a flight to safety that causes rapid movements in exchange rates, and usually a panicked unwinding of carry trades. As a result, traders running carry trades often get caught in losing positions, with the leverage involved magnifying their losses. Because of the tendency for long periods of relatively small gains in the carry trade to be followed by brief periods of large losses, the carry trade is sometimes characterized as "picking up nickels in front of a steamroller." One guide to the riskiness of the carry trade is the volatility of spot rate movements for the currency pair; all else equal, lower volatility is better for a carry trade position.

We close this section by noting that although the carry trade can be based on borrowing in a single funding currency and investing in a single high-yield currency, it is more common for carry trades to use multiple funding and investment currencies. The number of funding currencies and investment currencies need not be equal: for example, there could be five of one and three of the other. Sometimes the portfolio weighting of exposures between the various funding and investment currencies are simply set equal to each other. But the weights can also be optimized to reflect the trader's market view of the expected movements in each of the exchange rates, as well as their individual risks ($\sigma[\%\Delta S]$) and the expected correlations between movements in the currency pairs. These trades can be dynamically rebalanced, with the relative weights among both funding and investment currencies shifting with market conditions.

5.4 Active Currency Management Based on Volatility Trading

Another type of active trading style is unique to option markets and is known as volatility trading (or simply "vol trading").[20] To explain this trading style, we will start with a quick review of some option basics.

The derivatives of the option pricing model show the sensitivity of the option's premium to changes in the factors that determine option value. These derivatives are often referred to as the "Greeks" of option pricing. There is a very large number of first, second, third, and cross-derivatives that can be taken of an option pricing formula, but the two most important Greeks that we will consider here are the following:

- **Delta:** The sensitivity of the option premium to a small change in the price of the underlying[21] of the option, typically a financial asset. This sensitivity is an indication of *price* risk.
- **Vega:** The sensitivity of the option premium to a small change in implied volatility. This sensitivity is an indication of *volatility* risk.

The most important concept to grasp in terms of volatility trading is that the use of options allows the trader, through a variety of trading strategies, to *unbundle* and isolate all of the various risk factors (the Greeks) and trade them separately. Once an initial option position is taken (either long or short), the trader has exposure to

20 In principle, this trading style can be applied to all asset classes with options, not just FX trading. But FX options are the most liquid and widely traded options in the world, so it is in FX where most of volatility trading likely takes place in global financial markets.

21 The underlying asset of a derivative is typically referred to simply as the "underlying."

all of the various Greeks/risk factors. The unwanted risk exposures, however, can then be hedged away, leaving *only* the desired risk exposure to express that specific directional view.

Delta hedging is the act of hedging away the option position's exposure to delta, the price risk of the underlying (the FX spot rate, in this case). Because delta shows the sensitivity of the option price to changes in the spot exchange rate, it thus defines the option's hedge ratio: The size of the offsetting hedge position that will set the *net* delta of the combined position (option plus delta hedge) to zero. Typically implementing this delta hedge is done using either forward contracts or a spot transaction (spot, by definition, has a delta of one, and no exposure to any other of the Greeks; forward contracts are highly correlated with the spot rate). For example, if a trader was long a call option on USD/EUR with a nominal value of EUR1 million and a delta of +0.5, the delta hedge would involve a short forward position in USD/EUR of EUR0.5 million. That is, the size of the delta hedge is equal to the option's delta times the nominal size of the contract. This hedge size would set the net delta of the overall position (option and forward) to zero.[22] Once the delta hedge has set the net delta of the position to zero, the trader then has exposure *only* to the other Greeks, and can use various trading strategies to position in these (long or short) depending on directional views.

Although one could theoretically trade *any* of the other Greeks, the most important one traded is vega; that is, the trader is expressing a view on the future movements in implied volatility, or in other words, is engaged in volatility trading. Implied volatility is not the same as realized, or observed, historical volatility, although it is heavily influenced by it. By engaging in volatility trading, the trader is expressing a view about the future volatility of exchange rates *but not their direction* (the delta hedge set the net delta of the position to zero).

One simple option strategy that implements a volatility trade is a **straddle**, which is a combination of both an at-the-money (ATM) put and an ATM call. A long straddle buys both of these options. Because their deltas are −0.5 and +0.5, respectively, the net delta of the position is zero; that is, the long straddle is delta neutral. This position is profitable in more volatile markets, when either the put or the call go sufficiently in the money to cover the upfront cost of the two option premiums paid. Similarly, a short straddle is a bet that the spot rate will stay relatively stable. In this case, the payout on any option exercise will be less than the twin premiums the seller has collected; the rest is net profit for the option seller. A similar option structure is a **strangle** position for which a long position is buying out-of-the-money (OTM) puts and calls with the same expiry date and the same degree of being out of the money (we elaborate more on this subject later). Because OTM options are being bought, the cost of the position is cheaper—but conversely, it also does not pay off until the spot rate passes the OTM strike levels. As a result, the risk–reward for a strangle is more moderate than that for a straddle.

The interesting thing to note is that by using delta-neutral trading strategies, volatility is turned into a product that can be actively traded like any other financial product or asset class, such as equities, commodities, fixed-income products, and so on. Volatility is not constant nor are its movements completely random. Instead volatility is determined by a wide variety of underlying factors—both fundamental and technical—that the trader can express an opinion on. Movements in volatility are cyclical, and typically subject to long periods of relative stability punctuated by sharp upward spikes in volatility as markets come under periodic bouts of stress (usually the result of some dramatic event, financial or otherwise). Speculative vol traders—for example, among currency overlay managers—often want to be net-short volatility.

22 Strictly speaking, the net delta would be *approximately* equal to zero because forward contracts do not have identical price properties to those of the spot exchange rate. But it is close enough for our purposes here, and we will ignore this small difference.

The reason is because most options expire out of the money, and the option writer then gets to keep the option premium without delivery of the underlying currency pair. The amount of the option premium can be considered the risk premium, or payment, earned by the option writer for absorbing volatility risk. It is a steady source of income under "normal" market conditions. Ideally, these traders would want to "flip" their position and be long volatility ahead of volatility spikes, but these episodes can be notoriously difficult to time. Most hedgers typically run options positions that are net-long volatility because they are buying protection from unanticipated price volatility. (Being long the option means being exposed to the time decay of the option's time value; that is similar to paying insurance premiums for the protection against exchange rate volatility.)

We can also note that just as there are *currency overlay* programs for actively trading the portfolio's currency exposures (as discussed in Section 4.4.4) there can also be *volatility overlay* programs for actively trading the portfolio's exposures to movements in currencies' implied volatility. Just as currency overlay programs manage the portfolio's exposure to currency delta (movements in spot exchange rates), volatility overlay programs manage the portfolio's exposure to currency vega. These volatility overlay programs can be focused on earning speculative profits, but can also be used to hedge the portfolio against risk (we will return to this concept in the discussion of macro hedges in Section 6.4.2.).

Enumerating all the potential strategies for trading foreign exchange volatility is beyond the scope of this reading. Instead, the reader should be aware that this dimension of trading FX volatility (not price) exists and sees a large amount of active trading. Moreover, the best traders are able to think and trade in both dimensions simultaneously. Movements in volatility are often correlated with directional movements in the price of the underlying. For example, when there is a flight to safety as carry trades unwind, there is typically a spike in volatility (and options prices) at the same time. Although pure vol trading is based on a zero-delta position, this need not always be the case; a trader can express a market opinion on volatility (vega exposure) and still have a directional exposure to the underlying spot exchange rate as well (delta exposure). That is, the overall trading position has net vega and delta exposures that reflect the *joint* market view.

We end this section by explaining how currency options are quoted in professional FX markets. (This information will be used in Section 6 when we discuss other option trading strategies.) Unlike exchanged-traded options, such as those used in equity markets, OTC options for currencies are not described in terms of specific strike levels (i.e., exchange rate levels). Instead, in the interdealer market, options are described in terms of their "delta." Deltas for puts can range from a minimum of –1 to a maximum of 0, with a delta of –0.5 being the point at which the put option is ATM; OTM puts have deltas between 0 and –0.5. For call options, delta ranges from 0 to +1, with 0.5 being the ATM point. In FX markets, these delta values are quoted both in *absolute* terms (i.e., in positive rather than negative values) and as percentages, with standard FX option quotes usually in terms of 25-delta and 10-delta options (i.e., a delta of 0.25 and 0.10, respectively; the 10-delta option is deeper OTM and hence cheaper than the 25-delta option). The FX options market is the most liquid around these standard delta quoting points (ATM, 25-delta, 10-delta), but of course, as a flexible OTC market, options of any delta/strike price can be traded. The 25-delta put option (for example) will still go in the money if the spot price dips below a *specific* exchange rate level; this *implied* strike price is *backed out* of an option pricing model once all the other pricing factors, including the current spot rate and the 25-delta of the option, are put into the option pricing model. (The specific option pricing model used is agreed on by both parties to the trade.)

These standard delta price points are often used to define option trading strategies. For example, a 25-delta strangle would be based on 25-delta put and call options. Similarly, a 10-delta strangle would be based on 10-delta options (and would cost less and have a more moderate payoff structure than a 25-delta strangle). Labeling option structures by their delta is common in FX markets.

EXAMPLE 3

Active Strategies

Annie McYelland works as an analyst at Scotland-based Kilmarnock Advisors, an investment firm that offers several investment vehicles for its clients. McYelland has been put in charge of formulating the firm's market views for some of the foreign currencies that these vehicles have exposures to. Her market views will be used to guide the hedging and discretionary positioning for some of the actively managed portfolios.

McYelland begins by examining yield spreads between various countries and the implied volatility extracted from the option pricing for several currency pairs. She collects the following data:

One-Year Yield Levels	
Switzerland	−0.103%
United States	0.162%
Poland	4.753%
Mexico	4.550%

One-Year Implied Volatility	
PLN/CHF	8.4%
MXN/CHF	15.6%
PLN/USD	20.3%
MXN/USD	16.2%

Note: PLN = Polish zloty; the Swiss yields are negative because of Swiss policy actions.

McYelland is also examining various economic indicators to shape her market views. After studying the economic prospects for both Japan and New Zealand, she expects that the inflation rate for New Zealand is about to accelerate over the next few years, whereas the inflation rate for Japan should remain relatively stable. Turning her attention to the economic situation in India, McYelland believes that the Indian authorities are about to tighten monetary policy, and that this change has not been fully priced into the market. She reconsiders her short-term view for the Indian rupee (i.e., the INR/USD spot rate) after conducting this analysis.

McYelland also examines the exchange rate volatility for several currency pairs to which the investment trusts are exposed. Based on her analysis of the situation, she believes that the exchange rate between Chilean peso and the US dollar (CLP/USD) is about to become much more volatile than usual, although she has no strong views about whether the CLP will appreciate or depreciate.

One of McYelland's colleagues, Catalina Ortega, is a market technician and offers to help McYelland time her various market position entry and exit points based on chart patterns. While examining the JPY/NZD price chart, Ortega notices that the 200-day moving average is at 62.0405 and the current spot rate is 62.0315.

1 Based on the data she collected, all else equal, McYelland's *best* option for implementing a carry trade position would be to fund in:
   - **A** USD and invest in PLN.
   - **B** CHF and invest in MXN.
   - **C** CHF and invest in PLN.

2 Based on McYelland's inflation forecasts, all else equal, she would be *more likely* to expect a(n):
   - **A** depreciation in the JPY/NZD.
   - **B** increase in capital flows from Japan to New Zealand.
   - **C** more accommodative monetary policy by the Reserve Bank of New Zealand.

3 Given her analysis for India, McYelland's short-term market view for the INR/USD spot rate is now *most likely* to be:
   - **A** biased toward appreciation.
   - **B** biased toward depreciation.
   - **C** unchanged because it is only a short-run view.

4 Using CLP/USD options, what would be the *cheapest* way for McYelland to implement her market view for the CLP?
   - **A** Buy a straddle
   - **B** Buy a 25-delta strangle
   - **C** Sell a 40-delta strangle

5 Based on Ortega's analysis, she would *most likely* expect:
   - **A** support near 62.0400.
   - **B** resistance near 62.0310.
   - **C** resistance near 62.0400.

Solution to 1:

C is correct. The yield spread between the funding and investment currencies is the widest and the implied volatility (risk) is the lowest. The other choices have a narrower yield spread and higher risk (implied volatility).

Solution to 2:

A is correct. All else equal, an increase in New Zealand's inflation rate will decrease its real interest rate and lead to the real interest rate differential favoring Japan over New Zealand. This would likely result in a depreciation of the JPY/NZD rate over time. The shift in the relative real returns should lead to reduced capital flows from Japan to New Zealand (so Choice B is incorrect) and the RBNZ—New Zealand's central bank—is more likely to tighten monetary policy than loosen it as inflation picks up (so Choice C is incorrect).

Solution to 3:

B is correct. Tighter monetary policy in India should lead to higher real interest rates (at least in the short run). This increase will cause the INR to appreciate against the USD, but because the USD is the base currency, this will be

represented as depreciation in the INR/USD rate. Choice C is incorrect because a tightening of monetary policy that is not fully priced-in to market pricing is likely to move bond yields and hence the exchange rate in the short run (given the simple economic model in Section 5.1).

Solution to 4:

B is correct. Either a long straddle or a long strangle will profit from a marked increase in volatility in the spot rate, but a 25-delta strangle would be cheaper (because it is based on OTM options). Writing a strangle—particularly one that is close to being ATM, which is what a 40-delta structure is—is likely to be exercised in favor of the counterparty if McYelland's market view is correct.

Solution to 5:

C is correct. The 200-day moving average has not been crossed yet, and it is higher than the current spot rate. Hence this technical indicator suggests that resistance lies above the current spot rate level, likely in the 62.0400 area. Choice A is incorrect because the currency has not yet appreciated to 62.0400, so it cannot be considered a "support" level. Given that the currency pair has already traded through 62.0310 and is still at least 90 pips away from the 200-day moving average, it is more likely to suspect that resistance still lies above the current spot rate.

TOOLS OF CURRENCY MANAGEMENT

6

In this section, we focus on how the portfolio manager uses financial derivatives to implement both the *strategic* positioning of the portfolio along the risk spectrum (i.e., the performance benchmark) as well as the *tactical* decisions made in regard to variations around this "neutral" position. The manager's market view—whether based on carry, fundamental, currency volatility, or technical considerations—leads to this active management of risk positioning around the strategic benchmark point. Implementing both strategic and tactical viewpoints requires the use of trading tools, which we discuss in this section.

The balance of this reading will assume that the portfolio's strategic foreign-currency asset exposures and the maximum amount of currency risk desired have already been determined by the portfolio's IPS. We begin at the conservative end of the risk spectrum by describing a passive hedge for a single currency (with a 100% hedge ratio). After discussing the costs and limitations of this approach, we move out further along the risk spectrum by describing strategies in which the basic "building blocks" of financial derivatives can be combined to implement the manager's tactical positioning and construct much more customized risk–return profiles. Not surprisingly, the basic trading tools themselves—forwards, options, FX swaps—are used for both strategic and tactical risk management and by both hedgers and speculators alike (although for different ends). Note that the instruments covered as tools of currency management are not nearly an exhaustive list. For example, exchange-traded funds for currencies are a vehicle that can be useful in managing currency risk.

6.1 Forward Contracts

In this section, we consider the most basic form of hedging: a 100% hedge ratio for a single foreign-currency exposure. Futures or forward contracts on currencies can be used to obtain full currency hedges, although most institutional investors prefer to use forward contracts for the following reasons:

1. Futures contracts are standardized in terms of settlement dates and contract sizes. These may not correspond to the portfolio's investment parameters.
2. Futures contracts may not always be available in the currency pair that the portfolio manager wants to hedge. For example, the most liquid currency futures contracts trade on the Chicago Mercantile Exchange (CME). Although there are CME futures contracts for all major exchange rates (e.g., USD/EUR, USD/GBP) and many cross rates (e.g., CAD/EUR, JPY/CHF), there are not contracts available for all possible currency pairs. Trading these cross rates would need multiple futures contracts, adding to portfolio management costs. In addition, many of the "second tier" emerging market currencies may not have liquid futures contracts available against any currency, let alone the currency pair in which the portfolio manager is interested.
3. Futures contracts require up-front margin (initial margin). They also have intra-period cash flow implications, in that the exchange will require the investor to post additional variation margin when the spot exchange rate moves against the investor's position. These initial and ongoing margin requirements tie up the investor's capital and require careful monitoring through time, adding to the portfolio management expense. Likewise, margin flows can go in the investor's favor, requiring monitoring and reinvestment.

In contrast, forward contracts do not suffer from any of these drawbacks. Major global investment dealers (such as Deutsche Bank, Royal Bank of Scotland, UBS, etc.) will quote prices on forward contracts for practically every possible currency pair, settlement date, and transaction amount. They typically do not require margin to be posted or maintained.[23]

Moreover, the daily trade volume globally for OTC currency forward and swap contracts dwarfs that for exchange-traded currency futures contracts; that is, forward contracts are more liquid than futures for trading in large sizes. Reflecting this liquidity, forward contracts are the predominant hedging instrument in use globally. For the balance of this section, we will focus only on currency forward contracts. However, separate side boxes discuss exchange-traded currency futures contracts and currency-based exchange-traded funds (ETFs).

FUTURES CONTRACTS ON THE CME

The vast majority of trading in foreign exchange markets is conducted by large money-management institutions and global currency dealers. Many public sector market participants also create large foreign exchange flows; particularly sovereign wealth funds (SWFs) and central banks managing their country's foreign-currency reserves. The minimum dealing sizes for all of these institutional players are at least one million units of the base currency; typically the dealing sizes can be much larger. For the reasons mentioned in Section 6.1, these institutional market participants almost always use OTC forward contracts rather than exchange-traded futures contracts.

23 Some forward contracts—typically between investment dealers or between dealers and some large institutional accounts—are governed by what are called Credit Support Annexes (CSAs) that do require collateral to be posted. The amount of collateral required can change over the life of the forward contract if the mark-to-market losses on the position exceed pre-specified bounds.

But this preference does not mean that exchange-traded futures are unimportant to the FX market or that they do not have their own niche of market participants. The largest complex of exchange-traded currency products—with more than 50 futures contracts and 30 option contracts on futures—is hosted by the Chicago Mercantile Exchange. Collectively these products see an average daily turnover of approximately USD120 billion, which is not that much different than the average daily turnover on the main interbank dealing platforms, Reuters D3000 and EBS, which as of this writing have an average daily turnover of approximately USD140 billion each.[24] Moreover, the CME is experiencing a higher growth rate in its turnover than the main interbank platforms.

The mix of market participants on the CME is different than that of the interbank market. Typically, the CME will appeal to those accounts that are trading in smaller dealing sizes. (For example, the most heavily traded currency contract on the CME is for the USD/EUR currency pair, and its contract size is EUR125,000.) The CME also provides market access with tight pricing and good liquidity (for these smaller deal sizes) to those accounts that may not have the creditworthiness or the credit relationship with major FX dealers in order to access the FX market through other channels. These less creditworthy accounts are able to access the exchange-traded market because the central clearing house demands margin and guarantees delivery on all contracts.

There is a diverse range of market participants who fit this description, including small hedge funds, proprietary trading firms, and active individual traders. One important class of market participants on the CME are **managed futures funds**, which are often used by small institutions, high-net-worth individuals, and other accounts that would fall under the realm of private wealth management. These managed futures funds are pools of private capital managed by **commodity trading advisors** (CTAs). To trade futures contracts on behalf of others, CTAs need to be registered with the US Commodity Futures Trading Commission (CFTC) by application through the National Futures Association, which is a self-regulatory organization (SRO) that oversees derivatives trading on US exchanges. These managed futures funds are managed on a discretionary basis by the CTAs, who use leverage and aggressive trading strategies to earn speculative profits. As such, managed futures funds can be thought of as being somewhat similar to hedge funds, and as an alternative asset class, the returns on managed futures are typically uncorrelated with more traditional asset classes. This feature provides diversification benefits to the overall portfolio.

Finally, note that FX quoting conventions for contracts quoted on the CME are frequently different from those used elsewhere in the currency market (as shown in Exhibit 2). The CME is based in the United States and, as a matter of convention, uses the USD as the price currency in the foreign exchange quote for all currency pairs.[25] As a result, many of the CME futures and options contracts are quoted in terms that are different from standard interbank market quotes in the OTC market. For example, the dollar/yen futures contract has a nominal size of JPY12,500,000 and is quoted in terms of the amount of US dollars to buy one yen—that is, in terms of USD/JPY rather than the more usual JPY/USD. Hence, a recent price quote on this contract was 0.012807 rather than 78.08. (To make this quote more readable this price is often scaled by multiplying by 100 or 10,000: the price in USD of 100 JPY and 10,000 JPY, respectively.)

6.1.1 *Hedge Ratios with Forward Contracts*

In principle, setting up a full currency hedge is relatively straight forward: match the current market value of the foreign-currency exposure in the portfolio with an equal and offsetting position in a forward contract. In practice, of course, it is not that simple because the market value of the foreign-currency assets will change with market

24 It might seem odd that the CME transacts almost as much as the major interbank trading platforms, EBS and Reuters. However, these interbank platforms deal almost exclusively in *spot* transactions, which are only a fraction of overall FX market trading. Most of the approximately USD4 trillion in daily turnover in FX markets is accounted for by FX swap and outright forward transactions.

25 That is, for all currency pairs that involve the USD. The CME also has contracts for JPY/CAD and other cross rates.

conditions. This means that the actual hedge ratio will typically *drift* away from the desired hedge ratio as market conditions change. A **static hedge** (i.e., unchanging hedge) will avoid transaction costs, but will also tend to accumulate unwanted currency exposures as the value of the foreign-currency assets change. This characteristic will cause a mismatch between the market value of the foreign-currency asset portfolio and the nominal size of the forward contract used for the currency hedge; this is pure currency risk. For this reason, the portfolio manager will typically need to implement a **dynamic hedge** by rebalancing the portfolio periodically. This hedge rebalancing will mean adjusting some combination of the size, number, and maturities of the forward currency contracts.

A simple example will illustrate this rebalancing process. Suppose that an investor domiciled in Switzerland has a EUR-denominated portfolio that, at the start of the period, is worth EUR1,000,000. Assume a monthly hedge-rebalancing cycle. To hedge this portfolio, the investor would sell EUR1,000,000 one month forward against the CHF. Assume that one month later, the EUR-denominated investment portfolio is then actually worth only EUR950,000. To roll the hedge forward for the next month, the investor will engage in a mismatched FX swap. (Recall that a "matched" swap means that both the spot and forward transactions—the near and far "legs" of the swap, respectively—are of equal size). For the near leg of the swap, EUR1 million will be bought at spot to settle the expiring forward contract. (The euro amounts will then net to zero, but a Swiss franc cash flow will be generated, either a loss or a gain for the investor, depending on how the CHF/EUR rate has changed over the month). For the far leg of the swap, the investor will sell EUR950,000 forward for one month.

Another way to view this rebalancing process is to consider the case in which the original short forward contract has a three-month maturity. In this case, rebalancing after one month would mean that the manager would have to *buy* 50,000 CHF/EUR two months forward. There is no cash flow at the time this second forward contract is entered, but the *net* amount of euro for delivery at contract settlement two months into the future is now the euro hedge amount desired (i.e., EUR950,000). There will be a net cash flow (denominated in CHF) calculated over these two forward contracts on the settlement date two months hence.

Although rebalancing a dynamic hedge will keep the actual hedge ratio close to the target hedge ratio, it will also lead to increased transaction costs compared with a static hedge. The manager will have to assess the cost–benefit trade-offs of how frequently to dynamically rebalance the hedge. These will depend on a variety of idiosyncratic factors (manager risk aversion, market view, IPS guidelines, etc.), and so there is no single "correct" answer—different managers will likely make different decisions.

However, we can observe that the higher the degree of risk aversion, the more frequently the hedge is likely to be rebalanced back to the "neutral" hedge ratio. Similarly, the greater the tolerance for active trading, and the stronger the commitment to a particular market view, the more likely it is that the actual hedge ratio will be allowed to vary from a "neutral" setting, possibly through entering into new forward contracts. (For example, if the P/B spot rate was seen to be oversold and likely to rebound higher, an actively traded portfolio might buy the base currency through forward contracts to lock in this perceived low price—and thus change the actual hedge ratio accordingly.) The sidebar on executing a hedge illustrates the concepts of rolling hedges, FX swaps and their pricing (bid–offer), and adjusting hedges for market views and changes in market values.

EXECUTING A HEDGE

Jiao Yang works at Hong Kong-based Kwun Tong Investment Advisors; its reporting currency is the Hong Kong Dollar (HKD). She has been put in charge of managing the firm's foreign-currency hedges. Forward contracts for two of these hedges are coming due for settlement, and Yang will need to use FX swaps to roll these hedges forward three months.

Hedge #1: Kwun Tong has a short position of JPY800,000,000 coming due on a JPY/HKD forward contract. The market value of the underlying foreign-currency assets has not changed over the life of the contract, and Yang does not have a firm opinion on the expected future movement in the JPY/HKD spot rate.

Hedge #2: Kwun Tong has a short position of EUR8,000,000 coming due on a HKD/EUR forward contract. The market value of the EUR-denominated assets has increased (measured in EUR). Yang expects the HKD/EUR spot rate to decrease.

The following spot exchange rates and three-month forward points are in effect when Yang transacts the FX swaps necessary to roll the hedges forward:

	Spot Rate	Three-Month Forward Points
JPY/HKD	10.80/10.82	−20/−14
HKD/EUR	10.0200/10.0210	125/135

Note: The JPY/HKD forward points will be scaled by 100; the HKD/EUR forward points will be scaled by 10,000

As a result, Yang undertakes the following transactions:

For **Hedge #1**, the foreign-currency value of the underlying assets has not changed, and she does not have a market view that would lead her to want to either over- or under-hedge the foreign-currency exposure. Therefore, to roll these hedges forward, she uses a matched swap. For matched swaps (see Section 2.3), the convention is to base pricing on the mid-market spot exchange rate. Thus, the spot leg of the swap would be to buy JPY800,000,000 at the mid-market rate of 10.81 JPY/HKD. The forward leg of the swap would require selling JPY800,000,000 forward three months. Selling JPY (the price currency in the JPY/HKD quote) is equivalent to buying HKD (the base currency). Therefore, she uses the offer-side forward points, and the all-in forward rate for the forward leg of the swap is as follows:

$$10.81 + \frac{-14}{100} = 10.67$$

For **Hedge #2**, the foreign-currency value of the underlying assets has increased; Yang recognizes that this implies that she should increase the size of the hedge greater than EUR8,000,000. She also believes that the HKD/EUR spot rate will decrease, and recognizes that this implies a hedge ratio of more than 100% (Kwun Tong Advisors has given her discretion to over- or under-hedge based on her market views). This too means that the size of the hedge should be increased more than EUR8,000,000, because Yang will want a larger short position in the EUR to take advantage of its expected depreciation. Hence, Yang uses a mismatched swap, buying EUR8,000,000 at spot rate against the HKD, to settle the maturing forward contract and then *selling* an amount *more* than EUR8,000,000 forward to increase the hedge size. Because the EUR is the base currency in the HKD/EUR quote, this means using the *bid* side for both the spot rate and the forward points when calculating the all-in forward rate:

$$10.0200 + \frac{125}{10{,}000} = 10.0325$$

The spot leg of the swap—buying back EUR8,000,000 to settle the outstanding forward transaction—is also based on the bid rate of 10.0200. This is because Yang is selling an amount larger than EUR8,000,000 forward, and the all-in forward rate of the swap is

already using the bid side of the market (as it would for a matched swap). Hence, to pick up the net increase in forward EUR sales, the dealer Yang is transacting with would price the swap so that Yang also has to use bid side of the *spot* quote for the spot transaction used to settle the maturing forward contract.

6.1.2 *Roll Yield*

The roll yield (also called the roll return) on a hedge results from the fact that forward contracts are priced at the spot rate adjusted for the number of forward points at that maturity (see the example shown in Exhibit 3). This forward point adjustment can either benefit or detract from portfolio returns (positive and negative roll yield, respectively) depending on whether the forward points are at a premium or discount, and what side of the market (buying or selling) the portfolio manager is on.

The concept of roll yield is illustrated with the simplified example shown in Exhibit 7.

Exhibit 7 The Forward Curve and Roll Yield

The magnitude of roll yield is given by $|(F_{P/B} - S_{P/B})/S_{P/B}|$ where "||" indicates absolute value. The sign depends on whether the investor needs to buy or to sell the base currency forward in order to maintain the hedge. A *positive* roll yield results from buying the base currency at a forward discount or selling it at a forward premium (the intuition here is that it is profitable to "buy low and sell high"). Otherwise, the roll yield is negative (i.e., a positive cost). Examining the case of negative roll yield, assume that to implement the hedge requires buying the base currency in the P/B quote, and that the base currency is trading at a forward premium (as shown in Exhibit 7). By using a long position in a forward contract to implement this hedge, it means paying the forward price of A. All else equal, as time passes the price of the forward contract will "roll down the curve" toward Price B as the forward contract's settlement date approaches. (Note that in reality the curve is not always linear.) At the settlement date of the forward contract, it is necessary to roll the hedging position forward to extend the currency hedge. This rolling forward will involve selling the base currency at the then-current spot exchange rate to settle the forward contract, and then going long another far-dated forward contract (i.e., an FX swap transaction). Note that the portfolio manager originally bought the base currency at Price A and

then subsequently sold it at a lower Price B—and that buying high and selling low will be a cost to the portfolio. Or put differently, all else equal, the roll yield would be negative in this case.[26]

The concept of roll yield is very similar to the concept of forward rate bias (and the carry trade) introduced in Section 5. Indeed, a negative roll yield typically indicates that the hedger was trading *against* the forward rate bias by buying a currency at a forward premium (as in Exhibit 7) or selling a currency at a forward discount. This is the exact opposite of trading the forward rate bias, which is to buy at a discount and sell at a premium. Given the equivalence between the forward rate bias and the carry trade, by trading against the forward rate bias the hedger with a negative roll yield is also essentially entering into *negative* carry trade, in effect borrowing at high rates and investing at low rates. On average, this will not be a winning strategy. Given the equivalence between implementing a carry trade, trading the forward rate bias, and earning positive roll yield, we can now complete Exhibit 6 introduced in Section 5.3 on the carry trade:

Exhibit 8 The Carry Trade and Roll Yield

	Buy/Invest	Sell/Borrow	
Implementing the carry trade	High-yield currency	Low-yield currency	Earning a positive roll yield
Trading the forward rate bias	Forward discount currency	Forward premium currency	

Note as well that this concept of roll yield applies to forward and futures contracts used to trade *any* asset class, not just currencies: It applies equally well to forwards and futures on equities, fixed-income securities, commodities, and indeed, any financial product. For example, consider the case of a commodity processor that hedges the costs of its production process by going long corn futures contracts. If the futures curve for corn futures contracts is in contango (upward sloping, as in Exhibit 7), then this hedging position will also face the potential for negative roll yield.

To be fair, it is also possible for the level of, and movement in, forward points to be in the portfolio manager's favor. Extending our previous example, consider the case of a portfolio manager that has to *sell* the base currency to implement the currency hedge. In this case, the manager would be selling the base currency forward at Price A in Exhibit 7 and, all else equal and through entering an FX swap at settlement date, buying the currency back at the lower Price B—essentially, short selling a financial product with a declining price. In this case, the roll yield is positive.

Because the level of and movements in forward points can either enhance or reduce currency-hedged returns, it explains an observed tendency in foreign exchange markets for the amount of currency hedging to generally vary with movements in forward points. As forward points move against the hedger, the amount of hedging activity typically declines as the cost/benefit ratio of the currency hedge deteriorates. The opposite occurs when movements in forward points reduce hedging costs. Essentially the tendency to hedge will vary depending on whether implementing the hedge happens to be trading in the same direction of the forward rate bias strategy

26 The "all else equal" qualification refers to the fact that the all-in price of the forward contract consists of the spot rate and forward points, and both are likely to change over the life of the forward contract. It is possible that at the settlement date the spot rate would have moved higher than A, in which case the roll yield would be positive. But the larger the gap between A and B at contract initiation, the less likely this is to occur.

or against it. It is easier to sell a currency forward if there is a "cushion" when it is selling at a forward premium. Likewise, it is more attractive to buy a currency when it is trading at a forward discount. This swings the forward rate bias (and carry trade advantage) in favor of the hedge.

Combined with the manager's market view of future spot rate movements, what this concept implies is that, when setting the hedge ratio, the portfolio manager must balance the effect of expected future exchange rate movements on portfolio returns against the expected effect of the roll yield (i.e., the expected cost of the hedge).

A simple example can illustrate this effect. Consider a portfolio manager that needs to sell forward the base currency of a currency pair (P/B) to implement a currency hedge. Clearly, the manager would prefer to sell this currency at as high a price as possible. Assume that given the forward points for this currency pair and the time horizon for the hedge, the expected roll yield (cost of the hedge) is –3%. Suppose the portfolio manager had a market view that the base currency would depreciate by 4%. In this case, the hedge makes sense: It is better to pay 3% for the hedge to avoid an expected 4% loss.

Now, suppose that with a movement in forward points the new forward discount on the base currency is 6% away from the current spot rate. If the manager's market view is unchanged (an expected depreciation of the base currency of 4%), then now the use of the hedge is less clear: Does it make sense to pay 6% for the hedge to avoid an expected 4% loss? A *risk-neutral* manager would not hedge under these circumstances because the net expected value of the hedge is negative. But a *risk-averse* manager might still implement the hedge regardless of the negative net expected value. The reason is because it is possible that the market forecast is wrong and that the *actual* depreciation of the base currency (and realized loss to the portfolio) may be higher than the 6% cost of the hedge. The risk-averse manager must then weigh the *certainty* of a hedge that costs 6% against the *risk* that actual unhedged currency losses might be much higher than that.

Clearly, the cost/benefit analysis has shifted against hedging in this case, but many risk-averse investors would still undertake the hedge anyway. The risk-averse manager would likely only take an unhedged currency position if the difference between the expected cost of the hedge and the expected return on an unhedged position was so great as to make the risk acceptable. Balancing these two considerations would depend on the type of market view the manager held and the degree of conviction in it, as well as the manager's degree of risk aversion. The decision taken will vary among investors, so no definitive answer can be given as to what would be the appropriate hedging choice (different portfolio managers will make different choices given the same opportunity set). But hedging costs will vary with market conditions and the higher the expected cost of the hedge (negative roll yield) the more the cost/benefit calculation moves against using a fully hedged position. Or put another way, if setting up the hedge involves selling the low-yield currency and buying the high-yield currency in the P/B pair (i.e., an implicit carry position), then the more likely the portfolio will be fully hedged or even over-hedged. The opposite is also true: Trading against the forward rate bias is likely to lead to lower hedge ratios, all else equal.

EXAMPLE 4

The Hedging Decision

The reporting currency of Hong Kong-based Kwun Tong Investment Advisors is the Hong Kong dollar (HKD). The investment committee is examining whether it should implement a currency hedge for the firm's exposures to the GBP and the ZAR (the firm has long exposures to both of these foreign currencies). The

hedge would use forward contracts. The following data relevant to assessing the expected cost of the hedge and the expected move in the spot exchange rate has been developed by the firm's market strategist.

	Current Spot Rate	Six-Month Forward Rate	Six-Month Forecast Spot Rate
HKD/GBP	12.4610	12.6550	12.3000
HKD/ZAR	0.9510	0.9275	0.9300

1 Recommend whether to hedge the firm's long GBP exposure. Justify your recommendation.

2 Discuss the trade-offs in hedging the firm's long ZAR exposure.

Solution to 1:

Kwun Tong is long the GBP against the HKD, and HKD/GBP is selling at a forward premium of +1.6% compared with the current spot rate. All else equal, this is the expected roll yield—which is in the firm's favor, in this case, because to implement the hedge Kwun Tong would be *selling* GBP, the base currency in the quote, at a price *higher* than the current spot rate. Moreover, the firm's market strategist expects the GBP to *depreciate* by 1.3% against the HKD. Both of these considerations argue for hedging this exposure.

Solution to 2:

Kwun Tong is long the ZAR against the HKD, and HKD/ZAR is selling at a forward discount of –2.5% compared with the current spot rate. Implementing the hedge would require the firm to *sell* the base currency in the quote, the ZAR, at a price *lower* than the current spot rate. This would imply that, all else equal, the roll yield would go against the firm; that is, the expected cost of the hedge would be 2.5%. But the firm's strategist also forecasts that the ZAR will depreciate against the HKD by 2.2%. This makes the decision to hedge less certain. A risk-neutral investor would not hedge because the expected cost of the hedge is more than the expected depreciation of the ZAR. But this is only a point forecast and comes with a degree of uncertainty—there is a risk that the HKD/ZAR spot rate might depreciate by more than the 2.5% cost of the hedge. In this case, the decision to hedge the currency risk would depend on the trade-offs between (1) the level of risk aversion of the firm; and (2) the conviction the firm held in the currency forecast—that is, the level of certainty that the ZAR would not depreciate by more than 2.5%.

6.2 Currency Options

One of the costs of forward contracts is the opportunity cost. Once fully hedged, the portfolio manager forgoes any upside potential for future currency moves in the portfolio's favor. Currency options remove this opportunity cost because they provide the manager the right, but not the obligation, to buy or sell foreign exchange at a future date at a rate agreed on today. The manager will only exercise the option at the expiry date if it is favorable to do so.[27]

27 Almost all options in the FX market are European-style options, which only allow for exercise at the expiry date.

Consider the case of a portfolio manager who is long the base currency in the P/B quote and needs to sell this currency to implement the hedge. One approach is to simply buy an at-the-money put option on the P/B currency pair. Matching a long position in the underlying with a put option is known as a **protective put** strategy. Suppose the current spot rate is 1.3650 and the strike price on the put option bought is 1.3650. If the P/B rate subsequently goes down (P appreciates and B depreciates) by the expiry date, the manager can exercise the option, implement the hedge, and guarantee a selling price of 1.3650. But if the P/B rate increases (P depreciates and B appreciates), the manager can simply let the option expire and collect the currency gains.

Unfortunately, like forward contracts, currency options are not "free goods" and, like any form of insurance, there is always a price to be paid for it. Buying an option means paying an upfront premium. This premium is determined, first, by its **intrinsic value**, which is the difference between the spot exchange rate and the strike price of the option (i.e., whether the option is in the money, at the money, or out of the money, respectively). ATM options are more expensive than OTM options, and frequently these relatively expensive options expire worthless.[28]

The second determinant of an option's premium is its **time value**, which in turn is heavily influenced by the volatility in exchange rates. Regardless of exchange rate volatility, however, options are always moving toward expiry. In general, the time value of the option is always declining. This is the time decay of the option's value (theta, one of the "Greeks" of option prices, describes this effect) and is similar in concept to that of negative roll yield on forward contracts described earlier. Time decay always works against the owner of an option.

As with forward contracts, a portfolio manager will have to make judgments about the cost/benefit trade-offs of options-based strategies. Although options do allow the portfolio upside potential from favorable currency movements, options can also be a very expensive form of insurance. The manager will have to balance any market view of potential currency gains against hedging costs and the degree of risk aversion. There is no "right" answer; different managers will make different decisions about the cost/benefit trade-offs when given the same opportunity set.

EXAMPLE 5

Hedging Problems

Brixworth & St. Ives Asset Management is a UK-based firm managing a dynamic hedging program for the currency exposures in its Aggressive Growth Fund. One of the fund's foreign-currency asset holdings is denominated in the Mexican peso (MXN), and one month ago Brixworth & St. Ives fully hedged this exposure using a two-month MXN/GBP forward contract. The following table provides the relevant information.

28 This is nothing to be unduly concerned about. Most insurance contracts expire out of the money in that the insured event did not occur (e.g., your house did not catch fire). This does not mean the insurance was a mistake; the insurance buyer had downside protection, which is worth something. Moreover, the (absolute value of the) option's delta is *approximately* equal to the probability of exercise, which means that, on average, an ATM option will expire worthless about half the time.

	One Month Ago	Today
Value of assets (in MXN)	10,000,000	9,500,000
MXN/GBP spot rate (bid–offer)	20.0500/20.0580	19.5985/20.0065
One-month forward points (bid–offer)	625/640	650/665
Two-month forward points (bid–offer)	875/900	900/950

The Aggressive Growth Fund also has an unhedged foreign-currency asset exposure denominated in the South African rand (ZAR). The current mid-market spot rate in the ZAR/GBP currency pair is 5.1050.

1 One month ago, Brixworth & St. Ives *most likely* sold:

A MXN9,500,000 forward at an all-in forward rate of MXN/GBP 19.6635.

B MXN10,000,000 forward at an all-in forward rate of MXN/GBP 20.1375.

C MXN10,000,000 forward at an all-in forward rate of MXN/GBP 20.1480.

2 To rebalance the hedge today, the firm would *most likely* need to:

A buy MXN500,000 spot.

B buy MXN500,000 forward.

C sell MXN500,000 forward.

3 Given the data in the table, the roll yield on this hedge at the forward contracts' maturity date is *most likely* to be:

A zero.

B negative.

C positive.

4 Assuming that all ZAR/GBP options considered have the same notional amount and maturity, the *most* expensive hedge that Brixworth & St. Ives could use to hedge its ZAR exposure is a long position in a(n):

A ATM call.

B 25-delta call.

C put with a strike of 5.1050.

Solution to 1:

C is correct. Brixworth & St. Ives is long the MXN and hence must sell the MXN forward against the GBP. Selling MXN against the GBP means buying GBP, the base currency in the MXN/GBP quote. Therefore, the offer side of the market must be used. This means the all-in rate used one month ago would have been 20.0580 + 900/10,000, which equals 20.1480. Choice A is incorrect because it uses today's asset value and the bid side of the spot and one-month forward quotes and Choice B is incorrect because it uses the wrong side of the market (the bid side).

Solution to 2:

B is correct. The foreign investment went down in value in MXN terms. Therefore Brixworth & St. Ives must reduce the size of the hedge. Previously it had sold MXN10,000,000 forward against the GBP, and this amount must be reduced to MXN9,500,000 by buying MXN500,000 forward. Choice A is incorrect

because hedging is done with forward contracts not spot deals. Choice C is incorrect because selling MXN forward would increase the size of the hedge, not decrease it.

Solution to 3:

B is correct. To implement the hedge, Brixworth & St. Ives must sell MXN against the GBP, or equivalently, buy GBP (the base currency in the P/B quote) against the MXN. The base currency is selling forward at a premium, and—all else equal—its price would "roll down the curve" as contract maturity approached. Having to settle the forward contract means then selling the GBP spot at a lower price. Buying high and selling low will define a negative roll yield. Moreover, the GBP has depreciated against the MXN, because the MXN/GBP spot rate declined between one month ago and now, which will also add to the negative roll yield.

Solution to 4:

A is correct. The Aggressive Growth Fund is long the ZAR through its foreign-currency assets, and to hedge this exposure it must sell the ZAR against the GBP, or equivalently, buy GBP—the base currency in the P/B quote—against the ZAR. Hedging a required purchase means a long position in a call option (not a put, which is used to hedge a required sale of the base currency in the P/B quote). An ATM call option is more expensive than a 25-delta call option.

6.3 Strategies to Reduce Hedging Costs and Modify a Portfolio's Risk Profile

In the previous sections, we showed that completely hedging currency risk is possible—but can also be expensive. It can be even more expensive when trying to avoid all downside risk while keeping the full upside potential for favorable currency movements (i.e., a protective put strategy with ATM options). Hedging can be seen as a form of insurance, but it is possible to overpay for insurance. Judgments have to be made to determine at what point the costs outweigh the benefits.

As with any form of insurance, there are always steps that can be taken to reduce hedging costs. For most typical insurance products, these cost-reduction measures include such things as higher deductibles, co-pay arrangements, and lower maximum payouts. The same sorts of measures exist in the FX derivatives market; we will explore these various alterative measures in this section. The key point to keep in mind is that all of these various cost-reduction measures invariably involve some combination of *less downside protection* and/or *less upside potential* for the hedge. In efficient markets, lower insurance premiums mean lower insurance.

These cost-reduction measures also start moving the portfolio away from a passively managed 100% hedge ratio toward discretionary hedging in which the manager is allowed to take directional positions. Once the possibility of accepting some downside risk, and some upside potential, is introduced into the portfolio, the manager is moving away from a rules-based approach to hedging toward a more active style of trading. The portfolio manager can then use the trading tools and strategies described in the following sections to express a market view and/or cut hedging costs.

The variety of trading strategies—involving various combinations of forwards, options, and swaps—that can be deployed to this end is almost infinite. We will not attempt to explore all of them in this reading, but rather to give a sense of the range of trading tools and strategies available for managing currency risk. We begin with Exhibit 9, which gives a high-level description of some of these various trading strategies that will then be explained in more detail in subsequent sections. Note that

as this section progresses, we will be describing strategies at different points along the risk spectrum described in Section 4, moving in turn from passive hedge-based approaches to strategies used in more active currency management schemes.

Exhibit 9 Select Currency Management Strategies

Forward Contracts	Over-/under-hedging	Profit from market view
Option Contracts	OTM options	Cheaper than ATM
	Risk reversals	Write options to earn premiums
	Put/call spreads	Write options to earn premiums
	Seagull spreads	Write options to earn premiums
Exotic Options	Knock-in/out features	Reduced downside/upside exposure
	Digital options	Extreme payoff strategies

We will make one simplifying assumption for the following sections. Currency management strategies will differ fundamentally depending on whether the base currency of the P/B price quote must be bought or sold to decrease the foreign-currency exposure. To simplify the material and impose consistency on the discussions that follow, we will assume that the portfolio manager must sell the base currency in the P/B quote to reduce currency risk. In addition, unless otherwise noted, the notional amounts and expiration dates on all forward and options contracts are the same.[29]

6.3.1 *Over-/Under-Hedging Using Forward Contracts*

When the IPS gives the manager discretion either to over- or under-hedge the portfolio, relative to the "neutral" benchmark, there is the possibility to add incremental value based on the manager's market view. Profits from successful tactical positioning help reduce net hedging costs. For example, if the neutral benchmark hedge ratio is 100% for the base currency being hedged, and the portfolio manager has a market opinion that the base currency is likely to depreciate, then *over*-hedging through a short position in P/B forward contracts might be implemented—that is, the manager might use a hedge ratio higher than 100%. Similarly, if the manager's market opinion is that the base currency is likely to appreciate, the currency exposure might be *under*-hedged.

A variant of this approach would be to adjust the hedge ratio based on exchange rate movements: to increase the hedge ratio if the base currency depreciated, but decrease the hedge ratio if the base currency appreciated. Essentially, this approach is a form of "delta hedging" that tries to mimic the payoff function of a put option on the base currency. That is, this form of dynamic hedging with forward contracts tries to increasingly participate in any upside moves of the base currency, but increasingly hedge any downside moves. Doing so adds "convexity" to the portfolio, meaning that the hedge's payoff function will be a convex curve when this function is graphed with profit on the vertical axis and the spot rate on the horizontal axis. (Note that this concept of convexity is identical in intent to the concept of convexity describing bonds; as convexity increases the price of a bond rises more quickly in a declining yield environment and drops more slowly in a rising yield environment. Convexity is a desirable characteristic in both the fixed-income and currency-hedging contexts.)

29 Examples of implementing a hedge by *buying* the base currency will be provided in some of the practice examples.

6.3.2 *Protective Put Using OTM Options*

In the previous section, we examined a dynamic hedging strategy using forward contracts that tries to mimic the payoff function of an option and put convexity into the hedge's payoff function. The payoff functions for options are naturally convex to begin with. However, this can be a costly form of convexity (relatively high option premiums), and fully hedging a currency position with a protective put strategy using an ATM option is the most expensive means of all to buy convexity.

One way to reduce the cost of using options is to accept some downside risk by using an OTM option, such as a 25- or 10-delta option. These options will be less costly, but also do not fully protect the portfolio from adverse currency movements. Conversely, it makes sense to insure against larger risks but accept some smaller day-to-day price movements in currencies. As an analogy, it may be possible to buy a home or car insurance policy with a zero deductible—but the premiums would be exorbitant. It may be more rational to have a cheaper insurance policy and accept responsibility for minor events, but insure against extreme damage.

6.3.3 *Risk Reversal (or Collar)*

Another set of option strategies involves *selling* options (also known as writing options) to earn income that can be used to offset the cost of buying a put option, which forms the "core" of the hedge. Recall that in this section, we are using the simplifying convention that the manager is long the base currency in the P/B quote; hence puts and not calls would be used for hedging in this case.

One strategy to obtain downside protection at a lower cost than a straight protective put position is to *buy* an OTM put option and *write* an OTM call option. Essentially, the portfolio manager is selling some of the upside potential for movements in the base currency (writing a call) and using the option's premiums to help pay the cost of the long put option being purchased. This approach is similar to creating a collar in fixed-income markets. The portfolio is protected against downside movements, but its upside is limited to the strike price on the OTM call option; the exchange rate risk is confined to a corridor or "collar."

In professional FX markets, having a long position in a call option and a short position in a put option is called a **risk reversal**. For example, buying a 25-delta call and writing a 25-delta put is referred to as a *long* position in a 25-delta risk reversal. The position used to create the collar position we just described (buying a put, writing a call) would be a *short* position in a risk reversal.

The majority of currency hedging for foreign-currency asset portfolios and corporate accounts is based on the use of forward contracts and simple option strategies (protective puts/covered calls and risk reversals/collars). We now begin to transition to more active trading strategies that are designed to express market views for speculative profit.

6.3.4 *Put Spread*

A variation of the short risk reversal position is a **put spread**, which is also used to reduce the upfront cost of buying a protective put. The short risk reversal is structured by buying a put option and writing a call option: the premiums received by writing the call help cover the cost of the put. Similarly, the put spread position involves buying a put option and writing another put option to help cover the cost of the long put's premiums. This position is typically structured by buying an OTM put, and writing a deeper-OTM put to gain income from premiums; both options involved have the same maturity.

To continue our previous example, with the current spot rate at 1.3550, the portfolio manager might set up the following put spread: buy a put with a strike of 1.3500 and write a put with a strike of 1.3450. The payoff on the put spread position will then be

as follows: there is no hedge protection between 1.3550 and 1.3500; the portfolio is hedged from 1.3500 down to 1.3450; at spot rates below 1.3450, the portfolio becomes unhedged again. The put spread reduces the cost of the hedge, but at the cost of more limited downside protection. The portfolio manager would then use this spread only for cases in which a modest decline in the spot exchange rate was expected, and this position would have to be closely monitored against adverse exchange rate movements.[30]

Note that the put spread structure will not be zero-cost because the deeper-OTM put (1.3450) being written will be cheaper than the less-OTM put (1.3500) being bought. However, there are approaches that will make the put spread (or almost any other option spread position) cheaper or possibly zero-cost: the manager could alter: (a) the strike prices of the options; (b) the notional amounts of the options; or (c) some combination of these two measures.

Altering the strike prices of the put options would mean moving them closer together (and hence more equal in cost). However, this would reduce the downside protection on the hedge. Instead, the portfolio manager could write a larger notional amount for the deeper-OTM option; for example, the ratio for the notionals for the options written versus bought might be 1:2. (In standard FX market notation, this would be a 1 × 2 put spread—the option with exercise price closest to being ATM is given first. However, to avoid confusion it is good practice to specify explicitly in the price quote which is the long and short positions, and what their deltas/strike prices are.) Although this structure may now be (approximately) zero-cost it is not without risks: for spot rates below 1.3450 the portfolio has now seen its exposure to the base currency double-up (because of the 1:2 proportion of notionals) and at a worse spot exchange rate for the portfolio on top of it. Creating a zero-cost structure with a 1 × 2 put spread is equivalent to adding leverage to the options position, because you are selling more options than you are buying. This means that this put spread position will have to be carefully managed. For example, the portfolio manager might choose to close out the short position in the deep-OTM put (by going long/buying an equivalent put option) before the base currency depreciates to the 1.3450 strike level. This may be a costly position exit, however, as the market moves against the manager's original positioning. Because of this, this sort of 1 × 2 structure may be more appropriate for expressing directional opinions rather than as a pure hedging strategy.

6.3.5 *Seagull Spread*

An alternative, and somewhat safer approach, would be to combine the original put spread position (1:1 proportion of notionals) with a covered call position. This is simply an extension of the concept behind risk reversals and put spreads. The "core" of the hedge (for a manager long the base currency) is the long position in a put option. This is expensive. To reduce the cost, a short risk reversal position writes a call option while a put spread writes a deep-OTM put option. Of course, the manager can always do both: that is, be long a protective put and then write *both* a call and a deep-OTM put. This option structure is sometimes referred to as a **seagull spread**.

As with the names for other option strategies based on winged creatures, the "seagull" indicates an option structure with at least three individual options, and in which the options at the most distant strikes—the wings—are on the opposite side of the market from the middle strike(s)—the body. For example, if the current spot price is 1.3550, a seagull could be constructed by going *long* an ATM put at 1.3550 (the middle strike is the "body"), *short* an OTM put at 1.3500, and *short* an OTM call

30 Another approach could be to fully hedge the underlying currency exposure with a short position in a forward contract, and then overlay this hedge with a put spread as a *tactical* position designed to profit from modest depreciation of the base currency. The underlying currency exposure is hedged by the forward contract, and the portfolio manager earns a speculative gain if the base currency depreciates enough below the strike price on the long put position to cover the net cost of this option structure.

at 1.3600 (the latter two options are the "wings"). Because the options in the "wings" are being written (sold) this is called a *short* seagull position. The risk/return profile of this structure gives full downside protection from 1.3550 to 1.3500 (at which point the short put position neutralizes the hedge) and participation in the upside potential in spot rate movements to 1.3600 (the strike level for the short call option).

Note that because *two* options are now being written to gain premiums instead of one, this approach allows the strike price of the long put position to be ATM, increasing the downside protection. The various strikes and/or notional sizes of these options (and hence their premiums) can always be adjusted up or down until a zero-cost structure is obtained. However, note that this particular seagull structure gives away some upside potential (the short call position) as well as takes on some downside risk (if the short put position is triggered, it will disable the hedge coverage coming from the long put position). As always, lower structure costs come with some combination of lower downside protection and/or less upside potential.

There are many variants of these seagull strategies, each of which provides a different risk–reward profile (and net cost). For example, for the portfolio manager wishing to hedge a long position in the base currency in the P/B quote when the current spot rate is 1.3550, another seagull structure would be to write an ATM call at 1.3550 and use the proceeds to buy an OTM put option at 1.3500 and an OTM call option at 1.3600. Note that in this seagull structure, the "body" is now a *short* option position, not a long position as in the previous example, and the "wings" are the long position. Hence, it is a *long* seagull spread. This option structure provides cheap downside protection (the hedge kicks in at the put's 1.3500 strike) while providing the portfolio manager with unlimited participation in any rally in the base currency beyond the 1.3600 strike of the OTM call option. As before, the various option strikes and/or notional sizes on the options bought and written can be adjusted so that a zero-cost structure is obtained.

6.3.6 *Exotic Options*

In this section, we move even further away from derivatives and trading strategies used mainly for hedging, and toward the more speculative end of the risk spectrum dominated by active currency management. Exotic options are often used by more sophisticated players in the professional trading market—for example, currency overlay managers—and are less frequently used by investment funds or corporations for hedging purposes.[31]

In general, the term "exotic" refers to all options that are not "vanilla." In FX, vanilla refers essentially to European-style put and call options. The full range of exotic options is both very broad and constantly evolving; many are extraordinarily complex both to price and even to understand. However, all exotics, no matter how complex, typically share one defining feature in common: They are designed to customize the risk exposures desired by the client and provide them at the lowest possible price.[32] Much like the trading strategies described previously, they usually involve some combination of lower downside protection and/or lower upside potential while providing the client with the specific risk exposures they are prepared to manage, and to do so at what is generally a lower cost than vanilla options.

The two most common type of exotic options encountered in foreign exchange markets are those with **knock-in/knock-out** features and digital options.

---

31 There are several reasons for this relatively light usage of "exotics" for hedging purposes, some related to the fact that many smaller entities lack familiarity with these products. Another reason involves the difficulty of getting hedge accounting treatment in many jurisdictions, which is more advantageous for financial reporting reasons. Finally, the specialized terms of such instruments make them difficult to value for regulatory and accounting purposes.

32 Although the price is low for the client compared with vanilla options, exotics are typically nonetheless high profit margin items for investment dealers.

An option with a knock-in feature is essentially a vanilla option that is created only when the spot exchange rate touches a pre-specified level (this trigger level, called the "barrier," is not the same as the strike price). Similarly a knock-out option is a vanilla option that ceases to exist when the spot exchange rate touches some pre-specified barrier level. Because these options only exist (i.e., get knocked-in or knocked-out) under certain circumstances, they are more restrictive than vanilla options and hence are cheaper. But again, the knock-in/out features provide less upside potential and/or downside protection.

Digital options are also called binary options, or all-or-nothing options. They are called this because they pay a *fixed* amount if they "touch" their exercise level at any time before expiry (even if by a single pip). This characteristic of "extreme payoff" options makes them almost akin to a lottery ticket. Because of these large payoffs, digital options usually cost more than vanilla options with the same strike price. But digitals also provide highly leveraged exposure to movements in the spot rate. This makes these exotic products more appropriate as trading tools for active currency management, rather than as hedging tools. In practice, digital options are typically used by more sophisticated speculative accounts in the FX market to express directional views on exchange rates.

A full exposition of exotic options is beyond the scope of this reading, but the reader should be aware of their existence and why they exist.

6.3.7 *Section Summary*

Clearly, loosening the constraint of a fully hedged portfolio begins to introduce complicated active currency management decisions. The following steps can be helpful to sort things out:

a First, identify the *base* currency in the P/B quote (currency pair) you are dealing with. Derivatives are typically quoted in terms of either buying or selling the *base* currency when the option is exercised. A move upward in the P/B quote is an appreciation of the base currency.

b Then, identify whether the base currency must be *bought* or *sold* to establish the hedge. These are the price movements you will be protecting against.

c If *buying* the base currency is required to implement the hedge, then the core hedge structure will be based on some combination of a long call option and/or a long forward contract. The cost of this core hedge can be reduced by buying an OTM call option or writing options to earn premiums. (But keep in mind, lower hedging costs equate to less downside protection and/or upside potential.)

d If *selling* the base currency is required to implement the hedge, then the core hedge structure will be based on some combination of a long put option and/or a short forward contract. The cost of this core hedge can be reduced by buying an OTM put option or writing options to earn premiums.

e The higher the allowed discretion for active management, the lower the risk aversion; and the firmer a particular market view is held, the more the hedge is likely to be structured to allow risk exposures in the portfolio. This approach involves positioning in derivatives that "lean the same way" as the market view. (For example, a market view that the base currency will depreciate would use some combination of short forward contracts, writing call options, buying put

options, and using "bearish" exotic strategies.) This directional bias to the trading position would be superimposed on the core hedge position described in steps "c" and "d," creating an active-trading "tilt" in the portfolio.

f For these active strategies, varying the strike prices and notional amounts of the options involved can move the trading position toward a zero-cost structure. But as with hedges, keep in mind that lower cost implies less downside protection and/or upside potential for the portfolio.

A lot of different hedging tools and strategies have been named and covered in this section. Rather than attempting to absorb all of them by rote memorization (a put spread is "X" and a seagull is "Y"), the reader is encouraged instead to focus on the intuition behind a hedge, and how and why it is constructed. It matters less what name (if any) is given to any specific approach; what is important is understanding how all the moving parts fit together. The reader should focus on a "building blocks" approach in understanding how and why the parts of the currency hedge are assembled in a given manner.

EXAMPLE 6

Alternative Hedging Strategies

Brixworth & St. Ives Asset Management, the UK-based investment firm, has hedged the exposure of its Aggressive Growth Fund to the MXN with a long position in a MXN/GBP forward contract. The fund's foreign-currency asset exposure to the ZAR is hedged by buying an ATM call option on the ZAR/GBP currency pair. The portfolio managers at Brixworth & St. Ives are looking at ways to modify the risk–reward trade-offs and net costs of their currency hedges.

Jasmine Khan, one of the analysts at Brixworth & St. Ives, proposes an option-based hedge structure for the long-ZAR exposure that would replace the hedge based on the ATM call option with either long or short positions in the following three options on ZAR/GBP:

a ATM put option

b 25-delta put option

c 25-delta call option

Khan argues that these three options can be combined into a hedge structure that will have some limited downside risk, but provide complete hedge protection starting at the relevant 25-delta strike level. The structure will also have unlimited upside potential, although this will not start until the ZAR/GBP exchange rate moves to the relevant 25-delta strike level. Finally, this structure can be created at a relatively low cost because it involves option writing.

1 The *best* method for Brixworth & St. Ives to gain some upside potential for the hedge on the Aggressive Growth Fund's MXN exposure using MXN/GBP options is to replace the forward contract with a:

- **A** long position in an OTM put.
- **B** short position in an ATM call.
- **C** long position in a 25-delta risk reversal.

2 While keeping the ATM call option in the ZAR/GBP, the method that would lead to *greatest* cost reduction on the hedge would be to:

- **A** buy a 25-delta put.
- **B** write a 10-delta call.

C write a 25-delta call.

3 Setting up Khan's proposed hedge structure would *most likely* involve being:

A long the 25-delta options and short the ATM option.

B long the 25-delta call, and short both the ATM and 25-delta put options.

C short the 25-delta call, and long both the ATM and 25-delta put options.

Solution to 1:

C is correct. The Aggressive Growth Fund has a long foreign-currency exposure to the MXN in its asset portfolio, which is hedged by selling the MXN against the GBP, or equivalently, buying the GBP—the base currency in the P/B quote—against the MXN. This need to protect against an *appreciation* in the GBP is why the hedge is using a *long* position in the forward contract. To set a collar around the MXN/GBP rate, Brixworth & St. Ives would want a long call option position with a strike greater than the current spot rate (this gives upside potential to the hedge) and a short put position with a strike less than the current spot rate (this reduces net cost of the hedge). A long call and a short put defines a long position in a risk reversal.

Choice A is incorrect because, if exercised, buying a put option would increase the fund's exposure to the MXN (sell GBP, buy MXN). Similarly, Choice B is incorrect because, if exercised, the ATM call option would increase the MXN exposure (the GBP is "called" away from the fund at the strike price with MXN delivered). Moreover, although writing the ATM call option would gain some income from premiums, writing options (on their own) is never considered the "best" hedge because the premium income earned is fixed but the potential losses on adverse currency moves are potentially unlimited.

Solution to 2:

C is correct. As before, the hedge is implemented in protecting against an *appreciation* of the base currency of the P/B quote, the GBP. The hedge is established with an ATM call option (a long position in the GBP). Writing an OTM call option (i.e., with a strike that is more than the current spot rate of 5.1050) establishes a call spread (although hedge protection is lost if ZAR/GBP expires at or above the strike level). Writing a 25-delta call earns more income from premiums than a deeper-OTM 10-delta call (although the 25-delta call has less hedge protection). Buying an option would increase the cost of the hedge, and a put option on the ZAR/GBP would increase the fund's ZAR exposure if exercised (the GBP is "put" to the counterparty at the strike price and ZAR received).

Solution to 3:

A is correct. Once again, the hedge is based on hedging the need to sell ZAR/buy GBP, and GBP is the base currency in the ZAR/GBP quote. This means the hedge needs to protect against an *appreciation* of the GBP (an appreciation of the ZAR/GBP rate). Based on Khan's description, the hedge provides protection after a certain loss point, which would be a long 25-delta call. Unlimited upside potential after favorable (i.e., down) moves in the ZAR/GBP past a certain level means a long 25-delta put. Getting the low net cost that Khan refers to means that the cost of these two long positions is financed by selling the ATM option. (Together these three positions define a long seagull spread). Choice B is incorrect because although the first two legs of the position are right, a short position in the put does not provide any unlimited upside potential (from a down-move in

ZAR/GBP). Choice C is incorrect because any option-based hedge, given the need to hedge against an up-move in the ZAR/GBP rate, is going to be based on a long call position. C does not contain any of these.

6.4 Hedging Multiple Foreign Currencies

We now expand our discussion to hedging a portfolio with multiple foreign-currency assets. The hedging tools and strategies are very similar to those discussed for hedging a single foreign-currency asset, except now the currency hedge must consider the *correlation* between the various foreign-currency risk exposures.

For example, consider the case of a US-domiciled investor who has exposures to foreign-currency assets in Australia and New Zealand. These two economies are roughly similar in that they are resource-based and closely tied to the regional economy of the Western Pacific, especially the large emerging markets in Asia. As a result, the movements in their currencies are often closely correlated; the USD/AUD and USD/NZD currency pairs will tend to move together. If the portfolio manager has the discretion to take short positions, the portfolio may (for example) possibly have a net long position in the Australian foreign-currency asset and a net short position in the New Zealand foreign-currency asset. In this case, there may be less need to hedge away the AUD and NZD currency exposures separately because the portfolio's long exposure to the AUD is diversified by the short position on the NZD.

6.4.1 *Cross Hedges and Macro Hedges*

A **cross hedge**—also referred to a **proxy hedge**—occurs when a position in one asset (or a derivative based on the asset) is used to hedge the risk exposures of a different asset (or a derivative based on it).[33] Normally, cross hedges are not needed because, as we mentioned earlier, forward contracts and other derivatives are widely available in almost every conceivable currency pair. However, if the portfolio already has "natural" cross hedges in the form of negatively correlated residual currency exposures—as in the long-AUD/short-NZD example in Section 6.4—this helps moderate portfolio risk ($\sigma[R_{DC}]$) without having to use a direct hedge on the currency exposure.

33 Sometimes a distinction is made between a "proxy" hedge and a "cross" hedge. When this distinction is made, a *proxy hed*ge removes the foreign currency risk by hedging it back to the investor's domestic currency—such as in the example with USD/AUD and USD/NZD discussed in the text. In contrast, a *cross hed*ge moves the currency risk from one foreign currency to another foreign currency. For example, a US-domiciled investor may have an exposure to both the Indonesian rupiah (IDR) and the Thai baht (THB), but based on a certain market view, may only want exposure to the THB. In this context, the manager might use currency derivatives as a cross hedge to convert the IDR/USD exposure to a THB/USD exposure. But not all market participants make this sharp of a distinction between proxy hedges and cross hedges, and these terms are often used interchangeably. The most common term found among practitioners in most asset classes is simply a cross hedge, as we are using the term here: hedging an exposure with a closely correlated product (i.e., a proxy hedge when this distinction is made). The cross hedge of moving currency exposures between various *foreign* currencies is more of a special-case application of this concept. In our example, a US investor wanting to shift currency exposures between the IDR and THB would only need to shift the relative size of the IDR/USD and THB/USD forward contracts *already* being used. As mentioned earlier, forwards are available on almost every currency pair, so a cross hedge from foreign currency "A" to foreign currency "B" would be a special case when derivatives on one of the currencies are not available.

EXAMPLE 7

Cross Hedges

Mai Nguyen works at Cape Henlopen Advisors, which runs a US-domiciled fund that invests in foreign-currency assets of Australia and New Zealand. The fund currently has equally weighted exposure to one-year Australian and New Zealand treasury bills (i.e., both of the portfolio weights, $\omega_i = 0.5$). Because the foreign-currency return on these treasury bill assets is risk-free and known in advance, their expected $\sigma(R_{FC})$ is equal to zero.

Nguyen wants to calculate the USD-denominated returns on this portfolio as well as the cross hedging effects of these investments. She collects the following information:

Expected Values	Australia	New Zealand
Foreign-currency asset return R_{FC}	4.0%	6.0%
Foreign-currency return R_{FX}	5.0%	5.0%
Asset risk $\sigma(R_{FC})$	0%	0%
Currency risk $\sigma(R_{FX})$	8.0%	10.0%
Correlation (USD/AUD; USD/NZD)	+0.85	

Using Equation 1, Nguyen calculates that the expected domestic-currency return for the Australian asset is

$$(1.04)(1.05) - 1 = 0.092$$

or 9.2%. Likewise, she determines that the expected domestic-currency return for the New Zealand asset is

$$(1.06)(1.05) - 1 = 0.113$$

or 11.3%. Together, the result is that the expected domestic-currency return (R_{DC}) on the equally weighted foreign-currency asset portfolio is the weighted average of these two individual country returns, or

$$R_{DC} = 0.5(9.2\%) + 0.5(11.3\%) = 10.3\%$$

Nguyen now turns her attention to calculating the portfolio's investment risk [$\sigma(R_{DC})$]. To calculate the expected risk for the domestic-currency return, the currency risk of R_{FX} needs to be multiplied by the *known* return on the treasury bills. The portfolio's investment risk, $\sigma(R_{DC})$, is found by calculating the standard deviation of the right-hand-side of:

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

Although R_{FX} is a random variable—it is not known in advance—the R_{FC} term is in fact known in advance because the asset return is risk-free. Because of this Nguyen can make use of the statistical rules that, first, $\sigma(kX) = k\sigma(X)$, where X is a random variable and k is a constant; and second, that the correlation between a random variable and a constant is zero. These results greatly simplify the calculations because, in this case, she does not need to consider the correlation between exchange rate movements and foreign-currency asset returns. Instead, Nguyen needs to calculate the risk only on the currency side. Applying these statistical rules to the above formula leads to the following results:

A The expected risk (i.e., standard deviation) of the domestic-currency return for the Australian asset is equal to (1.04) × 8% = 8.3%.

B The expected risk (i.e., standard deviation) of the domestic-currency return for the New Zealand asset is equal to (1.06) × 10% = 10.6%.

Adding all of these numerical values into Equation 4 leads Nguyen to calculate:

$$\sigma^2(R_{DC}) = (0.5)^2(8.3\%)^2 + (0.5)^2(10.6\%)^2 + [(2)0.5(8.3\%)0.5(10.6\%)0.85]$$
$$= 0.8\%$$

The standard deviation of this amount—that is, $\sigma(R_{DC})$—is 9.1%. Note that in the expression, all of the units are in percent, so for example, 8.3% is equivalent to 0.083 for calculation purposes. The careful reader may also note that Nguyen is able to use an exact expression for calculating the variance of the portfolio returns, rather than the approximate expressions shown in Equations 3 and 5. This is because, with risk-free foreign-currency assets, the variance of these foreign-currency returns $\sigma^2(R_{FC})$ is equal to zero.

Nguyen now considers an alternative scenario in which, instead of an equally weighted portfolio (where the $\omega_i = 0.5$), the fund has a long exposure to the New Zealand asset and a short exposure to the Australian asset (i.e., the ω_i are +1 and −1, respectively; this is similar to a highly leveraged carry trade position). Putting these weights into Equations 2 and 4 leads to

$$R_{DC} = -1.0(9.2\%) + 1.0(11.3\%) = 2.1\%$$

$$\sigma^2(R_{DC}) = (1.0)^2(8.3\%)^2 + (1.0)^2(10.6\%)^2 + [-2.0(8.3\%)(10.6\%)0.85]$$
$$= 0.3\%$$

The standard deviation—that is, $\sigma(R_{DC})$—is now 5.6%, less than either of the expected risks for foreign-currency asset returns (results A and B). Nguyen concludes that having long and short positions in positively correlated currencies can lead to much lower portfolio risk, through the benefits of cross hedging. (Nguyen goes on to calculate that if the expected correlation between USD/AUD and USD/NZD increases to 0.95, with all else equal, the expected domestic-currency return risk on the long–short portfolio drops to 3.8%.)

Some types of cross hedges are often referred to as macro hedges. The reason is because the hedge is more focused on the entire portfolio, particularly when individual asset price movements are highly correlated, rather than on individual assets or currency pairs. Another way of viewing a macro hedge is to see the portfolio not just as a collection of financial assets, but as a collection of risk exposures. These various risk exposures are typically defined in categories, such as term risk, credit risk, and liquidity risk. These risks can also be defined in terms of the potential financial scenarios the portfolio is exposed to, such as recession, financial sector stress, or inflation. Often macro hedges are defined in terms of the financial scenario they are designed to protect the portfolio from.

Putting gold in the portfolio sometimes serves this purpose by helping to provide broad portfolio protection against extreme market events. Using a volatility overlay program can also hedge the portfolio against such risks because financial stress is typically associated with a spike in exchange rates' implied volatility. Using a derivative product based on an index, rather than specific assets or currencies, can also define a macro hedge. One macro hedge specific to foreign exchange markets uses derivatives based on fixed-weight baskets of currencies (such derivatives are available in both exchange-traded and OTC form). In a multi-currency portfolio, it may not always be cost efficient to hedge each single currency separately, and in these situations a macro hedge using currency basket derivatives is an alternative approach.

6.4.2 *Minimum-Variance Hedge Ratio*

A mathematical approach to determining the optimal cross hedging ratio is known as the **minimum-variance hedge ratio**. Recall that regression analysis based on ordinary least squares (OLS) is used to minimize the variance of $\hat{\varepsilon}$, the residual between actual and fitted values of the regression

$$y_t = \alpha + \beta x_t + \varepsilon_t \text{ where } \hat{\varepsilon}_t = y_t - \left(\hat{\alpha} + \hat{\beta} x_t\right)$$

This same principle can be used to minimize the tracking error between the value of the hedged asset and the hedging instrument. In the regression formula, we substitute the percentage change in the value of the asset to be hedged for y_t, and the percentage change in value of the hedging instrument for x_t (both of these values are measured in terms of the investor's domestic currency). The calculated coefficient in this regression ($\hat{\beta}$) gives the optimal hedging ratio, which means it minimizes the variance of $\hat{\varepsilon}$ and minimizes the tracking error between changes in the value of the hedge and changes in the value of the asset it is hedging. It can be shown that the formula for the minimum-variance hedge ratio—the formula for calculating the $\hat{\beta}$ coefficient in the regression—is mathematically equal to:

$$\frac{\text{covariance } (y,x)}{\text{variance } (x)} = \text{correlation } (y,x) \times \left[\frac{\text{std. dev. } (y)}{\text{std. dev. } (x)}\right]$$

where y and x are defined as before, the change in the domestic-currency value of the asset and the hedge, respectively.

Calculating the minimum-variance hedge ratio typically applies only for "indirect" hedges based on cross hedging or macro hedges; it is not typically applied to a "direct" hedge in which exposure to a spot rate is hedged with a forward contract in that same currency pair. This is because the correlation between movements in the spot rate and its forward contract is likely to be very close to +1. Likewise, the variance in spot price movements and movements in the price of the forward contract are also likely to be approximately equal. Therefore, calculating the minimum-variance hedge ratio by regressing changes in the spot exchange rate against changes in the forward rate will almost always result is a $\hat{\beta}$ regression estimate very close to 1, and hence a minimum-variance hedge ratio close to 100%. So, undertaking the regression analysis is superfluous.

But the minimum-variance hedge ratio can be quite different from 100% when the hedge is *jointly* optimized over *both* exchange rate movements R_{FX} and changes in the foreign-currency value of the asset R_{FC}. A sidebar discusses this case.

There can also be cases when the optimal hedge ratio may not be 100% because of the market characteristics of a specific currency pair. For example, a currency pair may not have a (liquid) forward contract available and hence an alternative cross hedging instrument or a macro hedge must be used instead. We examine when such situations might come up in Section 7.

6.4.3 *Basis Risk*

The portfolio manager must be aware that any time a direct currency hedge (i.e., a spot rate hedged against its own forward contract) is replaced with an indirect hedge (cross hedge, macro hedge), **basis risk** is brought into the portfolio. This risk reflects the fact that the price movements in the exposure being hedged and the price movements in the cross hedge instrument are not perfectly correlated, and that the correlation will change with time—and sometimes both dramatically and unexpectedly. For a minimum-variance hedge ratio, this risk is expressed as instability in the $\hat{\beta}$ coefficient estimate as more data become available.

For an example of basis risk, return to the illustration earlier of the foreign-currency asset portfolio that cross hedged a long USD/AUD exposure with a short USD/NZD exposure. It is not only possible, but highly likely, that the correlation between movements in the USD/AUD and the USD/NZD spot rates will vary with time. This varying correlation would reflect movements in the NZD/AUD spot rate. Another example of basis risk would be that the correlation between a multi-currency portfolio's domestic-currency market value and the value of currency basket derivatives being used as a macro hedge will neither be perfect nor constant.

At a minimum, this means that all cross hedges and macro hedges will have to be carefully monitored and, as needed, rebalanced to account for the drift in correlations. It also means that minimum-variance hedge ratios will have to be re-estimated as more data become available. The portfolio manager should beware that sudden, unexpected spikes in basis risk can sometimes turn what was once a minimum-variance hedge or an effective cross hedge into a position that is highly correlated with the underlying assets being hedged—the opposite of a hedge.[34]

OPTIMAL MINIMUM-VARIANCE HEDGES

For simple foreign-currency asset portfolios, it may be possible to use the single-variable OLS regression technique to do a *joint* optimization of the hedge over both the foreign-currency value of the asset R_{FC} and the foreign-currency risk exposure R_{FX}. This approach will reduce the variance of the all-in domestic-currency return R_{DC}, which is the risk that matters most to the investor, not just reducing the variance of the foreign exchange risk R_{FX}.

Calculating the minimum-variance hedge for the foreign exchange risk R_{FX} proceeds by regressing changes in the spot rate against changes in the value of the hedging instrument (i.e., the forward contract). But as indicated in the text, performing this regression is typically unnecessary; for all intents and purposes, the minimum-variance hedge for a spot exchange rate using a forward contract will be close to 100%.

But when there is only a *single* foreign-currency asset involved, one can perform a joint optimization over both of the foreign-currency risks (i.e., both R_{FC} and R_{FX}) by regressing changes in the domestic-currency return (R_{DC}) against percentage changes in the value of the hedging instrument. Basing the optimal hedge ratio on the OLS estimate for β in this regression will minimize the variance of the domestic-currency return $\sigma^2(R_{DC})$. The result will be a better hedge ratio than just basing the regression on R_{FX} alone because this joint approach will also pick up any *correlations* between R_{FX} and R_{FC}. (Recall from Section 4.3.1 that the asset mix in the portfolio, and hence the correlations between R_{FX} and R_{FC}, can affect the optimal hedge ratio.) This single-variable OLS approach, however, will only work if there is a single foreign-currency asset in the portfolio.

Recent work (Campbell 2010) has shown that the optimal hedge ratio based jointly on movements in R_{FC} and R_{FX} for international *bond* portfolios is almost always close to 100%. However, the optimal hedge ratio for single-country foreign *equity* portfolios varies widely between currencies, and will depend on *both* the investor's domestic currency and the currency of the foreign investment. For example, the optimal hedge ratio for a US equity portfolio will be different for UK and eurozone-based investors; and for

34 Basis risk is also used in the context of forward and futures contracts because the price movements of these derivatives products do not always correspond exactly with those of the underlying currency. This is because the price of the forward contract also reflects the interest rate differential between the two countries in the currency pair as well as the term to contract maturity. But with futures and forwards, the derivatives price converges to the price of the underlying as maturity approaches, which is enforced by arbitrage. This convergence is not the case with cross hedges, which potentially can go disastrously wrong with sudden movements in market risk (price correlations), credit risk, or liquidity risk. We will also make passing reference to a term that one may sometimes come across in financial markets: a "Texas hedge." This is a derogatory term used to refer to a position that doubles-up an exposure rather than hedges it; it is the direct opposite of a hedge. For example, someone who buys both call options and their underlying may have put on a "Texas hedge."

eurozone investors, the optimal hedge ratio for a US equity portfolio can be different from that of a Canadian equity portfolio. The study found that the optimal hedge ratio for foreign equity exposures can vary widely from 100% between countries. But as the author cautions, these optimal hedge ratios are calculated on historical data that may not be representative of future price dynamics.

Minimum-Variance Hedge Ratio Example

Annie McYelland is an analyst at Scotland- based Kilmarnock Capital. Her firm is considering an investment in an equity index fund based on the Swiss Stock Market Index (SMI). The SMI is a market-cap weighted average of the twenty largest and most liquid Swiss companies, and captures about 85% of the overall market capitalization of the Swiss equity market.

McYelland is asked to formulate a currency-hedging strategy. Because this investment involves only one currency pair and one investment (the SMI), she decides to calculate the minimum-variance hedge ratio for the entire risk exposure, not just the currency exposure. McYelland collects 10 years of monthly data on the CHF/GBP spot exchange rate and movements in the Swiss Market Index.

McYelland notes that the GBP is the base currency in the CHF/GBP quote and that the formula for domestic-currency returns (R_{DC}) shown in Equation 1 requires that the domestic currency be the price currency. Accordingly, she starts by inverting the CHF/GBP quote to a GBP/CHF quote ($S_{GBP/CHF}$). Then she calculates the monthly percentage changes for this adjusted currency series ($\%\Delta S_{GBP/CHF}$) as well as for the SMI (%ΔSMI). This allows her to calculate the monthly returns of an unhedged investment in the SMI with these unhedged returns measured in the "domestic" currency, the GBP:

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

where R_{FC} = %ΔSMI and $R_{FX} = \%\Delta S_{GBP/CHF}$. Because McYelland wants to minimize the variance of these unhedged domestic-currency returns, she calculates the minimum-variance hedge ratio with the following OLS regression:

$$R_{DC} = \alpha + \beta(\%\Delta S_{GBP/CHF}) + \varepsilon$$

The calculated regression coefficients show that $\hat{\alpha} = -0.21$ and $\hat{\beta} = 1.35$. McYelland interprets these results to mean that the estimated $\hat{\beta}$-coefficient is the minimum-variance hedge ratio. This conclusion makes sense because $\hat{\beta}$ represents the sensitivity of the domestic-currency return on the portfolio to percentage changes in the spot rate. In this case, the return on the SMI seems very sensitive to the appreciation of the CHF. Indeed, over the 10 years of data she collected, McYelland notices that the correlation between %ΔSMI and $\%\Delta S_{GBP/CHF}$ is equal to +0.6.

On the basis of these calculations, she recommends that the minimum-variance hedge ratio for Kilmarnock Capital's exposure to the SMI be set at approximately 135%. This recommendation means that a *long* CHF1,000,000 exposure to the SMI should be hedged with a *short* position in CHF against the GBP of approximately CHF1,350,000. Because forward contracts in professional FX markets are quoted in terms of CHF/GBP for this currency pair, this would mean a *long* position in the forward contract ($F_{CHF/GBP}$)—that is, *selling* the CHF means *buying* the base currency GBP.

McYelland cautions the Investment Committee at Kilmarnock Capital that this minimum-variance hedge ratio is only approximate and must be closely monitored because it is estimated over historical data that may not be representative of future price dynamics. For example, the +0.6 correlation estimated between %ΔSMI and $\%\Delta S_{GBP/CHF}$ is the 10-year *average* correlation; future market conditions may not correspond to this historical average.[35]

35 Another reason why this hedge ratio would only be approximate is because it is based on the SMI, which is not a total-return index (i.e., including reinvested dividends). Additionally, some approaches to the minimum-variance hedge ratio incorporate the forward premium or discount in the calculation as well. Given the approximate nature of the minimum-variance hedge ratio to begin with, we ignore these other factors as second-order events.

6.5 Basic Intuitions for Using Currency Management Tools

This section has covered only some of the most common currency management tools and strategies used in FX markets—there are a great many other derivatives products and strategies that have not been covered. The key points are that there are *many* different hedging and active trading strategies, there are many possible *variations* within each of these strategies, and these strategies can be used in *combination* with each other. There is no need to cover all of what would be a very large number of possible permutations and combinations. Instead, we will close this section with a key thought: Each of these many approaches to either hedging or expressing a directional view on currency movements has its advantages and disadvantages, its risks, and its costs.

As a result, there is no single "correct" approach to initiating and managing currency exposures. Instead, at the strategic level, the IPS of the portfolio sets guidelines for risk exposures, permissible hedging tools, and strategies, which will vary among investors. At the tactical level, at which the portfolio manager has discretion on risk exposures, currency strategy will depend on the manager's management style, market view, and risk tolerance. It will also depend on the manager's perceptions of the relative costs and benefit of any given strategy. Market conditions will affect the cost/benefit calculations behind the hedging decision, as movements in forward points (expected roll yield) or exchange rate volatility (option premiums) affect the expected cost of the hedge; the same hedge structure can be "rich" or "cheap" depending on current market conditions.

Reflecting all of these considerations, different managers will likely make different decisions when confronted with the same opportunity set; and each manager will likely have a good reason for their individual decision. The most important point is that the portfolio manager be aware of all the benefits, costs, and risks of the chosen strategy and be comfortable that any remaining residual currency risks in the hedge are acceptable.

To summarize the key insights of Section 6—and continuing our example of a portfolio manager who is long the base currency in the P/B quote and wants to hedge that price risk—the manager needs to understand the following:

1. Because the portfolio has a *long* exposure to base currency, to neutralize this risk the hedge will attempt to build a *short* exposure out of that currency's derivatives using some combination of forward and/or option contracts.
2. A currency hedge is not a free good, particularly a complete hedge. The hedge cost, real or implied, will consist of some combination of lost upside potential, potentially negative roll yield (forward points at a discount or time decay on long option positions), and upfront payments of option premiums.
3. The cost of any given hedge structure will vary depending on market conditions (i.e., forward points and implied volatility).
4. The cost of the hedge is focused on its "core." For a manager with a long exposure to a currency, the cost of this "core" hedge will be the implicit costs of a short position in a forward contract (no upside potential, possible negative roll yield) or the upfront premium on a long position in a put option. Either of these two forms of insurance can be expensive. However, there are various cost mitigation methods that can be used alone or in combination to reduce these core hedging costs:
   - **a** Writing options to gain upfront premiums.
   - **b** Varying the strike prices of the options written or bought.
   - **c** Varying the notional amounts of the derivative contracts.
   - **d** Using various "exotic" features, such as knock-ins or knock-outs.

5 There is nothing inherently wrong with any of these cost mitigation approaches—but the manager *must* understand that these invariably involve some combination of reduced upside potential and/or reduced downside protection. A reduced cost (or even a zero-cost) hedge structure is perfectly acceptable, but only as long as the portfolio manager fully understands all of the residual risks in the hedge structure and is prepared to accept and manage them.

6 There are often "natural" hedges within the portfolio, in which some residual risk exposures are uncorrelated with each other and offer portfolio diversification effects. Cross hedges and macro hedges bring basis risk into the portfolio, which will have to be monitored and managed.

7 There is no single or "best" way to hedge currency risk. The portfolio manager will have to perform a due diligence examination of potential hedge structures and make a rational decision on a cost/benefit basis.

EXAMPLE 8

Hedging Strategies

Ireland-based Old Galway Capital runs several investment trusts for its clients. Fiona Doyle has just finished rebalancing the dynamic currency hedge for Overseas Investment Trust III, which has an IPS mandate to be fully hedged using forward contracts. Shortly after the rebalancing, Old Galway receives notice that one of its largest investors in the Overseas Investment Trust III has served notice of a large withdrawal from the fund.

Padma Bhattathiri works at Malabar Coast Capital, an India-based investment company. Her mandate is to seek out any alpha opportunities in global FX markets and aggressively manage these for speculative profit. The Reserve Bank of New Zealand (RBNZ) is New Zealand's central bank, and is scheduled to announce its policy rate decision within the week. The consensus forecast among economists is that the RBNZ will leave rates unchanged, but Bhattathiri believes that the RBNZ will surprise the markets with a rate hike.

Jasmine Khan, analyst at UK-based Brixworth & St. Ives Asset Management, has been instructed by the management team to reduce hedging costs for the firm's Aggressive Growth Fund, and that more currency exposure—both downside risk and upside potential—will have to be accepted and managed. Currently, the fund's ZAR-denominated foreign-currency asset exposures are being hedged with a 25-delta risk reversal (on the ZAR/GBP cross rate). The current ZAR/GBP spot rate is 13.1350.

Bao Zhang is a market analyst at South Korea–based Kwangju Capital, an investment firm that offers several actively managed investment trusts for its clients. She notices that the exchange rate for the Philippines Peso (PHP/USD) is increasing (PHP is depreciating) toward its 200-day moving average located in the 42.2500 area (the current spot rate is 42.2475). She mentions this to Akiko Takahashi, a portfolio manager for one of the firm's investment vehicles. Takahashi's view, based on studying economic fundamentals, is that the PHP/USD rate should continue to increase, but after speaking with Zhang she is less sure. After further conversation, Zhang and Takahashi come to the view that the PHP/USD spot rate will either break through the 42.2500 level and gain upward momentum through the 42.2600 level, or stall at the 42.2500 level and then drop down through the 42.2400 level as frustrated long positions exit the market. They decide that either scenario has equal probability over the next month.

Annie McYelland is an analyst at Scotland-based Kilmarnock Capital. The firm is considering a USD10,000,000 investment in an S&P 500 Index fund. McYelland is asked to calculate the minimum-variance hedge ratio. She collects the following statistics based on 10 years of monthly data:

$\sigma(\%\Delta_{SGBP/USD})$	$\sigma(R_{DC})$	$\rho(R_{DC};\%\Delta S_{GBP/USD})$
2.7%	4.4%	0.2

Source: Data are from Bloomberg.

1 Given the sudden liquidity need announced, Doyle's *best* course of action with regard to the currency hedge is to:
   - **A** do nothing.
   - **B** reduce the hedge ratio.
   - **C** over-hedge by using currency options.

2 Given her market view, Bhattathiri would *most likely* choose which of the following long positions?
   - **A** 5-delta put option on NZD/AUD
   - **B** 10-delta put option on USD/NZD
   - **C** Put spread on JPY/NZD using 10-delta and 25-delta options

3 Among the following, replacing the current risk reversal hedge with a long position in which of the following would *best* meet Khan's instructions? (All use the ZAR/GBP.)
   - **A** 10-delta risk reversal
   - **B** Put option with a 13.1300 strike
   - **C** Call option with a 13.1350 strike

4 Which of the following positions would *best* implement Zhang's and Takahashi's market view?
   - **A** Long a 42.2450 put and long a 42.2550 call
   - **B** Long a 42.2450 put and short a 42.2400 put
   - **C** Long a 42.2450 put and short a 42.2550 call

5 Which of the following positions would *best* implement Kilmarnock Capital's minimum-variance hedge?
   - **A** Long a USD/GBP forward contract with a notional size of USD1.2 million
   - **B** Long a USD/GBP forward contract with a notional size of USD3.3 million
   - **C** Short a USD/GBP forward contract with a notional size of USD2.0 million

Solution to 1:

A is correct. After rebalancing, the Overseas Investment Trust III is fully hedged; currency risk is at a minimum, which is desirable if liquidity needs have increased. Choices B and C are incorrect because they increase the currency risk exposures.

Solution to 2:

A is correct. The surprise rate hike should cause the NZD to appreciate against most currencies. This appreciation would mean a depreciation of the NZD/AUD rate, which a put option can profit from. A 5-delta option is deep-OTM, but the price reaction on the option premiums will be more extreme than a higher-delta option. That is to say, the *percentage* change in the premiums for a 5-delta option for a given percentage change in the spot exchange rate will be higher than the percentage change in premiums for a 25-delta option. In a sense, a very low delta option is like a highly leveraged lottery ticket on the event occurring. With a surprise rate hike, the odds would swing in Bhattathiri's favor. Choice B is incorrect because the price reaction in the USD/NZD spot rate after the surprise rate hike would likely cause the NZD to appreciate; so Bhattathiri would want a call option on the USD/NZD currency pair. Choice C is incorrect because an appreciation of the NZD after the surprise rate hike would best be captured by a call spread on the JPY/NZD rate, which will likely increase (the NZD is the base currency).

Solution to 3:

A is correct. Moving to a 10-delta risk reversal will be cheaper (these options are deeper-OTM than 25-delta options) and widen the bands in the corridor being created for the ZAR/GBP rate. Choice B is incorrect because a long put provides no protection against an upside movement in the ZAR/GBP rate, which Brixworth & St. Ives is trying to hedge (recall that the fund is long ZAR in its foreign-currency asset exposure and hence needs to sell ZAR/buy GBP to hedge). Also, if Brixworth & St. Ives exercises the option, they would "put" GBP to the counterparty at the strike price and receive ZAR in return. Although this option position may be considered profitable in its own right, it nonetheless causes the firm to double-up its ZAR exposure. Choice C is incorrect because although an ATM call option on ZAR/GBP will provide complete hedge protection, it will be expensive and clearly more expensive than the current 25-delta risk reversal.

Solution to 4:

A is correct. Zhang's and Takahashi's market view is that, over the next month, a move in PHP/USD to either 42.2400 or 42.2600 is equally likely. A strangle would express this view of heightened volatility but without a directional bias, and would require a long put and a long call positions. Choice B is incorrect because it is a put spread; it will profit by a move in PHP/USD between 42.2450 and 42.2400. If it moves below 42.2400 the short put gets exercised by the counterparty and neutralizes the long put. Although less costly than an outright long put position, this structure is not positioned to profit from a move higher in PHP/USD. Choice C is incorrect because it is a short risk reversal position. It provides relatively cheap protection for a down-move in PHP/USD but is not positioned to profit from an up-move in PHP/USD.

Solution to 5:

B is correct. The formula for the minimum-variance hedge ratio (h) is:

$$h = \rho\left(R_{DC};R_{FX}\right) \times \left[\frac{\sigma\left(R_{DC}\right)}{\sigma\left(R_{FX}\right)}\right]$$

After inputting the data from the table, this equation solves to 0.33. This means that for a USD10 million investment in the S&P 500 (long position), Kilmarnock Capital would want to be *short* approximately USD3.3 million in a forward contract. Because the standard market quote for this currency pair is USD/GBP, to be short the USD means one would have to buy the GBP; that is, a

long position in a USD/GBP forward contract. Choice A is incorrect because it inverts the ratio in the formula. Choice C is incorrect because it shows a short position in the USD/GBP forward, and because it only uses the correlation to set the contract size.

7 CURRENCY MANAGEMENT FOR EMERGING MARKET CURRENCIES

Most of the material in this reading has focused on what might be described as the major currencies, such as the EUR, GBP, or JPY. This focus is not a coincidence: The vast majority of daily flow in global FX markets is accounted for by the top half dozen currencies. Moreover, the vast majority of investable assets globally, as measured by market capitalization, are denominated in the major currencies. Nonetheless, more investors are looking at emerging markets, as well as "frontier markets," for potential investment opportunities. And many developing economies are beginning to emerge as major forces in the global economy. In the following sections, we survey the challenges for currency management and the use of non-deliverable forwards as one tool to address them.

7.1 Special Considerations in Managing Emerging Market Currency Exposures

Managing emerging market currency exposure involves unique challenges. Perhaps the two most important considerations are (1) higher trading costs than the major currencies under "normal" market conditions, and (2) the increased likelihood of extreme market events and severe illiquidity under stressed market conditions.

Many emerging market currencies are thinly traded, causing higher transaction costs (bid–offer spreads). There may also be fewer derivatives products to choose from, especially exchange-traded products. Although many global investment banks will quote spot rates and OTC derivatives for almost any conceivable currency pair, many of these are often seen as "specialty" products and often come with relatively high mark-ups. This mark-up increases trading and hedging costs. (In addition, the underlying foreign-currency asset in emerging markets can be illiquid and lack the full array of derivatives products.)

These higher currency trading costs would especially be the case for "crosses" in these currency pairs. For example, there is no reason why an investor in Chile (which uses the Chilean peso, currency code CLP) could not have an investment in assets denominated in the Thai baht (THB). But the CLP/THB cross is likely to be very thinly traded; there simply are not enough trade or capital flows between these two countries. Typically, any trade between these two currencies would go through a major intermediary currency, usually the USD. Hence, the trade would be broken into two legs: a trade in the CLP/USD pair and another in the THB/USD pair. These trades might go through different traders or trading desks at the same bank; or perhaps one leg of the trade would be done at one bank and the other leg through a different bank. There may also be time zone issues affecting liquidity; one leg of the trade may be relatively liquid at the same time as the other leg of the trade may be more thinly traded. The

reason is because liquidity in most emerging market currencies is typically deepest in their domestic time zones. In any event, there are two bid–offer spreads—one for each leg of the trade—to be covered.[36]

The liquidity issue is especially important when trades in these less-liquid currencies get "crowded," for example, through an excessive build-up of carry trades or through a fad-like popularity among investors for investing in a particular region or trading theme. Trades can be much easier to gradually enter into than to quickly exit, particularly under stressed market conditions. For example, after a long period of slow build-up, carry trades into these currencies can occasionally be subject to panicked unwinds as market conditions suddenly turn. This situation typically causes market liquidity to evaporate and leaves traders locked into positions that continue to accumulate losses.

The investment return probability distributions for currency (and other) trades subject to such relatively frequent extreme events have fatter tails than the normal distribution as well as a pronounced negative skew.[37] Risk measurement and control tools (such as value at risk, or VaR) that depend on normal distributions can be misleading under these circumstances and greatly understate the risks the portfolio is actually exposed to. Many investment performance measures are also based on the normal distribution. Historical investment performance measured by such indexes as the Sharpe ratio can look very attractive during times of relative tranquility; but this seeming outperformance can disappear into deep losses faster than most investors can react (investors typically do a poor job of timing crises). As mentioned in the prior section on volatility trading, price volatility in financial markets is very cyclical and implied volatility can be subject to sharp spikes. These volatility spikes can severely affect both option prices and hedging strategies based on options.[38] Even if the initial option protection is in place, it will eventually have to be rolled as options expire—but then at much higher prices for the option buyer.

The occurrence of currency crises can also affect hedging strategies based on forward contracts. Recall that hedging a long exposure to a foreign currency typically involves selling the foreign currency forward. However, when currencies are under severe downward pressure, central banks often react by hiking the policy rate to support the domestic currency. But recall that the higher interest rates go in a country, then, all else equal, the deeper the forward discount for its currency (enforced by the arbitrage conditions of covered interest rate parity). Having to sell the currency forward at increasingly deep discounts will cause losses through negative roll yield and undermine the cost effectiveness of the hedging program.

Extreme price movements in financial markets can also undermine many hedging strategies based on presumed diversification. Crises not only affect the volatility in asset prices but also their correlations, primarily through "contagion" effects. The recent history of financial markets (circa 2012) has been characterized by a "risk-on, risk-off" environment dominated by swings in investor sentiment between speculative enthusiasm and pronounced flight-to-safety flows. In the process, there is often little differentiation between individual currencies, which tend to get traded together in broader baskets (such as "haven currencies"—USD, JPY, and CHF—and "commodity currencies"—AUD, NZD, and ZAR). Investors who may have believed that they had diversified their portfolio through a broad array of exposures in emerging markets

36 This is often the case for many of the cross rate currency pairs among developed market currencies as well. However, the bid–offer spreads are usually tighter for the major currency pairs.

37 Relatively frequent at least compared with that contained in the tails of a normal distributions whose variance is estimated over recent historical data. One is struck by how often "once in a lifetime" events seem to have occurred in the past 20 years.

38 Option pricing models are based on some underlying process of price diffusion for the underlying. In simple option pricing models, this diffusion process is usually assumed to be relatively "smooth." It is more difficult to model option pricing when there are extreme events in the price diffusion process.

may find instead in crises that they doubled-up their currency exposures. (Likewise, there can be correlated and extreme movements in the underlying assets of these foreign-currency exposures.)

Another potential factor affecting currency management in these "exotic" markets is government involvement in setting the exchange rate through such measures as foreign exchange market intervention, capital controls, and pegged (or at least tightly managed) exchange rates. These measures too can lead to occasional extreme events in markets; for example, when central banks intervene or when currency pegs change or get broken. Short-term stability in these government-influenced markets can lull traders into a false sense of overconfidence and over-positioning. When currency pegs break, the break can happen quickly. Assuming that investment returns will be normally distributed according to parameters estimated on recent historical data, or that correlation factors and liquidity will not change suddenly, can be lethal.

It bears noting that currency crises and government involvement in FX markets is not limited to emerging market currencies, but often occur among the major currencies as well. The central banks of major currencies will, on occasion, intervene in their own currencies or use other polices (such as sharp movements in policy rates) to influence exchange rate levels. These too can lead to extreme events in currency markets.

7.2 Non-Deliverable Forwards

Currencies of many emerging market countries trade with some form of capital controls. Where capital controls exist and delivery in the controlled currency is limited by the local government, it is often possible to use what are known as **non-deliverable forwards** (NDFs). These are similar to regular forward contracts, but they are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received). The non-controlled currency for NDFs is usually the USD or some other major currency. A partial list of some of the most important currencies with NDFs would include the Chinese yuan (CNY), Korean won (KRW), Russian ruble (RUB), Indian rupee (INR), and Brazilian real (BRL). The NDF is essentially a cash-settled "bet" on the movement in the spot rate of these currencies.

For example, a trader could enter into a long position in a three-month NDF for the BRL/USD. Note that the BRL—the currency with capital controls—is the price currency and the base currency, the USD, is the currency that settlement of the NDF will be made in. Assume that the current all-in rate for the NDF is 2.0280 and the trader uses an NDF with a notional size of USD1,000,000. Suppose that three months later the BRL/USD spot rate is 2.0300 and the trader closes out the existing NDF contract with an equal and offsetting spot transaction at this rate. Settlement proceeds by noting that the USD amounts net to zero (USD1,000,000 both bought and sold on settlement date), so the net cash flow generated would normally be in BRL if this was an ordinary forward contract. The net cash flow to the long position in this case would be calculated as

$$(2.0300 - 2.0280) \times 1{,}000{,}000 = \text{BRL}2{,}000$$

But with an NDF, there is no delivery in the controlled currency (hence the name *non-deliverable* forward). Settlement must be in USD, so this BRL amount is converted to USD at the then-current spot rate of 2.0300. This leads to a USD cash inflow for the long position in the NDF of

$$\text{BRL}2{,}000 \div 2.0300 \text{ BRL/USD} = \text{USD}985.22$$

The credit risk of an NDF is typically lower than for the outright forward because the principal sums in the NDF do not move, unlike with an outright "vanilla" forward contract. For example, in the illustration the cash pay-off to the "bet" was the relatively small amount of USD985.22—there was no delivery of USD1,000,000 against receipt of BRL2,028,000. Conversely, as noted previously, NDFs exist because of some form of government involvement in foreign exchange markets. Sudden changes in government policy can lead to sharp movements in spot and NDF rates, often reversing any investment gains earned during long periods of seeming (but artificial) market calm. The implicit market risk of the NDF embodies an element of "tail risk."

Finally, we note that when capital controls exist, the free cross-border flow of capital that enforces the arbitrage condition underlying covered interest rate parity no longer functions consistently. Therefore, the pricing on NDFs need not be exactly in accord with the covered interest rate parity theorem. Instead, NDF pricing will reflect the individual supply and demand conditions (and risk premia) in the offshore market, which need not be the same as the onshore market of the specific emerging market country. Some of the most active participants in the NDF market are offshore hedge funds and proprietary traders making directional bets on the emerging market currency, rather than corporate or institutional portfolio managers hedging currency exposures. Volatility in the net speculative demand for emerging market exposure can affect the level of forward points. We also note that the type and strictness of capital controls can vary among emerging markets; hence, the need for knowledge of local market regulations is another factor influencing currency risk management in these markets.

SUMMARY

In this reading, we have examined the basic principles of managing foreign exchange risk within the broader investment process. International financial markets create a wide range of opportunities for investors, but they also create the need to recognize, measure, and control exchange rate risk. The management of this risk starts with setting the overall mandate for the portfolio, encoding the investors' investment objectives and constraints into the investment policy statement and providing strategic guidance on how currency risk will be managed in the portfolio. It extends to tactical positioning when portfolio managers translate market views into specific trading strategies within the overall risk management guidelines set by the IPS. We have examined some of these trading strategies, and how a range of portfolio management tools—positions in spot, forward, option, and FX swap contracts—can be used either to hedge away currency risk, or to express a market opinion on future exchange rate movements.

What we have emphasized throughout this reading is that there is no simple or single answer for the "best" currency management strategies. Different investors will have different strategic mandates (IPS), and different portfolio managers will have different market opinions and risk tolerances. There is a near-infinite number of possible currency trading strategies, each with its own benefits, costs, and risks. Currency risk management—both at the strategic and tactical levels—means having to manage the trade-offs between all of these various considerations.

Some of the main points covered in this reading are as follows:

- In professional FX markets, currencies are identified by standard three-letter codes, and quoted in terms of a price and a base currency (P/B).

- The spot exchange rate is typically for $T + 2$ delivery, and forward rates are for delivery for later periods. Both spot and forward rates are quoted in terms of a bid–offer price. Forward rates are quoted in terms of the spot rate plus forward points.
- An FX swap is a simultaneous spot and forward transaction; one leg of the swap is buying the base currency and the other is selling it. FX swaps are used to renew outstanding forward contracts once they mature, to "roll them forward."
- The domestic-currency return on foreign-currency assets can be broken into the foreign-currency asset return and the return on the foreign currency (the percentage appreciation or depreciation of the foreign currency against the domestic currency). These two components of the domestic-currency return are multiplicative.
- When there are several foreign-currency assets, the portfolio domestic-currency return is the weighted average of the individual domestic-currency returns (i.e., using the portfolio weights, which should sum to one)
- The risk of domestic-currency returns (its standard deviation) can be approximated by using a variance formula that recognizes the individual variances and covariances (correlations) among the foreign-currency asset returns and exchange rate movements.
- The calculation of the domestic-currency risk involves a large number of variables that must be estimated: the risks and correlations between all of the foreign-currency asset returns and their exchange rate risks.
- Guidance on where to target the portfolio along the risk spectrum is part of the IPS, which makes this a *strategic* decision based on the investment goals and constraints of the beneficial owners of the portfolio.
- If the IPS allows currency risk in the portfolio, the amount of desired currency exposure will depend on both portfolio diversification considerations and cost considerations.
  - Views on the diversifying effects of foreign-currency exposures depend on the time horizon involved, the type of foreign-currency asset, and market conditions.
  - Cost considerations also affect the hedging decision. Hedging is not free: It has both direct transactional costs as well as opportunity costs (the potential for favorable outcomes is foregone). Cost considerations make a perfect hedge difficult to maintain.
- Currency management strategies can be located along a spectrum stretching from:
  - passive, rules-based, complete hedging of currency exposures;
  - discretionary hedging, which allows the portfolio manager some latitude on managing currency exposures;
  - active currency management, which seeks out currency risk in order to manage it for profit; and to
  - currency overlay programs that aggressively manage currency "alpha."
- There are a variety of methods for forming market views.
  - The use of macroeconomic fundamentals to predict future currency movements is based on estimating the "fair value" for a currency with the expectation that spot rates will eventually converge on this equilibrium value.

- Technical market indicators assume that, based on market psychology, historical price patterns in the data have a tendency to repeat. Technical indicators can be used to predict support and resistance levels in the market, as well as to confirm market trends and turning points.
- The carry trade is based on violations of uncovered interest rate parity, and is also based on selling low-yield currencies in order to invest in high-yield currencies. This approach is equivalent to trading the forward rate bias, which means selling currencies trading at a forward premium and buying currencies trading at a forward discount.
- Volatility trading uses the option market to express views on the distribution of future exchange rates, not their levels.

- Passive hedging will typically use forward contracts (rather than futures contracts) because they are more flexible. However, currency futures contracts are an option for smaller trading sizes and are frequently used in private wealth management.
- Forward contracts have the possibility of negative roll yield (the forward points embedded in the forward price can work for or against the hedge). The portfolio manager will have to balance the advantages and costs of hedging with forward contracts.
- Foreign-currency options can reduce opportunity costs (they allow the upside potential for favorable foreign-currency movements). However, the upfront option premiums must be paid.
- There are a variety of means to reduce the cost of the hedging with either forward or option contracts, but these cost-reduction measures always involve some combination of less downside protection and/or less upside potential.
- Hedging multiple foreign currencies uses the same tools and strategies used in hedging a single foreign-currency exposure; except now the correlation between residual currency exposures in the portfolio should be considered.
- Cross hedges introduce basis risk into the portfolio, which is the risk that the correlation between exposure and its cross hedging instrument may change in unexpected ways. Forward contracts typically have very little basis risk compared with movements in the underlying spot rate.
- The number of trading strategies that can be used, for hedging or speculative purposes, either for a single foreign currency or multiple foreign currencies, is near infinite. The manager must assess the costs, benefits, and risks of each in the context of the investment goals and constraints of the portfolio. There is no single “correct” approach.

REFERENCES

Bank for International Settlements. 2013. "Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity."

Campbell, John Y. 2010. "Global Currency Hedging: What Role Should Foreign Currency Play in a Diversified Investment Portfolio?" *CFA Institute Conference Proceedings Quarterly*, vol. 27, no. 4 (December):8–18.

Campbell, John Y., Karine Serfaty-de Medeiros, and Luis. M. Viceira. 2007. "Global Currency Hedging," NBER Working Paper 13088 (May).

Darnell, R. Max. 2004. "Currency Strategies to Enhance Returns." In *Fixed-Income Tools for Enhancing Return and Meeting Client Objectives*. Charlottesville, VA: Association for Investment Management and Research.

Froot, Kenneth A. 1993. "Currency Hedging Over Long Horizons." NBER Working Paper 4355 (April): www.people.hbs.edu/kfroot/oldwebsite/cvpaperlinks/currency_hedging.pdf.

Hnatkovska, Viktoria, and Martin Evans. 2005. "International Capital Flows in a World of Greater Financial Integration." NBER Working Paper 11701 (October).

Kritzman, Mark P. 1999. "The Forward-Rate Bias." In *Currency Risk in Investment Portfolios*. Charlottesville, VA: Association for Investment Management and Research.

Martini, Giulio. 2010. "The Continuum from Passive to Active Currency Management." *CFA Institute Conference Proceedings Quarterly*, vol. 27, no. 1 (March):1–11.

Michenaud, Sébastien, and Bruno Solnik. 2008. "Applying Regret Theory to Investment Choices: Currency Hedging Decisions." (https://studies2.hec.fr/jahia/webdav/site/hec/shared/sites/solnik/acces_anonyme/2008/Currency-Regret-FULL.pdf).

Rosenberg, Michael R. 2002. *Deutsche Bank Guide to Exchange-Rate Determination*. London: Irwin Professional Publishing (May).

Rosenberg, Michael R., and William A. Barker. 2012. "Currency Exchange Rates: Determination and Forecasting." CFA Program Curriculum, Level II.

Sine, Barry M., and Robert A. Strong. 2012. "Technical Analysis." CFA Program Curriculum, Level I. US Department of the Treasury. 2007. "Semiannual Report on International Economic and Exchange Rate Policies, Appendix I." (December).

PRACTICE PROBLEMS

The following information relates to Questions 1–9

Kamala Gupta, a currency management consultant, is hired to evaluate the performance of two portfolios. Portfolio A and Portfolio B are managed in the United States and performance is measured in terms of the US dollar (USD). Portfolio A consists of British pound (GBP) denominated bonds and Portfolio B holds euro (EUR) denominated bonds.

Gupta calculates a 19.5% domestic-currency return for Portfolio A and 0% domestic-currency return for Portfolio B.

1 **Analyze** the movement of the USD against the foreign currency for Portfolio A. **Justify** your choice.

Template for Question 1

Asset	Foreign-Currency Portfolio Return	USD Relative to Foreign-Currency (circle one)
Portfolio A	15%	appreciated depreciated

Justification

2 **Analyze** the foreign-currency return for Portfolio B. **Justify** your choice.

Template for Question 2

Asset	Percentage Movement in the Spot Exchange Rate	Foreign-Currency Portfolio Return (circle one)
Portfolio B	EUR appreciated 5% against the USD	positive negative

(continued)

© 2013 CFA Institute. All rights reserved.

(Continued)

Justification

The fund manager of Portfolio B is evaluating an internally-managed 100% foreign-currency hedged strategy.

3 **Discuss** *two* forms of trading costs associated with this currency management strategy.

Gupta tells the fund manager of Portfolio B:

> "We need to seriously consider the potential costs associated with favorable currency rate movements, given that a 100% hedge-ratio strategy is being applied to this portfolio."

4 **Explain** Gupta's statement in light of the strategic choices in currency management available to the portfolio manager.

The investment policy statement (IPS) for Portfolio A provides the manager with discretionary authority to take directional views on future currency movements. The fund manager believes the foreign currency assets of the portfolio could be fully hedged internally. However, the manager also believes existing firm personnel lack the expertise to actively manage foreign-currency movements to generate currency alpha.

5 **Recommend** a solution that will provide the fund manager the opportunity to earn currency alpha through active foreign exchange management.

Gupta and the fund manager of Portfolio A discuss the differences among several active currency management methods.

6 **Evaluate** each statement independently and select the active currency approach it *best* describes. **Justify** each choice.

Template for Question 6

Gupta's Statements	Active Currency Approach (circle one)	Justification
"Many traders believe that it is not necessary to examine factors like the current account deficit, inflation, and interest rates because current exchange rates already reflect the market view on how these factors will affect future exchange rates."	carry trade technical analysis economic fundamental	
"The six-month interest rate in India is 8% compared to 1% in the United States. This presents a yield pick-up opportunity."	carry trade technical analysis economic fundamental	
"The currency overlay manager will estimate the fair value of the currencies with the expectation that observed spot rates will converge to long-run equilibrium values described by parity conditions."	carry trade technical analysis economic fundamental	

The following information is used for Question 7

Gupta interviews a currency overlay manager on behalf of Portfolio A. The foreign currency overlay manager describes volatility-based trading, compares volatility-based trading strategies and explains how the firm uses currency options to establish positions in the foreign exchange market. The overlay manager states:

Statement 1 "Given the current stability in financial markets, several traders at our firm take advantage of the fact that most options expire out-of-the money and therefore are net-short volatility."

Statement 2 "Traders that want to minimize the impact of unanticipated price volatility are net-long volatility."

7 **Compare** Statement 1 and Statement 2 and **identify** which *best* explains the view of a speculative volatility trader and which best explains the view of a hedger of volatility. **Justify** your response.

The following information is used for Questions 8 and 9

The fund manager of Portfolio B believes that setting up a full currency hedge requires a simple matching of the *current* market value of the foreign-currency exposure in the portfolio with an equal and offsetting position in a forward contract.

8 **Explain** how the hedge, as described by the fund manager, will eventually expose the portfolio to currency risk.

9 **Recommend** an alternative hedging strategy that will keep the hedge ratio close to the target hedge ratio. **Identify** the main disadvantage of implementing such a strategy.

The following information relates to Questions 10–15

Guten Investments GmbH, based in Germany and using the EUR as its reporting currency, is an asset management firm providing investment services for local high net worth and institutional investors seeking international exposures. The firm invests in the Swiss, UK, and US markets, after conducting fundamental research in order to select individual investments. Exhibit 1 presents recent information for exchange rates in these foreign markets.

Exhibit 1 Exchange Rate Data

	One Year Ago	Today
Euro-dollar (USD/EUR)*	1.2730	1.2950
Euro-sterling (GBP/EUR)	0.7945	0.8050
Euro-Swiss (CHF/EUR)	1.2175	1.2080

* The amount of USD required to buy one EUR

In prior years, the correlation between movements in the foreign-currency asset returns for the USD-denominated assets and movements in the exchange rate was estimated to be +0.50. After analyzing global financial markets, Konstanze Ostermann, a portfolio manager at Guten Investments, now expects that this correlation will increase to +0.80, although her forecast for foreign-currency asset returns is unchanged.

Ostermann believes that currency markets are efficient and hence that long-run gains cannot be achieved from active currency management, especially after netting out management and transaction costs. She uses this philosophy to guide hedging decisions for her discretionary accounts, unless instructed otherwise by the client.

Ostermann is aware, however, that some investors hold an alternative view on the merits of active currency management. Accordingly, their portfolios have different investment guidelines. For these accounts, Guten Investments employs a currency specialist firm, Umlauf Management, to provide currency overlay programs specific to each client's investment objectives. For most hedging strategies, Umlauf Management develops a market view based on underlying fundamentals in exchange rates. However, when directed by clients, Umlauf Management uses options and a variety of trading strategies to unbundle all of the various risk factors (the "Greeks") and trade them separately.

Ostermann conducts an annual review for three of her clients and gathers the summary information presented in Exhibit 2.

Exhibit 2 Select Clients at Guten Investments

Client	Currency Management Objectives
Adele Kastner – A high net worth individual with a low risk tolerance.	Keep the portfolio's currency exposures close, if not equal to, the benchmark so that the domestic-currency return is equal to the foreign-currency return.
Braunt Pensionskasse – A large private-company pension fund with a moderate risk tolerance.	Limited discretion which allows the actual portfolio currency risk exposures to vary plus-or-minus 5% from the neutral position.
Franz Trading GmbH – An exporting company with a high risk tolerance.	Discretion with respect to currency exposure is allowed in order to add alpha to the portfolio.

10 Based on Exhibit 1, the domestic-currency return over the last year (measured in EUR terms) was *higher* than the foreign-currency return for:

A USD-denominated assets.

B GBP-denominated assets.

C CHF-denominated assets.

11 Based on Ostermann's correlation forecast, the expected domestic-currency return (measured in EUR terms) on USD-denominated assets will *most* likely:

A increase.

B decrease.

C remain unchanged.

12 Based on Ostermann's views regarding active currency management, the percentage of currency exposure in her discretionary accounts that is hedged is *most likely:*

A 0%.

B 50%.

C 100%.

13 The active currency management approach that Umlauf Management is *least* likely to employ is based on:

A volatility trading.

B technical analysis.

C economic fundamentals.

14 Based on Exhibit 2, the currency overlay program *most* appropriate for Braunt Pensionskasse would:

A be fully passive.

B allow limited directional views.

C actively manage foreign exchange as an asset class.

15 Based on Exhibit 2, the client *most likely* to benefit from the introduction of an additional overlay manager is:

A Adele Kastner.

B Braunt Pensionskasse.

C Franz Trading GmbH.

The following information relates to Questions 16–19

Li Jiang is an international economist operating a subscription website through which she offers financial advice on currency issues to retail investors. One morning she receives four subscriber e-mails seeking guidance.

Subscriber 1	"As a French national now working in the United States, I hold US dollar-denominated assets currently valued at USD 700,000. The USD/EUR exchange rate has been quite volatile and now appears oversold based on historical price trends. With my American job ending soon, I will return to Europe. I want to protect the value of my USD holdings, measured in EUR terms, before I repatriate these funds back to France. To reduce my currency exposure I am going to use currency futures contracts. Can you explain the factors most relevant to implementing this strategy?"
Subscriber 2	"I have observed that many of the overseas markets for Korean export goods are slowing, while the United States is experiencing a rise in exports. Both trends can combine to possibly affect the value of the won (KRW) relative to the US dollar. As a result, I am considering a speculative currency trade on the KRW/USD exchange rate. I also expect the volatility in this exchange rate to increase."
Subscriber 3	"India has relatively high interest rates compared to the United States and my market view is that this situation is likely to persist. As a retail investor actively trading currencies, I am considering borrowing in USD and converting to the Indian rupee (INR). I then intend to invest these funds in INR-denominated bonds, but without using a currency hedge."
Subscriber 4	"I was wondering if trading in emerging market currencies provides the more opportunities for superior returns through active management than trading in Developed Market currencies."

16 For Subscriber 1, the *most* significant factor to consider would be:

A margin requirements.

B transaction costs of using futures contracts.

C different quoting conventions for future contracts.

17 For Subscriber 2, and assuming all of the choices relate to the KRW/USD exchange rate, the *best* way to implement the trading strategy would be to:

A write a straddle.

B buy a put option.

C use a long NDF position.

18 Which of the following market developments would be *most* favorable for Subscriber 3's trading plan?

A A narrower interest rate differential.

B A higher forward premium for INR/USD.

C Higher volatility in INR/USD spot rate movements.

19 Jiang's *best* response to Subscriber 4 would be that active trading in trading in emerging market currencies:

A typically leads to return distributions that are positively skewed.

B should not lead to higher returns because FX markets are efficient.

C often leads to higher returns through carry trades, but comes with higher risks and trading costs.

The following information relates to Questions 20–23

Rika Björk runs the currency overlay program at a large Scandinavian investment fund, which uses the Swedish krona (SEK) as its reporting currency. She is managing the fund's exposure to GBP-denominated assets, which are currently hedged with a GBP 100,000,000 forward contract (on the SEK/GBP cross rate, which is currently at 10.6875 spot). The maturity for the forward contract is December 1, which is still several months away. However, since the contract was initiated the value of the fund's assets has declined by GBP 7,000,000. As a result, Björk wants to rebalance the hedge immediately.

Next Björk turns her attention to the fund's Swiss franc (CHF) exposures. In order to maintain some profit potential Björk wants to hedge the exposure using a currency option, but at the same time, she wants to reduce hedging costs. She believes that there is limited upside for the SEK/CHF cross rate.

Björk then examines the fund's EUR-denominated exposures. Due to recent monetary tightening by the Riksbank (the Swedish central bank) forward points for the SEK/EUR rate have swung to a premium. The fund's EUR-denominated exposures are hedged with forward contracts.

Finally Björk turns her attention to the fund's currency exposures in several emerging markets. The fund has large positions in several Latin American bond markets, but Björk does not feel that there is sufficient liquidity in the related foreign exchange derivatives to easily hedge the fund's Latin American bond markets exposures. However, the exchange rates for these countries, measured against the SEK, are correlated with

the MXN/SEK exchange rate. (The MXN is the Mexican peso, which is considered to be among the most liquid Latin American currencies). Björk considers using forward positions in the MXN to cross-hedge the fund's Latin American currency exposures.

20 To rebalance the SEK/GBP hedge, and assuming all instruments are based on SEK/GBP, Björk would buy:

A GBP 7,000,000 spot.

B GBP 7,000,000 forward to December 1.

C SEK 74,812,500 forward to December 1.

21 Given her investment goals and market view, and assuming all options are based on SEK/CHF, the *best* strategy for Björk to manage the fund's CHF exposure would be to buy an:

A ATM call option.

B ITM call option and write an OTM call option.

C OTM put option and write an OTM call option.

22 Given the recent movement in the forward premium for the SEK/EUR rate, Björk can expect that the hedge will experience higher:

A basis risk.

B roll yield.

C premia income.

23 The *most* important risk to Björk's Latin American currency hedge would be changes in:

A forward points.

B exchange rate volatility.

C cross-currency correlations.

The following information relates to Question 24

Kalila Al-Khalili has been hired as a consultant to a Middle Eastern sovereign wealth fund. The fund's oversight committee has asked her to examine the fund's financial characteristics and recommend an appropriate currency management strategy given the fund's Investment Policy Statement. After a thorough study of the fund and its finances, Al-Khalili reaches the following conclusions:

- The fund's mandate is focused on the long-term development of the country, and the royal family (who are very influential on the fund's oversight committee) are prepared to take a long-term perspective on the fund's investments.
- The fund's strategic asset allocation is tilted towards equity rather than fixed-income assets.
- Both its fixed-income and equity portfolios have a sizeable exposure to emerging market assets.

- Currently, about 90% of exchange rate exposures are hedged although the IPS allows a range of hedge ratios.
- Liquidity needs of the fund are minimal, since the government is running a balanced budget and is unlikely to need to dip into the fund in the near term to cover fiscal deficits. Indeed, the expected lifetime of country's large oil reserves has been greatly extended by recent discoveries, and substantial oil royalties are expected to persist into the future.

24 Based on her investigation, Al-Khalili would *most* likely recommend:

A active currency management.

B a hedging ratio closer to 100%.

C a narrow discretionary band for currency exposures.

SOLUTIONS

1

Template for Question 1

Asset	Foreign-Currency Portfolio Return	USD Relative to Foreign-Currency (circle one)
Portfolio A	**15%**	appreciated depreciated

Justification

The 19.5% domestic-currency return for Portfolio A is higher than the 15% foreign-currency portfolio return in GBP; therefore, the USD necessarily depreciated relative to the GBP.

The domestic-currency return on a foreign portfolio will reflect both the foreign-currency return on the portfolio and the percentage movements in the spot exchange rate between the domestic and foreign currency. The domestic-currency return is multiplicative with respect to these two factors:

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

where R_{DC} is the domestic-currency return (in percent), R_{FC} is the foreign-currency return of the asset (portfolio), and R_{FX} is the percentage change of the foreign currency against the domestic currency. (Note that in the R_{FX} expression the domestic currency—the USD in this case—is the price currency.)

Solving for R_{FX}: $(1 + 15\%)(1 + R_{FX}) - 1 = 19.50\%$; $R_{FX} = 3.91\%$

Thus, the USD depreciated relative to the GBP. That is, the GBP appreciated against the USD because R_{FX} is quoted in terms of USD/GBP, with the USD as the price currency and GBP as the base currency, and in this example R_{FX} is a positive number (3.91%).

2

Template for Question 2

Asset	Percentage Movement in the Spot Exchange Rate	Foreign-Currency Portfolio Return (circle one)
Portfolio B	EUR appreciated 5% against the USD	positive negative

Justification

The domestic-currency return for Portfolio B is 0%, and the EUR appreciated 5% against the USD; therefore, the foreign-currency return for Portfolio B is necessarily negative.

The domestic-currency return on a foreign portfolio will reflect both the foreign-currency return on the portfolio and the percentage movements in the spot exchange rate between the domestic and foreign currency. The domestic-currency return is multiplicative with respect to these two factors:

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

where R_{DC} is the domestic-currency return (in percent), R_{FC} is the foreign-currency return of the asset (portfolio), and R_{FX} is the percentage change of the foreign currency against the domestic currency. (Note that once again, the domestic currency—the USD—is the price currency in the USD/EUR quote for R_{FX}.)

Solving for R_{FC}: $(1 + R_{FC})(1 + 5\%) - 1 = 0\%$; $R_{FC} = -4.76\%$

3 Any *two* of the following four points is acceptable:

- Trading requires dealing on the bid/offer spread offered by dealers. Dealer profit margin is based on these spreads. Maintaining a 100% hedge will require frequent rebalancing of minor changes in currency movements and could prove to be expensive. "Churning" the hedge portfolio would progressively add to hedging costs and reduce the hedge's benefits.
- A long position in currency options involves an upfront payment. If the options expire out-of-the-money, this is an unrecoverable cost.
- Forward contracts have a maturity date and need to be "rolled" forward with an FX swap transaction to maintain the hedge. Rolling hedges typically generate cash inflows and outflows, based on movements in the spot rate as well as roll yield. Cash may have to be raised to settle the hedging transactions (increases the volatility in the organization's cash accounts). The management of these cash flow costs can accumulate and become a large portion of the portfolio's value, and they become more expensive for cash outflows as interest rates increase.
- Hedging requires maintaining the necessary administrative infrastructure for trading (personnel and technology systems). These overhead costs can become a significant portion of the overall costs of currency trading.

4 Optimal hedging decisions require balancing the benefits of hedging against the costs of hedging. Hedging costs come mainly in two forms: trading costs and opportunity costs. Gupta is referring to the opportunity cost of the 100% hedge strategy. The opportunity cost of the 100% hedge strategy for Portfolio B is the forgone opportunity of benefiting from favorable currency rate movements. Gupta is implying that accepting some currency risk has the potential to enhance portfolio return. A complete hedge eliminates this possibility.

5 A solution is to put in place a currency overlay program for active currency management. Because internal resources for active management are lacking, the fund manager would outsource currency exposure management to a sub-advisor that specializes in foreign exchange management. This approach would allow the fund manager of Portfolio A to separate the currency hedging function (currency beta), which can be done effectively internally, and the active currency management function (currency alpha) which can be managed externally by a foreign currency specialist.

6

Template for Question 6

Gupta's Statements	Active Currency Approach (circle one)	Justification
"Many traders believe that it is not necessary to examine factors like the current account deficit, inflation, and interest rates because current exchange rates already reflect the market view on how these factors will affect future exchange rates."	carry trade **technical analysis** economic fundamentals	Gupta is describing active currency management based on market technicals. Market technicians believe that in a liquid, freely-traded market the historical price data already incorporates all relevant information on future price movements. Technicians believe that it is not necessary to look outside the market at data like the current account deficit, inflation and interest rates because current exchange rates already reflect the market consensus view on how these factors will affect future exchange rates.
"The six-month interest rate in India is 8% compared to 1% in the United States. This presents a yield pick-up opportunity."	**carry trade** technical analysis economic fundamentals	Gupta is describing active currency management based on the carry trade. This strategy is implemented by borrowing in low-yield currencies (USD at 1%) and investing in high-yield currencies (INR at 8%).
"The currency overlay manager will estimate the fair value of the currencies with the expectation that observed spot rates will converge to long-run equilibrium values described by parity conditions."	carry trade technical analysis **economic fundamentals**	Gupta is describing active currency management based on economic fundamentals. This approach assumes that, in free markets, exchange rates are determined by logical economic relationships that can be modeled. A fundamentals-based approach estimates the "fair value" of the currency, with the expectation that observed spot rates will converge to long-run equilibrium values described by parity conditions.

7 Statements 1 and 2 compare differences between speculative volatility traders and hedgers of volatility. Statement 1 best explains the view of a speculative volatility trader. Speculative volatility traders often want to be net-short volatility, if they believe that market conditions will remains stable. The reason for this is that most options expire out-of-the money, and the option writer can then keep the option premium as a payment earned for accepting volatility risk. (Speculative volatility traders would want to be long volatility if they thought volatility was likely to increase.) Statement 2 best describes the view of a hedger of volatility. Most hedgers are net-long volatility since they want to buy protection from unanticipated price volatility. Buying currency risk protection generally means a long option position. This can be thought of as paying an insurance premium for protection against exchange rate volatility.

8 In practice, matching the *current* market value of the foreign-currency exposure in the portfolio with an equal and offsetting position in a forward contract is likely to be ineffective over time because the market value of foreign-currency assets will change with market conditions. A static hedge (i.e., an unchanging hedge) will tend to accumulate unwanted currency exposures as the value of

the foreign-currency assets change. This will result in a mismatch between the market value of the foreign-currency asset portfolio and the nominal size of the forward contract used for the currency hedge (resulting in currency risk). For this reason, the portfolio manager will generally need to implement a dynamic hedge by rebalancing the portfolio periodically.

9 The fund manager should implement a dynamic hedging approach. Dynamic hedging requires rebalancing the portfolio periodically. The rebalancing would require adjusting some combination of the size, number, and maturities of the foreign-currency contracts.

Although rebalancing a dynamic hedge will keep the actual hedge ratio close to the target hedge ratio, it has the disadvantage of increased transaction costs compared to a static hedge.

10 C is correct. The domestic-currency return is a function of the foreign-currency return and the percentage change of the foreign currency against the domestic currency. Mathematically, the domestic-currency return is expressed as:

$$R_{DC} = (1 + R_{FC})(1 + R_{FX}) - 1$$

where R_{DC} is the domestic-currency return (in percent), R_{FC} is the foreign-currency return, and R_{FX} is the percentage change of the foreign currency against the domestic currency. Note that this R_{FX} expression is calculated using the investor's domestic currency (the EUR in this case) as the *price* currency in the P/B quote. This is different than the market-standard currency quotes in Exhibit 1, where the EUR is the *base* currency in each of these quotes. Therefore, for the foreign currency (USD, GBP, or CHF) to *appreciate* against the EUR, the market-standard quote (USD/EUR, GBP/EUR, or CHF/EUR, respectively) must *decrease*; i.e. the EUR must depreciate.

The Euro-Swiss (CHF/EUR) is the only spot rate with a negative change (from 1.2175 to 1.2080), meaning the EUR depreciated against the CHF (the CHF/EUR rate decreased). Or put differently, the CHF appreciated against the EUR, adding to the EUR-denominated return for the German investor holding CHF-denominated assets. This would result in a higher domestic-currency return (R_{DC}), for the German investor, relative to the foreign-currency return (R_{FC}) for the CHF-denominated assets. Both the Euro-dollar (USD/EUR) and Euro-sterling (GBP/EUR) experienced a positive change in the spot rate, meaning the EUR appreciated against these two currencies (the USD/EUR rate and the GBP/EUR rate both increased). This would result in a lower domestic-currency return (R_{DC}) for the German investor relative to the foreign-currency return (R_{FC}) for the USD- and GBP-denominated assets.

A is incorrect because the Euro-dollar (USD/EUR) experienced a positive change in the spot rate, meaning the EUR appreciated against the USD (the USD/EUR rate increased). This would result in a lower domestic-currency (i.e. EUR-denominated) return relative to the foreign-currency return for the USD-denominated assets, since the USD has depreciated against the EUR.

B is incorrect because the Euro-sterling (GBP/EUR) experienced a positive change in the spot rate, meaning the EUR appreciated against the GPB (the GBP/EUR rate increased). This would result in a lower domestic-currency (i.e. EUR-denominated) return relative to the foreign-currency return for the GBP-denominated assets, since the GBP has depreciated against the EUR.

11 C is correct. An increase in the expected correlation between movements in the foreign-currency asset returns and movements in the spot exchange rates from 0.50 to 0.80 would increase the domestic-currency return *risk* but would not change the *level* of expected domestic-currency return. The domestic-currency

return risk is a function of the foreign-currency return risk [$\sigma(R_{FC})$] the exchange rate risk [$\sigma(R_{FX})$] and the correlation between the foreign-currency returns and exchange rate movements. Mathematically, this is expressed as:

$$\sigma^2(R_{DC}) \approx \sigma^2(R_{FC}) + \sigma^2(R_{FX}) + 2\sigma(R_{FC})\sigma(R_{FX})\rho(R_{FC}R_{FX})$$

If the correlation increases from +0.50 to +0.80, then the *variance* of the expected domestic-currency return will increase—but this will not affect the *level* of the expected domestic-currency return (R_{DC}). Refer to the equation shown for the answer in Question 1 and note that Ostermann's expected R_{FC} has not changed. (Once again, note as well that R_{FX} is defined with the domestic currency as the price currency.)

A and B are incorrect. An increase in the expected correlation between movements in the foreign-currency asset returns and movements in the spot rates from 0.50 to 0.80 would increase the domestic-currency return risk but would not impact the expected domestic-currency return.

12 A is correct. Guten believes that, due to efficient currency markets, there should not be any long-run gains for speculating (or active management) in currencies, especially after netting out management and transaction costs. Therefore, both currency hedging and actively trading currencies represent a cost to the portfolio with little prospect of consistently positive active returns. Given a long investment horizon and few immediate liquidity needs, Guten is most likely to choose to forgo currency hedging and its associated costs.

B and C are incorrect because given a long investment horizon and little immediate liquidity needs, Guten is most likely to choose to forgo currency hedging and its associated costs. Guten believes that due to efficient currency markets there should not be any long-run gains when speculating in currencies, especially after netting out management and transaction costs.

13 B is correct. Umlauf develops a market view based on underlying fundamentals in exchange rates (an economic fundamental approach). When directed by clients, Umlauf uses options and a variety of trading strategies to *unbundle* all of the various risk factors and trades them separately (a volatility trading approach). A market technical approach would entail forming a market view based on technical analysis (i.e., a belief that historical prices incorporate all relevant information on future price movements and that such movements have a tendency to repeat).

A is incorrect because, in using options and a variety of trading strategies to *unbundle* all of the various risk factors and trade them separately, Umlauf is likely to periodically employ volatility trading-based currency strategies.

C is incorrect because, in developing a market view based on underlying fundamentals in exchange rates, Umlauf does utilize an economic fundamentals approach.

14 B is correct. Braunt Pensionskasse provides the manager with limited discretion in managing the portfolio's currency risk exposures. This would be most consistent with allowing the currency overlay manager to take directional views on future currency movements (within predefined bounds) where the currency overlay is limited to the currency exposures already in the foreign asset portfolio. It would not be appropriate to use a fully-passive hedging approach since it would eliminate any alpha from currency movements. Further, a currency overlay program, which considers "foreign exchange as an asset class", would likely expose Braunt's portfolio to more currency risk than desired given the given primary performance objectives.

A is incorrect because a directional view currency overlay program is most appropriate given the limited discretion Braunt Pensionskasse has given the manager. A fully passive currency overlay program is more likely to be used when a client seeks to hedge all the currency risk.

C is incorrect because a directional view currency overlay program is most appropriate given the limited discretion Braunt Pensionskasse has given the manager. In contrast, the concept of "foreign exchange as an asset class" allows the currency overlay manager to take currency exposure positions in any currency pair where there is value-added to be harvested.

15 C is correct. The primary performance objective of Franz Trading GmbH is to add alpha to the portfolio, and thus has given the manager discretion in trading currencies. This is essentially a "foreign exchange as an asset class" approach. Braunt Pensionskasse and Kastner have more conservative currency strategies, and thus are less likely to benefit from the different strategies that a new overlay manager might employ.

A is incorrect because Franz Trading GmbH is more likely to benefit from the introduction of an additional overlay manager. Kastner is more likely to have a fully passive currency overlay program.

B is incorrect because Franz Trading GmbH is more likely to benefit from the introduction of an additional overlay manager. Braunt is more likely to have a currency overlay program where the manager takes a directional view on future currency movements.

16 A is correct. Exchange-traded futures contract not only have initial margin requirements, they also have daily mark-to-market and, as a result, can be subject to daily margin calls. Market participants must have sufficient liquidity to meet margin calls, or have their positions involuntarily liquidated by their brokers. Note that the risk of daily margin calls is not a feature of most forwards contracts; nor is initial margin. (However, this is changing among the largest institutional players in FX markets as many forward contracts now come with what are known as Collateral Support Annexes—CSAs—in which margin can be posted. Posting additional margin would typically not be a daily event, however, except in the case of extreme market moves.)

B is incorrect because futures contracts have low transactions costs. C is incorrect because whether the EUR is the price or the base currency in the quote will not affect the hedging process. In fact, on the CME the quote would be the market-standard USD/EUR quote, with the EUR as the base currency.

17 C is correct. Based on predicted export trends, Subscriber 2 most likely expects the KRW/USD rate to increase (i.e., the won—the price currency—to depreciate relative to the USD). This would require a long forward position in a forward contract, but as a country with capital controls, a NDF would be used instead. (Note: While forward contracts offered by banks are generally an institutional product, not retail, the retail version of a non-deliverable forward contract is known as a "contract for differences" (CFD) and is available at several retail FX brokers.)

A is incorrect because Subscriber 2 expects the KRW/USD rate to increase. A short straddle position would be used when the direction of exchange rate movement is unknown and volatility is expected to remain low.

B is incorrect because a put option would profit from a decrease of the KRW/USD rate, not an increase (as expected). Higher volatility would also make buying a put option more expensive.

18 B is correct. Subscriber 3's carry trade strategy is equivalent to trading the forward rate bias, based on the historical evidence that the forward rate is not the center of the distribution for the spot rate. Applying this bias involves buying currencies selling at a forward discount and selling currencies trading at a forward premium. So a higher forward premium on the lower yielding currency—the USD, the base currency in the INR/USD quote—would effectively reflect a more profitable trading opportunity. That is, a higher premium for buying or selling the USD forward is associated with a lower US interest rate compared to India. This would mean a wider interest rate differential in favor of Indian instruments, and hence potentially more carry trade profits.

A is incorrect because Subscriber 3's carry trade strategy depends on a wide interest rate differential between the high-yield country (India) and the low-yield country (the United States). The differential should be wide enough to compensate for the unhedged currency risk exposure.

C is incorrect because a guide to the carry trade's riskiness is the volatility of spot rates on the involved currencies, with rapid movements in exchange rates often associated with a panicked unwinding of carry trades. All things being equal, higher volatility is worse for carry trades.

19 C is correct. Emerging market currencies are often the investment currencies in the carry trade. This reflects the higher yields often available in their money markets compared to Developed Market economies (funding currencies are typically low-yield currencies such as the JPY). This can lead to higher holding returns, but these higher returns can also come with higher risks: carry trades are occasionally subject to panicked unwinds in stressed market conditions. When this occurs, position exit can be made more difficult by market illiquidity and higher trading costs (wider bid/offer spreads). The leverage involved in the carry trade can magnify trading losses under these circumstances.

A is incorrect because return distributions are often *negatively* skewed, reflecting the higher event risk (panicked carry trade unwinds, currency pegs being re-set, etc.) associated with the carry trade.

B is incorrect because although FX markets are typically efficient (or very close thereto) this does not mean that higher returns are not available. The key question is whether these are abnormally high *risk-adjusted* returns. Higher return in an efficient market comes with higher risk. The higher (short-term) return in the carry trade reflects the risk premia for holding unhedged currency risk, in the context of a favorable interest rate differential.

20 B is correct. The GBP value of the assets has declined, and hence the hedge needs to be *reduced* by GBP 7,000,000. This would require buying the GBP forward to net the outstanding (short) forward contract to an amount less than GBP 100,000,000.

A is incorrect because to rebalance the hedge (reduce the net size of the short forward position) the GBP must be bought *forward*, not with a spot transaction.

C is incorrect because the GBP must be bought, not sold. Buying SEK against the GBP is equivalent to selling GBP. Moreover, the amount of SEK that would be sold forward (to buy GBP 7,000,000 forward) would be determined by the *forward* rate, not the spot rate (7,000,000 × 10.6875 = 74,812,500).

21 C is correct. The fund holds CHF-denominated assets and hence Björk wants to protect against a depreciation of the CHF against the SEK, which would be a down-move in the SEK/CHF cross rate. An OTM put option provides some downside protection against such a move, while writing an OTM call option helps reduce the cost of this option structure. Note that Björk does not expect

that the SEK/CHF rate will increase, so this option (in her view) will likely expire OTM and allow her to keep the premia. This hedging structure is known as a short risk reversal (or a collar) and is a popular hedging strategy.

A is incorrect because the ATM call option will not protect against a decrease in the SEK/CHF rate. An ATM option is also expensive (compared to an OTM option). Note that Björk does not expect the SEK/CHF rate to increase, so would not want a long call option position for this rate.

B is incorrect because this structure is expensive (via the long ITM call option) and does not protect against a decrease in the SEK/CHF rate.

22 B is correct. To hedge the EUR-denominated assets Björk will be selling forward contracts on the SEK/EUR cross rate. A higher forward premium will result in higher roll return as Björk is selling the EUR forward at a higher all-in forward rate, and closing out the contract at a lower rate (all else equal), given that the forward curve is in contango.

A is incorrect because Björk is hedging EUR-denominated assets with a EUR-denominated forward contract. While it is true that the gap between spot and forward rates will be higher the higher the interest rate differential between countries, this gap (basis) converges to zero near maturity date, when the forward contracts would be rolled.

C is incorrect because forward contracts do not generate premia income; writing options does.

23 C is correct. A cross hedge exposes the fund to basis risk; that is, the risk that the hedge fails to protect against adverse currency movements because the correlations between the value of the assets being hedged and the hedging instrument change.

A is incorrect because movements in forward points (and hence roll yield) would be of secondary importance compared to the basis risk of a cross hedge.

B is incorrect because exchange rate volatility would not necessarily affect a hedge based on forward contracts, as long as the correlations between the underlying assets and the hedge remained stable. Although relevant, volatility in itself is not the "most" important risk to consider for a cross-hedge. (However, movements in volatility would affect hedges based on currency options.)

24 A is correct. The fund has a long-term perspective, few immediate liquidity needs, and a lower weight in fixed income that in equities (bond portfolios are typically associated with hedge ratios closer to 100% than equity portfolios). The emerging market exposure would also support active management, given these countries' typically higher yields (carry trade) and often volatile exchange rates.

B is incorrect because the characteristics of the fund and the beneficial investor (in this case, the royal family) do not argue for a conservative currency strategy.

C is incorrect because a more active currency management strategy would be more suitable for this fund.

CUSTOMER SERVICE

68

READING

20

Market Indexes and Benchmarks

by C. Mitchell Conover, PhD, CFA, CIPM

C. Mitchell Conover, PhD, CFA, CIPM, is at the University of Richmond (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** distinguish between benchmarks and market indexes;
☐	**b.** describe investment uses of benchmarks;
☐	**c.** compare types of benchmarks;
☐	**d.** contrast liability-based benchmarks with asset-based benchmarks;
☐	**e.** describe investment uses of market indexes;
☐	**f.** discuss tradeoffs in constructing market indexes;
☐	**g.** discuss advantages and disadvantages of index weighting schemes;
☐	**h.** evaluate the selection of a benchmark for a particular investment strategy.

INTRODUCTION

1

The *Oxford English Dictionary* defines a **benchmark** as "a standard or point of reference against which things may be compared." In an investments context, a benchmark is a standard or point of reference for evaluating the performance of an investment portfolio. The selection of an appropriate benchmark depends on the objective and constraints that govern the construction of the portfolio.[1]

An investment benchmark is typically a collection of securities that characterizes a manager's preferred habitat of securities and risk. For example, an investor in German equities with characteristically small market capitalizations (and no other distinctive selection characteristics) might have a benchmark consisting of a broad portfolio of

1 This reading substantially draws on "An Introduction to Benchmarks" by C. Mitchell Conover, PhD, CFA, CIPM, Daniel Broby, FSIP, and David Cariño, PhD (CFA Institute, 2012).

© 2014 CFA Institute. All rights reserved.

small-market-cap German equities. However, a benchmark can also be a market rate of return—for example, when the investment strategy targets a specific rate of return that cannot be readily represented by a portfolio.

Benchmarks make it possible to determine how effectively active fund managers—managers who trade on perceived opportunities to earn superior risk-adjusted returns—have performed by measuring the impact of departures from benchmark weights. An ideal benchmark provides the portfolio manager and his or her investment clients with an objective means of evaluating how skillfully the manager implemented the investment strategy. Analysts can use it when attempting to identify active investment management skill. Well-chosen benchmarks allow returns to be accurately evaluated and decomposed. If the benchmark chosen is invalid, then all subsequent portfolio manager evaluation and analysis is incorrect. Throughout this reading, we refer to the ideal benchmark as one that is "valid," consistent with the literature in the field. Although a valid benchmark may not be attainable in certain circumstances, the goal of a performance analyst should be to use a benchmark that allows the most accurate evaluation of manager performance.

Benchmarks are extremely important to owners of capital. Benchmarks communicate information about an investment manager's **investment universe** (the set of assets that may be considered for investment) and investment discipline. Investment managers often claim to beat the "market." The benchmark defines what the relevant "market" is and allows an analysis of the manager's performance.

Benchmarks provide investment managers with a guidepost for acceptable levels of risk and return. They can be a powerful influence on investment decision making. As one investment authority has opined, "Benchmarks determine the performance of investment managers perhaps more than any other influence, including managers' determination to succeed and the resources and skills they bring to this task. We in the industry have largely overlooked this fact, perhaps at our peril."[2]

Market indexes are sometimes used as benchmarks. However, they are constructed using a variety of methodologies and are designed for many purposes. As such, market indexes may not always be the most appropriate choice for a particular manager's benchmark. This reading will help the reader understand market indexes and benchmarks. Among the questions it will answer are the following:

- How are benchmarks different from market indexes?
- How are benchmarks used?
- What are the various types of benchmarks?
- How are market indexes used?
- What are the tradeoffs in market index construction?
- What are the advantages and disadvantages of market index weighting schemes?
- What type of market index is best suited for use as a benchmark?
- What are the shortcomings of using a market index as a benchmark?

The remainder of this reading is organized as follows: Section 2 clarifies the distinction between benchmarks and market indexes. Section 3 provides an explanation of how benchmarks are used and their types. Section 4 discusses the construction and use of market indexes. Section 5 examines index weighting schemes and the use of indexes as benchmarks. Section 6 provides an example of a benchmark for a particular investment strategy. The reading concludes with a summary in Section 7.

2 Siegel (2003, p. ix).

DISTINGUISHING BETWEEN A BENCHMARK AND A MARKET INDEX

2

Although the terms "benchmark" and "market index" (or simply "index") are often loosely used interchangeably, we must distinguish between them to have an accurate discussion. A **market index** represents the performance of a specified security market, market segment, or asset class. For example, the FTSE 100 Index is an index constructed to represent the broad performance of large-cap UK equities. The Bloomberg Barclays Sterling Aggregate Bond Index represents the performance of fixed-rate, investment-grade sterling-denominated bonds; in contrast, the Bloomberg Barclays Sterling Gilts Index captures the performance of a narrower segment of the UK investment-grade debt market—UK government debt. The constituents of each of these indexes are selected for their appropriateness in representing the targeted market, market segment, or asset class.

A market index *may* be considered for use as a benchmark or comparison point for an investment manager; however, the most appropriate benchmark or reference point for an investment manager *need not be, and often is not*, an available market index. A good example in which a market index is an appropriate benchmark is the case of passive managers, who typically invest in a portfolio similar (or identical) to a chosen market index so as to closely track its performance. For example, the iShares Core S&P 500 ETF (exchange-traded fund) seeks investment results, before fees and expenses, that correspond to the price and yield performance of US large-cap stocks as represented by the S&P 500 Index. Because the investment objective of the iShares Core S&P 500 ETF is to track the performance of the S&P 500, the S&P 500 is the appropriate benchmark for iShares Core S&P 500 ETF, as it is for any other investment with an identical investment objective. An active US core equity manager whose investment universe is the S&P 500—that is, one that seeks to add value by under- or overweighting component securities of the S&P 500—might also use the S&P 500 as its benchmark.

However, many active managers follow specific investment disciplines that cannot be adequately described by a security market index. Benchmarks must be appropriate for the specific investor (sponsor) and any investment manager hired to manage money, whereas market indexes are typically meant to serve the general public's purposes and to have broad appeal.[3] The fundamental requirements of indexes and valid benchmarks are formulated differently, as discussed in Bailey, Richards, and Tierney (2007). Valid benchmarks will be unambiguous, investable, measurable, appropriate, reflective of current investment opinions, specified in advance, and accountable ("owned").[4] Nonetheless, indexes can sometimes serve as valid benchmarks. The reader will find that writers and index vendors vary in their preference for the plural of "index." For simplicity, throughout this reading we will consistently use "indexes" rather than the Latin-inspired "indices" as the plural of "index."

3 Amenc, Goltz, and Tang (2011, p. 68).

4 *Unambiguous* means the identities and weights of the benchmark's components are clearly defined. *Measurable* means that the benchmark's returns are readily calculable on a reasonably frequent basis. *Reflective of current investment opinions* means that the investment manager should be familiar with the benchmark's component securities. *Specified in advance* means the composition of the benchmark should be known before the evaluation period. *Accountable* (or *owned*) means that the manager is willing to have his or her performance judged against the benchmark's.

3 BENCHMARK USES AND TYPES

This section gives a general overview of benchmarks. The discussion should be relevant for both private wealth management and institutional portfolio management, although much of the theory was developed in the institutional world. Before we discuss the uses of benchmarks, a delineation of their users is in order.

A **plan sponsor** is used in this reading for the trustee, company, or employer responsible for a public or private institutional investment plan. The responsibilities of the plan sponsor include determining plan participation requirements, investment choices, contributions, and distributions. The type of benchmark chosen will differ depending on its characteristics. In a private wealth context, we would be referring in general to the investor.

A **fund manager** is the professional manager of separate accounts or pooled assets structured in any of a variety of ways (e.g., a US mutual fund, a UK unit trust, a European Union UCITS fund, an exchange-traded fund, or a hedge fund). Although the plan sponsor could manage a fund in house, in general, we will think of the fund manager as an external investment manager to whom management of a part of the sponsor's assets is delegated. The fund manager may have a mandate from the sponsor to follow either a passive or an active investment strategy.

- **Passive investment strategies** prominently include indexing.[5] Indexers seek to deliver investment returns comparable to those of a market index by investing in or replicating the index constituents.
- **Active investment strategies** seek to use a fund manager's insight to deliver investment returns in excess of those from a passive strategy. These returns are referred to as the manager's active returns, and the variability of the active returns is referred to as active risk.

Benchmarks are vital for performance measurement when the assets are actively managed. However, benchmarks can also be useful when passive investment strategies are employed, as discussed below.

3.1 Benchmarks: Investment Uses

There are several uses of benchmarks in investment practice, including the following:

- reference points for segments of the sponsor's portfolio;
- communication of instructions to the manager;
- communication of instructions to a board of directors (or any oversight group) and consultants;
- identification and evaluation of the current portfolio's risk exposures;
- interpretation of past performance and performance attribution;
- manager appraisal and selection;
- marketing of investment products; and
- demonstration of compliance with regulations, laws, or standards.

Sponsor benchmarks need to be distinguished from fund manager benchmarks. A sponsor's strategic asset allocation (policy portfolio) is the long-run allocation to asset classes consistent with the sponsor's objectives and constraints. From this, a benchmark, often in the form of an investable market index, will be specified for

5 "Buy and hold" is another example of a passive strategy. However, indexing is by far the most important passive investment strategy in terms of assets committed to it and the only one discussed in this reading.

each asset class in the strategic asset allocation. That practice implicitly and reasonably specifies a passive investment in the asset class as a neutral comparison point in measuring sponsor progress toward investment goals. By doing so, benchmarks are useful as reference points for segments of the sponsor's portfolio.

In general, when we refer simply to benchmarks, the reference will be to benchmarks provided to fund managers that are appropriate references for their specific investment disciplines. Given the sponsor's understanding of the fund manager's investment discipline, a second use of benchmarks is that they will convey the sponsor's expectations to the manager as to how the fund assets will be invested and their expected risk and return. By conveying the sponsor's expectations, benchmarks provide accountability, so that if a manager's security selection and subsequent performance frequently diverges far from the benchmark, it is apparent that the manager's investment approach is inconsistent with the fund's stated investment discipline. Benchmarks also ensure a degree of fairness in the sense that the manager will not be held to standards that the fund's board or consultants might arbitrarily impose.

Third, the benchmark communicates to the board and external consultants the manager's area of expertise and how a manager should subsequently invest and be evaluated. In a multiple-manager fund, benchmarks convey the managers' coverage areas, so that assets and securities that lack coverage or are overemphasized can be identified.

A fourth use of benchmarks is to identify and evaluate the risk exposures of the manager. Managers often describe themselves as "value managers" or "growth managers." However, these terms are imprecise. An appropriate benchmark will have risk similar to the portfolio and be informative in revealing the manager's active risk exposures, which should help explain the manager's performance within his or her chosen investment style.

Another fundamental use of benchmarks is to attribute and appraise past performance and, in general, the consequences of the manager's investment decisions. The benchmark helps the board and its consultants determine and evaluate the manager's **excess return** (the difference between the portfolio return and the benchmark return, which may be either positive or negative). Return attribution identifies such things as whether the manager's security selection, industry bets (in equity analysis), or yield curve positioning (in fixed-income analysis) have added value. What caused the manager's performance to be different from the benchmark's? Performance appraisal's chief focus is to distinguish active investment skill from luck.

Inappropriate benchmarks introduce noise into the investment manager assessment process and provide a misleading picture of manager performance. Good benchmarks enhance the effectiveness of manager assessment, whereas bad ones may lead to an inefficient or unintended allocation of fund assets and disguise managers' contributions.[6] As a result, benchmarks will also be instrumental in investment contracts that have an incentive compensation component in which outperformance is rewarded (and underperformance is possibly penalized).

Furthermore, benchmarks play a role in the manager selection processes because they will influence the perception of a manager's skill. The analysis of past performance will involve a qualitative assessment of whether the manager's investment process is robust enough to produce repeatable outperformance in the future or, alternatively, whether a manager's past underperformance is likely to persist.

Benchmarks are also used to market investment products to potential investors. The Global Investment Performance Standards (GIPS®) require that if a benchmark exists, it must be included in a performance presentation with its description. If no

6 "Inefficient" is used in an investment context here, referring to an asset allocation that does not have an optimal risk–return tradeoff.

benchmark is provided, a reason must be given. Marketing requires the communication and explanation of the investment process, of which the benchmark is an essential descriptor of the investment strategy and a crucial determinant of excess returns. Excess returns have been found to be a significant determinant of investor inflows, so the choice of the benchmark will influence the fund's ability to attract new capital.

Lastly, benchmarks are used to demonstrate compliance with regulations, laws, and standards. Regulatory organizations use benchmarks as part of their oversight and surveillance, and as a result, benchmarks have become mandated in many jurisdictions. In 1998, the US SEC introduced a requirement that mutual funds self-designate a benchmark and present their historical returns alongside it in the prospectus. Many other jurisdictions now have similar rules. More generally, institutions are sometimes restricted from investing in specific instruments, such as below-investment-grade bonds. Benchmarks for such institutions have to be tailored accordingly.

3.2 Types of Benchmarks

Given the uses described above, benchmarks are an important part of the investment process for both institutional and private wealth clients. In the discussion below, we introduce the types of benchmarks based on the discussion in Bailey, Richards, and Tierney (2007).[7] The seven types of benchmarks distinguished by Bailey, Richards, and Tierney are:

- absolute (including target) return benchmarks;
- manager universes (peer groups);
- broad market indexes;
- style indexes;
- factor-model-based benchmarks;
- returns-based (Sharpe style analysis) benchmarks; and
- custom security-based (strategy).

In addition, we discuss liability-based benchmarks which represent characteristics of a stream of liabilities rather than a market or market segment as do broad market and style indexes.

An **absolute return benchmark** is simply a minimum target return that the manager is expected to beat. The return may be a stated minimum (e.g., 9%), stated as a spread above a market index (e.g., euro interbank offered rate + 4%), or determined from actuarial assumptions. An example of an absolute return benchmark is 30% per annum return for a private equity investment (e.g., a buyout fund—note that more sophisticated benchmarks are available). Market neutral long–short equity funds are another example where absolute return benchmarks are used. Such funds are run by portfolio managers who believe that they can identify over- and undervalued shares. Such a fund consists of long and short positions in, respectively, perceived undervalued and overvalued equities and is constructed so that, overall, the portfolio is expected to be insensitive to broad equity market movements—that is, market neutral with a market beta of zero. Because a market neutral fund is in principle a zero–expected systematic risk investment, the benchmark may be specified as a three-month Treasury bill return; the investment objective may be to outperform the benchmark consistently by a given number of basis points.

A **manager universe**—or **manager peer group**—is a broad group of managers with similar investment disciplines. Manager universe benchmarks allow investors to make comparisons with the performance of other managers. Managers are typically

7 The authors discuss seven benchmark types, to which we add one more: liability-based benchmarks.

expected to beat the median manager return, which refers to the manager return that splits the sample of managers' returns in half. Manager universes are typically formed by asset class and the investment approach within that class. Hedge funds are often evaluated relative to manager universe benchmarks, provided by such vendors as Credit Suisse/Tremont, Hedge Fund Research, and Lipper/TASS. Private equity funds are also commonly evaluated in this way; examples of data vendors are Burgiss, Cambridge Associates, Preqin, and Thomson Venture Economics. Investment magazines are prolific providers of peer group comparisons for investment funds (e.g., mutual funds in the United States and unit trusts in the United Kingdom); thus, a mutual fund investing in global equities might be ranked among all mutual funds with similar objectives over various time periods.

Broad market indexes are measures of broad asset class performance, such as the JP Morgan Emerging Markets Bond Index (EMBI) for emerging market bonds or the MSCI World Index for global developed market equities. Broad market indexes are well known, readily available, and easily understood. The number of market indexes has proliferated over time so as to serve a greater number and variety of applications and end users. For example, in 1999, JP Morgan created the EMBI Global index (EMBIG), which added less liquid issues and less creditworthy issues to the EMBI. The performance of broad market indexes is widely reported in popular media, such as television.

Market indexes have also been more narrowly defined to represent investment styles within asset classes, resulting in style indexes. (An **investment style** can be defined as a natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.)[8] In the late 1970s, researchers found that stock valuation (e.g., defined using the price-to-earnings ratio) and market capitalization explained much of stock return variation. In response, many index providers provided various style versions of their broad market indexes. For example, in 1999, Wilshire introduced value, growth, and size subsets of its US Wilshire 5000 Index.[9] Style indexes are formed under the belief that a characteristic of an asset, such as a stock's dividend yield or a bond's credit rating, will be the primary determinant of its subsequent performance.

A **factor-model-based benchmark** is constructed by examining the portfolio's sensitivity to a set of factors. Examples of factors include the return for a broad market index, company earnings growth, industry, and financial leverage. The simplest form of a factor-model-based benchmark is the market model, in which there is a single factor, the return on a broad market index. To determine the factor sensitivities, the portfolio's return is regressed against the factors believed to influence returns. The general form of a factor model is

$$R_p = a_p + b_1F_1 + b_2F_2 \ldots b_kF_k + \varepsilon_p \quad (1)$$

where

R_p = the portfolio's periodic return
a_p = the "zero-factor" term, which is the expected portfolio return if all factor sensitivities are zero
b_k = the sensitivity of portfolio returns to the factor return
F_k = systematic factors responsible for asset returns
ε_p = residual return due to nonsystematic factors

8 See Brown and Goetzmann (1997).

9 Broadly speaking, a value investment style with respect to equity portfolio management is focused on paying a relatively low price with respect to earnings or assets per share. A growth investment style with respect to equity portfolio management is focused on investing in high-earnings-growth companies.

The sensitivities (b_k) are then used to predict the return the portfolio should provide for given values of the systematic risk factors; a higher positive sensitivity indicates greater positive exposure to a specified factor and higher expected return, holding all else equal. The factors (F) represent values that are related to security values, such as interest rates. For example, interest rates may be inversely related to security prices. If interest rates unexpectedly rise, then security returns will fall by the amount determined by the security's sensitivity (b_k) to interest rate changes.

Returns-based benchmarks (Sharpe style analysis) are similar to factor-model-based benchmarks in that portfolio returns are related to a set of factors that do well in explaining portfolio returns. In the case of returns-based benchmarks, however, the factors are the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth). The analysis produces a benchmark that is essentially the weighted average of these asset class indexes that best explains or tracks the portfolio's returns. The difference between the use of the style indexes previously discussed and returns-based benchmarks is that the latter view style on a continuum; for example, a portfolio may be characterized as 60% small-cap value and 40% small-cap growth. To create a returns-based benchmark using Sharpe style analysis, an optimization procedure is used in which the portfolio's sensitivities (analogous to the b_k's in factor-model-based benchmarks) are forced to be non-negative and sum to 1.

A **custom security-based benchmark** is built to accurately reflect the investment discipline of a particular investment manager. Such benchmarks are developed through discussions with the manager and an analysis of past portfolio exposures. After the manager's investment process is identified, the benchmark is constructed by selecting securities and weightings consistent with that process and client restrictions. A cash weight is also identified that is appropriate for the situation. The benchmark is subsequently rebalanced on a periodic basis to ensure that it stays consistent with the manager's investment practice. Custom security-based benchmarks are also referred to as **strategy benchmarks** because they should reflect the manager's particular strategy. Custom security-based benchmarks are particularly appropriate when the manager's strategy cannot be closely matched to a broad market index or style index.

So far, our focus has been asset-based benchmarks, in which the manager's performance is compared with the performance of a collection of assets. We now examine liability-based benchmarks.

Liability-based benchmarks are particularly important for investors who invest with the chief objective of providing for the payment of a stream of liabilities. Examples include insurance companies and defined benefit pension schemes. Investing assets using a liability-relative approach, assets are chosen for their ability to fund the payment of liabilities with relatively low risk. An appropriate benchmark for such an investor must accurately represent changes in the value of the liability stream and thus be liability-based. A **liability-based benchmark** will match the duration profile and other key characteristics of the liabilities. A liability-based benchmark typically consists of nominal bonds, real return bonds, common shares, and other assets. Unlike market indexes in which the components' weights typically reflect relative overall market values, in a liability-based benchmark component weights are determined based on the requirement that the benchmark closely track returns to the liabilities. Investment success relative to such a benchmark is linked with achieving the objective of funding liabilities; by contrast outperformance of a market index used as a benchmark would not imply anything about the portfolio's ability to fund liabilities. Bernstein (2000, p. 5) made an argument for liability-based benchmarks for investors in general. He stated that manager evaluation should be based on the question, "How much is this organization contributing to a return in excess of our required return, and at what level of volatility?" Bernstein believes these benchmarks are preferable to using cap-weighted security indexes, which may be overweighted by overvalued securities and for which

the performance target is not defined quantitatively *a priori*. Furthermore, the users of asset-based benchmarks often assume that they can identify managers capable of consistently achieving an excess return, which is highly unlikely if a market is efficient.

In sum, in a liability-based benchmark, the benchmark is structured to accurately reflect the return required to meet the future obligations as well as mimic the volatility of the liabilities. As an additional benefit, modeling the liability risk exposure will help the portfolio manager better understand the liabilities that must be satisfied.

In conclusion, the fund sponsor may select from a number of benchmarks, including broad market indexes. We next examine the uses of indexes.

MARKET INDEXES USES AND CONSTRUCTION

4

One of the most popular methods of assessing portfolio managers in the financial press is to compare their returns with those of a market index, such as the CAC 40, FTSE 100, or Dow Jones Industrial Average (DJIA) for, respectively, French, UK, and US equities. The basic idea is that such indexes reasonably represent the performance of securities in a market. Market indexes played a key role in modern portfolio theory, and the success of low-cost index funds furthered their popularity. They are more readily recognizable by the general public than most other benchmark types.

Currently, there are thousands of market indexes available for more than 70 countries, spanning developed markets, such as the United States; emerging markets, such as Brazil; and smaller frontier markets, such as Kazakhstan. Indexes are created by traditional providers (e.g., MSCI), as well as exchanges (e.g., Euronext) and investment banks (e.g., Barclays). Equity indexes were the first to be developed but were soon followed by bond and alternative asset indexes.

In addition to the indexes mentioned, many other well-known broad market equity index series are provided by such vendors as FTSE, MSCI, Russell Investments, and S&P Dow Jones Indices. Major providers for broad market fixed-income indexes include Bloomberg Barclays, JP Morgan, Markit, and S&P/Citigroup. Bond index examples include the S&P/Citigroup International Treasury Bond Index Series, the Markit iBoxx USD Liquid Investment Grade Index, and the JP Morgan Emerging Markets Bond Index.

4.1 Use of Market Indexes

Given the abundance and the importance of security market indexes, it is constructive to understand their many uses. We discuss the uses of indexes in the approximate order that a plan sponsor would encounter them in practice: as asset allocation proxies, investment management mandates, performance benchmarks, and portfolio analysis applications. Additionally, we discuss the use of indexes as a gauge of market sentiment and as the basis for investment vehicles.[10]

Asset allocation proxies

Used for asset allocation, an index constructed consistently over time provides the investor a tool to measure asset class *ex ante* return, risk, and correlations. It allows investors to determine the incremental expected return and risk from adding a new asset to a portfolio. These measurements can be used to design an investment policy suitable for different risk aversion levels.

10 Schoenfeld (2002), Schoenfeld (2003), and Siegel (2003) have elaborated on these four uses of asset class indexes.

Investment management mandates

As a result of their effectiveness as asset allocation proxies, investment mandates can include a specified benchmark index. The benchmark index for a mandate communicates the expectations of the asset owner (e.g., plan sponsor) to the portfolio manager: The portfolio manager is generally expected to select securities primarily from the constituents of the index. Exceeding an index return is frequently considered an objective of an actively managed portfolio (and matching the index return is the objective of a passively managed portfolio). Such an index will be valid as an evaluation tool, of course, only to the extent that it meets the criteria for a valid benchmark.

Performance benchmarks

Indexes are often used as *ex post* performance benchmarks, where they answer the basic question, did the manager beat the market? With the development of the capital asset pricing model (CAPM) in the 1960s, the "market" index return representing the entirety of assets became important in investment theory. Investment practitioners subsequently looked to various indexes as proxies of this "market" return. The same benchmark validity criteria apply. Sometimes, a combination of more than one index is used to create a benchmark for the manager, under the assumption that the manager's portfolio cannot be captured by a single index.[11]

Portfolio analysis

In addition to benchmarking the manager's performance, indexes can be used for more detailed portfolio analysis. For example, currency-hedged and unhedged versions of non-domestic indexes can be used to measure the effectiveness of a currency management strategy.

Gauge of market sentiment

Possibly the most common use of indexes is as a gauge of public or market sentiment. They answer the question, how did the market do today? Index values are cited incessantly in business media as an indicator of daily (and even intra-day) market movements. Such movements are influenced by a wide variety of factors, such as the prospects for economic expansion or recession, war and rumors of war, and general feelings of investor confidence. Market indexes provide a convenient summary statistic of expectations because they are succinctly summarized in a single number, the current return on the index. Market indexes convey the perceived importance of both past events and the probability of future events. As a specific example of the latter, the Chicago Board Options Exchange (CBOE) Market Volatility Index (VIX) is a frequently used measure of market uncertainty.

Basis for investment vehicles

Indexes are also used as a basis for investments, such as index mutual funds, many exchange-traded funds (ETFs), and derivatives. Index funds, ETFs, and derivative instruments are created on the basis of indexes ranging in breadth from broad markets to narrow market segments and investment themes. The royalties from licensing indexes for such uses has been a major driver of the proliferation of market indexes. Derivative instruments, such as futures and options, are used in hedging, trading, and asset reallocation and have other uses as well. More recently, indexes have served as the basis for ETFs.

---

11 According to a survey of European portfolio managers, there is general agreement that a benchmark can be created from a combination of indexes (Amenc, Goltz, and Tang, 2011, p. 67).

There is a great deal of research suggesting that it is difficult for active managers to earn their fees, so passive investments in low-cost index funds have become increasingly popular. There are also enhanced-index managers, who take active bets away from the index while also trying to limit their deviation from the index's risk. For an index to be useful as the basis for an investment vehicle, it must be one that an investor can replicate at low cost without much difficulty.

In sum, indexes serve many vital purposes for sponsors, managers, and investors at large. We next examine the construction of indexes.

4.2 Index Construction

Indexes are created by defining a set of rules, which are then applied to a set of existing securities. However, not all indexes are constructed in the same way. There are three primary choices in index construction: the inclusion criteria, security weighting, and index maintenance.

The first choice, the inclusion criteria, determines which specific population of securities the index represents. The greater the number of securities and the more diversified they are by industry and size, the better the index will measure broad market performance. A narrower universe will measure performance of a specific group of securities. To serve as a benchmark, the inclusion criteria for an index should result in security composition that is similar to the manager's portfolio.

The second choice, selecting the methodology for security weighting, is usually a choice among value, price, or another weighting scheme. Indexes vary in their weighting schemes, resulting in performance differences among indexes.

The third choice relates to the index's maintenance rules, which will influence the index's performance and its applicability as a benchmark. One should be aware of such differences before comparing a manager's portfolio to an index.

Although the details vary by each index constructor, the general approach to constructing asset class indexes consists of creating rules for the following steps:

Define eligible securities

The starting universe of securities, such as all common equity shares of companies within a given country, must first be identified. Typically, various eligibility rules are applied to improve the investability of the index. Examples of eligibility rules include liquidity standards, minimum trading price, available shares (float), etc.

Define index weighting

Once the eligible securities are determined, rules for weighting the securities are applied. The security weighting is important because it directly affects index risk and return and also influences the validity of the index as a manager's benchmark.

There are several weighting schemes commonly used:

- **Capitalization weighting**, also known as **market value weighting**, **market cap weighting**, or **cap weighting**. The most common weighting scheme used is capitalization weighting. In this scheme, constituents are held in proportion to their market capitalizations, calculated as price times available shares. *The performance of a value-weighted index represents the performance of a portfolio that holds all the outstanding value of each index security*. By far, market capitalization weighting has the greatest acceptance by investment professionals. There are several advantages to this approach, which are discussed later.

  Examples of US capitalization-weighted indexes include the S&P 500 and the Russell indexes. Global indexes that are capitalization weighted include the MSCI indexes. Non-US indexes include the Financial Times Actuaries Share

Indexes (representing stocks on the London Stock Exchange), the Tokyo Stock Exchange Price Index (TOPIX), the CAC 40 in France, and the DAX 30 in Germany.

Nearly all capitalization-weighted indexes are adjusted for the free float. The *free float* is the amount of shares outstanding for a given company that is available to the public. This adjustment is intended to exclude the capitalization of a company that is not widely available for purchase and thus is not part of the investable opportunity set. The resulting index is called a free-float-adjusted market capitalization index, or float-weighted index for short. *A float-weighted index represents the performance of a portfolio that holds all the index securities available for trading*.

Adjustments for free float are particularly important in less developed markets, where governments, founding families, and other companies often hold a large portion of issued stock. All the major global indexes are float adjusted, including those of S&P Dow Jones Global, FTSE, MSCI, Russell, and S&P/Citigroup.[12] Float adjustments result in the index being more investable.

- **Price weighting**. In this scheme, constituents are weighted in proportion to their prices. The index value thereby can be interpreted simply as an average of the constituent prices. *The performance of a price-weighted index represents the performance of a portfolio that holds one unit of each index security*. Although the advantage of price weighting is its simplicity, the scheme offers little relevance to the way most investors weight their portfolios. The most notable price-weighted indexes are the Dow Jones Averages, which are widely quoted and have a long history. The Nikkei Stock Average is also a price-weighted index, representing stocks listed on the Tokyo Stock Exchange.

Beyond cap weighting and price weighting, other forms of index weighting fall into a category called "alternative weighting." Some noteworthy approaches include the following:

- **Equal weighting**. In a pure equal-weighting scheme, all constituents are held at equal weights at specified rebalancing times. *The performance of an equal-weighted index represents the performance of a portfolio that invests the same amount of wealth in each index security*. Variations of this approach might weight groups of constituents (such as sectors or industries) equally. Equal-weighted indexes must be rebalanced periodically (e.g., quarterly) to reestablish the equal weighting because individual security returns will vary, causing security weights to drift from equal weights. The Value Line Composite Average is an equally weighted average of US stock returns.
- **Fundamental weighting**. This weighting scheme uses company characteristics other than market values, such as sales, cash flow, book value, and dividends, to weight securities. By forming weights based on variables considered important (fundamental) for valuation, these indexes seek to weight securities using true *values,* rather than the market *prices* of capitalization and price weighting. *The performance of a fundamental-weighted index represents the performance of a portfolio that invests according to valuation metrics for a security.*

We discuss the relative advantages and disadvantages of these types of indexes in Section 5.

12 In 2012, the Dow Jones indexes were merged with those of Standard & Poor's.

Determine index maintenance rules

A variety of rules must be chosen by an index constructor to provide for ongoing maintenance of an index. For example, shares outstanding may change due to buybacks, secondary offerings, spinoffs, stock distributions, and so on. Index constructors typically handle these events as they occur, by specified rules.

Given these choices, index constructors will determine index values from which returns can be calculated. When creating an index, index providers face several tradeoffs, which we examine next.

4.3 Index Construction Tradeoffs

Previously, we said that indexes are widely used to represent the performance of asset classes and the "market" in general. They are also increasingly used as a basis for investment vehicles. To satisfy these usages, index construction requires many choices, with accompanying tradeoffs.[13] We examine these tradeoffs following the discussion in Siegel (2003).

Completeness vs. investability

In principle, striving for complete coverage of a market would suggest including every possible security in the investment universe available to investors. Doing so, however, would include many small-capitalization securities that are too illiquid and could not be purchased in amounts relevant to institutional investors. Eliminating hard-to-trade securities improves the investability of an index. Index designers must decide how broad their indexes can be while maintaining adequate investability.

As an example, the Wilshire 5000 is the broadest US equity index, representing more than 5,000 stocks. However, many of its stocks are illiquid and would be costly or very difficult to trade. As a result, no fund has ever tried to replicate the full sample of its securities. When index funds were created to track the Wilshire 5000, about 2,000 of its securities were untradeable. Indeed, one test of the investability of an index is to what extent there are investment funds that fully replicate it.

Investability is not, however, the same as liquidity, as emerging markets sometimes illustrate. A security may have excellent liquidity in its home country but may not be investable for foreign investors if the country's government imposes restrictions. An index representing investment opportunities to developed-world investors should exclude non-tradeable emerging securities, reflecting the free float of the market from a foreign investor's perspective.

Completeness and investability are important when indexes are used as a basis for investment vehicles. In choosing an index, the fund creator should consider how the index has balanced the tradeoff between completeness and investability. A more complete index can provide broader, more diversified performance.[14] However, investability is an important concern for managers facing frequent and uncertain withdrawals. If investors suddenly withdraw funds, portfolio managers must quickly sell securities at possibly low prices. Another consideration is that portfolios tracking more popular indexes tend to have lower trading costs, owing to their greater liquidity.

---

13 Schoenfeld (2003), Enderle, Pope, and Siegel (2003), and Christopherson, Carino, and Ferson (2009) provided evaluations of existing indexes in terms of many of the criteria discussed here.

14 However, a more complete index might also have a greater number of securities that have not traded recently, resulting in stale prices, with reported volatility and correlations that are understated. See Calverley, Meder, Singer, and Staub (2007, Section 2.2).

Reconstitution and rebalancing frequency vs. turnover

The processes of reconstitution and rebalancing are designed to keep an index close to its intended membership and weighting criteria. Reconstitution refers to the process of adding and dropping securities from an index, whereas rebalancing refers to a readjustment in the weights of existing securities.

In principle, more frequent reconstitution and rebalancing would be desirable in order to improve representativeness were it not for the fact that such activities create turnover in the index. Turnover is costly for investors who wish to track an index because they must trade more often. Therefore, there is a conflict between representativeness and low turnover. Index designers must decide how often to reconstitute and rebalance their indexes while maintaining tolerable turnover.

Turnover is a potential concern for managers who track particular size and style indexes because they must trade as companies migrate from one classification to another. As a result, these indexes are less frequently reconstituted by providers. In contrast, the turnover in broad market indexes typically occurs among smaller issues, resulting in less trading when the index is reconstituted. Reconstitution is also less frequent for all-inclusive indexes than for those with a fixed number of securities (e.g., the S&P 500), where securities periodically enter and exit the index.

Rebalancing is of particular concern in international indexes, where float adjustments are more important. At one extreme, index creators could frequently adjust the float of index constituents to precise amounts. This adjustment would result in frequent rebalancing and high transaction costs for tracking portfolios. Instead, many index providers use bands to make float adjustments, where a range is used to capture the percentage of the issue's market cap that is free floating (e.g., 60%–70%). As long as the issue's estimated free float stays within the band, they do not adjust the issue's weight in the index. A narrower band would result in more frequent rebalancing.

Objective and transparent rules vs. judgment

Security prices rise when securities are added to an index and fall when they are deleted from an index. Index reconstitution results in decreased returns for managers tracking the index because they have to buy added securities at higher prices and sell deleted securities at lower prices. These price changes will be more acute for more popular indexes.

Transparency and objectivity are desirable characteristics of indexes because they allow investors to readily predict the changes in index constituents that might occur. This information enables investors to anticipate changes and trade accordingly, instead of reacting to them. Less transparency and the greater use of judgment by the index provider make it harder for investors to determine the constituents of an index and anticipate changes in it, making the index less investable and creating additional costs for tracking portfolios.

All index constructors, however, exercise some degree of judgment in applying their methodologies. Doing so allows providers to adapt to changing circumstances or special situations that might not have been anticipated by explicit rules. Some providers intentionally use committees to choose index constituents, for example, in order to obtain certain characteristics that might be difficult to describe in rules. Index designers must decide when to use judgment in their methodologies and how much to use.

In sum, there are many choices and steps in index construction. An index provider must define the universe of eligible securities, determine the index weighting, and maintain the index. From an index user's perspective, an index should be constructed using simple, transparent methods that are replicable. The index creator should

publish clear, unambiguous construction rules, and the data should be available in a timely manner. We next examine the advantages and disadvantages of index weighting schemes in more detail.

INDEX WEIGHTING SCHEMES: ADVANTAGES AND DISADVANTAGES

5

In the following discussion, we compare the advantages and disadvantages of weighting schemes for indexes. We discuss their attributes in general and discuss the applicability of indexes as benchmarks.

5.1 Capitalization-Weighted Indexes

Capitalization weighting is used in most market indexes for good reasons. First, weighting companies by market value is an objective way of measuring the relative importance of constituents, as it clearly measures the market's assessment of their relative values. A security's price is a consensus estimate of its value formed by a multitude of investors, rather than a single index creator's estimate. Market prices and the number of tradeable securities are unambiguous measures of value at a point in time.

Second, a capitalization-weighted, float-adjusted index is the only index type that all investors could hold. If all investors held all the securities in cap-weighted indexes in proportion to their market value, then all shares would be held, with none left over. This property has been referred to as *macro consistency* (Siegel 2003). With other weighting methods, such as fundamental-weighted indexes, not all investors could hold the index. A cap-weighted index is thus the best representation of a typical investor's opportunity set. As a result, a capitalization-weighted index is superior at succinctly representing the effect of changes in a market's total value and investors' total wealth.

This property is closely related to one of the central results of the original capital asset pricing model (CAPM): Under the assumptions of the CAPM, a cap-weighted portfolio of all assets is efficient, and all investors in a CAPM world would hold a proportional investment in the market portfolio. A cap-weighted index reflects this concept.

Third, a capitalization-weighted index requires less rebalancing than other indexes. In value weighting, changes in prices do not create a need to add or remove shares; the index remains cap weighted after a change in price. The capitalization-weighted index also self-corrects for stock splits because they are reflected in the number of shares outstanding and price per share. If an investor tracks a capitalization-weighted index and there are no changes in the index constituents, then the portfolio will automatically track the index and no rebalancing is necessary. Other weighting schemes require periodic trades to bring the weights back to those required by the scheme.

There are disadvantages of capitalization weighting however. First, because they are market value weighted, these indexes could be overly influenced by overpriced securities. As a security's price increases through time, its representation in the index will grow. The capitalization-weighted index is thus potentially more susceptible to market bubbles and will not necessarily represent an efficient investment from a risk–return perspective. Second, the index may be overly concentrated because large issues will be weighted the most heavily. For example, in 2013, the 10 largest constituents of the S&P 500 represented approximately 19% of its value.[15] Some investors may prefer

15 28 March 2013 S&P 500 Fact Sheet, available at http://www.spindices.com.

a more diversified portfolio. Similarly, active managers may desire weights that are different from those of the index, and institutional investors may not be able to track a capitalization-weighted index if they are subject to maximum holdings. Portfolio risk and return for these managers may, therefore, substantially deviate from the index, meaning that the index will not serve as a valid benchmark.

5.2 Price-Weighted Indexes

The main advantage of price-weighted indexes lies in the simplicity of their construction. Price-weighted indexes also have a long historical track record, which facilitates investment research. For example, the DJIA was first published in 1896.

There are several disadvantages of price-weighted indexes. First, price-weighted indexes are overly influenced by the highest-priced securities because they have greater weights in the calculation of the indexes' returns.[16] Because price-weighted indexes weight by price instead of total market value, they do not necessarily reflect the economic importance of issuing companies. Second, stocks that appreciate often experience stock splits, and their weights in the index will decrease. Successful companies will become underrepresented, creating a downward bias in the index return. Lastly, price-weighted indexes assume an investor holds one unit of each security in the index, which does not describe how most investors form portfolios.

5.3 Equal-Weighted Indexes

The primary advantage of equal-weighted indexes is that they give smaller weights to large-cap securities (and larger weights to small-cap securities) than indexes formed by cap weighting. By reducing exposures to the largest-cap securities, the index is thereby less concentrated in those securities and more diversified. Proponents of this approach suggest that market prices do not always reflect true value and that equal weights reflect a more naive or informationless weighting of a portfolio, resulting in superior returns during particular historical periods. Second, these indexes may better represent "how the market did" because they provide an average of all index security returns.

However, some argue that this type of weighting results in a small-issuer bias, the primary disadvantage of equal-weighted indexes, because small issuers are weighted the same as large ones. Second, to maintain equal weighting, strong-performing issues must be sold and weak performers must be bought, resulting in frequent rebalancing and high transaction costs for a portfolio tracking such an index. Third, the inclusion of small issuers means that investors tracking the index may not be able to find liquidity in some of these issues.

5.4 Fundamental-Weighted Indexes

The proponents of fundamental-weighted indexes argue that capitalization-weighted indexes overweight overvalued issues and underweight undervalued issues. Fundamental-weighted indexes seek to avoid this problem by using valuation metrics, rather than market value, to weight index constituents. Proponents also assert that these indexes will be more representative of an issuer's importance in an economy because they weight by fundamentals, rather than by market prices subject to bubbles.

16 Some price-weighted indexes, such as the Nikkei 225 for Japanese equities, reduce the weighting of high-priced stocks to minimize this bias. See Gastineau, Olma, and Zielinski (2007) for an illustration and discussion.

A disadvantage of fundamental-weighted indexes is that they reflect the index creator's view of valuation, which may or may not be correct. The fact that there are different methods of constructing fundamental-weighted indexes in the industry demonstrates that they rely on subjective judgment. A second disadvantage is that they may be less diversified than capitalization-weighted indexes if the valuation screen is restrictive. Third, as mentioned previously, not all investors could hold a fundamental-weighted index because they are weighted by valuation metrics, not by available liquidity (market capitalization). Fourth, the construction methodology used by these indexes is usually proprietary because they are created to market a fundamental-weighted fund. In this case, these indexes would not serve as valid benchmarks because their composition and weightings are not fully known.

Fifth, just because fundamental-weighted indexes have outperformed capitalization-weighted indexes in certain past time periods does not mean they will in the future and, more importantly, does not indicate that they are useful indexes. As a reflection of "how the market did," an index should be judged on whether it is a representative sample, not on its performance. It is active management that is intended to deliver superior performance, not indexes. Index performance should be an outcome of index construction, not an objective. Furthermore, the reason why fundamental-weighted indexes have outperformed historically is that they are usually tilted toward small-cap value stocks, a well-documented effect in academic literature. For investors preferring a large-cap or growth emphasis, fundamental-weighted indexes would not serve as ideal benchmarks.

5.5 Choosing an Equity Index Weighting Scheme When an Index Is Used as a Benchmark

A natural categorization among indexes divides those that are cap weighted from those that are not. The objectivity, practicality, and theoretical underpinning of market capitalization weighting has made it the dominant scheme for constructing indexes. In most cases, benchmarks should be capitalization weighted and then float adjusted, reflecting the fact that most portfolio managers will take smaller positions in less available, less liquid securities. Of the index types examined, capitalization-weighted, float-adjusted indexes are considered the best for use as benchmarks because they are the most easily mimicked with the least amount of tracking risk and cost. The major equity index families published by FTSE, MSCI, Russell, and S&P and nearly all those published by S&P Dow Jones and Wilshire are cap weighted and float adjusted.

Non-cap-weighted indexes are often proposed to seek return (or risk-adjusted return) in excess of that provided by a cap-weighted index. The primacy of cap-weighted indexes as benchmarks is supported by the fact that a cap-weighted return must be calculated in order to determine by how much an alternate strategy might exceed it. As performance benchmarks, capitalization-weighted indexes are superior to the other index types because, simply put, they best tell us how a manager did relative to everyone else (i.e., the entire market). Price-weighted and equal-weighted indexes are best seen as particular market indicators that are generally not reasonable benchmarks. Fundamental-weighted indexes may or may not serve as viable investment strategies, but they do not serve the traditional representative role of an index and their proprietary nature means that it would be difficult to use them for manager evaluation.

In sum, capitalization-weighted indexes are the most likely type of index to serve as a valid benchmark for an investor. The next question is how they fare against standards for benchmark validity. We next examine in more detail whether float-adjusted, capitalization-weighted indexes can serve as valid benchmarks.

5.6 Market Indexes as Benchmarks

From our previous discussion, we concluded that if a market index is to be used as a benchmark, a capitalization-weighted, float-adjusted index would likely be the best benchmark for most managers. Established indexes of that type are widely available, commonly accepted, and readily understood. In terms of the Bailey, Richards, and Tierney (2007) tests of benchmark validity, these market indexes generally fulfill most criteria because they are easily measurable, unambiguous, specified in advance, and generally investable. Most managers would also be familiar with and have an opinion on index securities. Plan sponsors may find market indexes acceptable as benchmarks if their managers select from the same universe of securities as the indexes and have no obvious style biases.

However, capitalization-weighted, float-adjusted indexes may have several limitations for use as benchmarks. First, a value-weighted approach might not be compatible with a manager's investment approach. For example, as noted, value weighting may lead to concentration in large issues. Second, some construction rules might be less transparent than desired. As an example, consider float adjustment. Although desirable, some index providers do not fully disclose their adjustment process, and there is also no standardization of the process among providers. Moreover, as an index is reconstituted, its composition changes over time, sometimes in non-predictable ways. As a result, an index's style, sector, and risk exposures can change drastically over time.[17]

In terms of the Bailey, et al. benchmark validity criteria, a market index will not be appropriate as a benchmark if the manager's style differs from the index's style. In this case, managers should not and likely would not be willing to be held accountable to the index. This shortcoming of market indexes as benchmarks reflects the fact that market indexes are designed to be representative of a market segment, not a particular manager's portfolio. The performance of a broad market index is usually influenced by many factors, few of which would be related to a manager's style or skill. A capitalization-weighted index is usually only valid as a benchmark when the manager takes a market-oriented approach or specifically tracks the index.

In summary, market indexes are similar to Swiss Army knives; they serve many useful purposes but are sometimes not the best tool for the job.[18] If market indexes do not capture a manager's investment process, a custom benchmark is often constructed, an example of which we examine in the next section.

EXAMPLE

A Japanese Stock Market Index

The Nikkei 225 index is a widely followed, price-weighted index of 225 large-cap Japanese stocks with a history extending back to 1950. It represents six sectors and 36 industries, with the largest sector being technology at 43%. The ten largest companies represent 36% of its value. It is reconstituted every October and excludes REITs and ETFs. Stocks added to the index are chosen by a committee of academicians and market professionals for their liquidity and sector representation. The changes to the index are announced before stocks are added or deleted.[19]

17 See Amenc, Goltz, and Tang (2011, Section 2) for an excellent literature review and analysis of market index issues, upon which some of our discussion in this section is based.
18 This analogy is provided by Schoenfeld (2002).
19 Data on the Nikkei indexes can be obtained at http://indexes.nikkei.co.jp/en/nkave/index.

Discuss the use of the Nikkei 225 as an asset allocation proxy, investment management mandate, performance benchmark, gauge of market sentiment, basis for an investment vehicle, and in portfolio analysis.

Solution:

The Nikkei 225 is widely-followed, represents a large portion of the Japanese equity market, and is diversified across many industries. Thus, it is a good representation of Japanese equity market performance and would serve as a useful asset allocation proxy and gauge of market sentiment.

Regarding its usefulness for a specific investment manager or investment, we would evaluate it as an investment management mandate, as a performance benchmark, as a basis for an investment vehicle, and for its usefulness in portfolio analysis. The index balances completeness and investability by selecting securities with wide industry representation and liquidity. The index is reconstituted only once a year, so tracking it would not incur inordinate trading costs. The index therefore has potential to serve as an investment vehicle.

However, investor seeking to track the index would need to be aware of several peculiarities. First, price-weighted indexes assume an investor holds one unit of each index security, which is not how most investors form portfolios. Second, the Nikkei 225 index may be overweighted by high-priced securities and sectors. As of early 2014, the technology sector was almost half the index's weight at 43% and the ten largest companies represented 36% of its value. Third, the judgment of a committee is used to determine which securities are added or deleted. Therefore, it may be difficult for investors to adjust tracking portfolios prior to the reconstitution announcement. Securities would be bought at inflated prices or sold at deflated prices if the investor is unable to anticipate index changes. For these reasons, the Nikkei 225 has limitations as an investment management mandate, performance benchmark, basis for an investment vehicle, or for use in portfolio analysis.

BENCHMARK SELECTION: AN EXAMPLE

6

In our discussion, we have emphasized that the benchmark should be constructed so as to be consistent with the portfolio's objectives and the manager's investment process. We now provide an example to illustrate the selection of a benchmark.

Consider a pension fund with the following sponsor characteristics, portfolio objectives, and manager investment process:

- The fund manager has full discretion over the portfolio and its benchmark creation. The fund is tax exempt.
- The sponsor is a US technology company with cyclical earnings and the majority of its sales in Japan.
- The sponsor is highly levered and has recently experienced financial difficulties.
- The sponsor has made large contributions to the fund owing to increased life expectancies and wishes to avoid future required contributions.
- Ten years ago, interest rates dropped to historic lows, and the sponsor's pension liability soared. As a result, the company switched from a defined benefit plan to a defined contribution plan for new employees to limit its future pension liabilities.
- The plan is fully funded.

- The percentage of participants in the plan who are now retired and receiving their pensions is 40%. The average duration of the liabilities is 12.5 years.
- The benefits are indexed to inflation. Future benefits will also increase as wages for current employees increase.
- The plan contains a lump sum provision whereby retirees can take a cash distribution at retirement in lieu of future payments. The plan will have to provide the required cash distributions at that time.
- The manager starts with the Bloomberg Barclays Global Government, Corporate, and Inflation-Linked bond indexes as the target for bonds.
- Bonds will be used to provide liquidity and limit the risk exposure of the fund. Bonds also have a low correlation with the sponsor's cash flows.
- A total return approach will be used to meet required liquidity; however, the equity portion of the portfolio will be tilted toward dividend-paying stocks. Because the fund is tax exempt, capital gains are not favored over ordinary income.
- The preference for dividend-paying stocks is also consistent with the manager's belief that value stocks outperform growth stocks. The equity portfolio will be composed of value stocks, identified as low-price-to-book stocks.
- The manager starts with the MSCI World Index as the target for equities.
- The manager believes that the Japanese equity market is overvalued. The manager will also exclude Japanese stocks because of the sponsor's dependency on Japan.
- The manager will exclude technology stocks because of their high correlation with the sponsor's cash flows.

One approach to benchmark construction would be to use a blend of the MSCI World Index and the Bloomberg Barclays bond indexes that reflects the intended portfolio asset allocation. Alternatively, a value style version of the MSCI World Index could be used for the equity portion. The portfolio's risk exposures could also be modeled with factor-model-based or returns-based benchmarks. However, these benchmark candidates would contain many securities not consistent with the plan's strategic investment objectives. They may also misrepresent the manager's style.

The ideal benchmark will be a custom security-based benchmark whose assets, securities, and their weighting are chosen to mimic the liabilities. The construction of the benchmark will require a great deal of time and care. Data on securities in the indexes and the plan's characteristics and strategic investment objectives will be required.

A custom security-based benchmark would be constructed with the following attributes and features.

- The plan portfolio appears to have below-average ability to take risk because the manager prefers liquid, income-producing investments and the sponsor does not wish to make further contributions to the fund.
- The benchmark's asset allocation and security weighting should reflect the plan's liability duration of 12.5 years.
- Because pension benefits are indexed to inflation and future benefits will increase as the business grows in the future, the portfolio and benchmark will contain allocations to nominal bonds, inflation-indexed bonds, and equities.
- The Bloomberg Barclays Global Government, Corporate, and Inflation-Linked bond indexes are the initial bond universe. From this universe, only investment-grade bonds and bonds with reasonable liquidity will be considered owing to the plan's risk aversion and its need for liquidity.

- The MSCI World Index is the initial equity universe. The equities selected for benchmark inclusion will be screened to ensure a composition of dividend-paying value stocks. Stocks with a large exposure to Japan and the technology industry will be excluded.
- The benchmark will have a cash allocation that, together with income from the investments, is sufficient to meet the liquidity required by retirement benefits due within the next year.
- The preliminary benchmark should be reviewed for consistency with the plan objectives and modified as appropriate.

Once constructed, the benchmark will be rebalanced through time to reflect changes in the investment process and ensure that it is still consistent with the fund's objectives. For example, the liability duration will decline through time, or the manager may change his views on the relative attractiveness of value and growth stocks.

SUMMARY

- Benchmarks play key roles in the highly competitive investment management industry because most managers are hired, retained, and often compensated on the basis of their performance relative to a benchmark. A poorly specified benchmark will result in performance measurement, attribution, and appraisal analyses that are invalid.
- Although they are often used as benchmarks, market indexes are distinct from benchmarks. Market indexes have a wide variety of uses whereas benchmarks should be specific to a particular manager's investment process.
- In addition to their use in performance measurement and attribution, benchmarks facilitate communication between sponsors, investment managers, and consultants; identify risk exposures; and assist with manager selection, marketing, and regulatory compliance.
- Benchmark types include absolute return benchmarks, manager universes, broad market indexes, style indexes, factor-model-based benchmarks, returns-based benchmarks, custom security-based.
- Liability-based benchmark can be contrasted with asset-based benchmarks. A liability-based benchmark will match the duration profile and other key characteristics of the liabilities. Unlike asset-based benchmarks such as market indexes in which the components' weights typically reflect relative overall market values, in a liability-based benchmark component weights are determined based on the requirement that the benchmark closely track returns to the liabilities.
- Market indexes are used for asset allocation, investment management mandates, performance benchmarks, portfolio analysis, gauges of market sentiment, and the basis for investment vehicles.
- Market indexes can be capitalization-weighted, price-weighted, equal-weighted, or fundamental-weighted. Although there are advantages and disadvantages to each weighting scheme, capitalization-weighting is generally the most appropriate methodology when indexes are used as benchmarks.

- A capitalization-weighted index is typically only valid as a benchmark when the manager takes a market-oriented approach or specifically tracks the index.
- When constructing an index, the creator must accept tradeoffs between completeness vs. investability; reconstitution and rebalancing frequency vs. turnover; objective and transparent rules vs. judgment.

REFERENCES

Amenc, Noel, Felix Goltz, and Lin Tang. 2011. *EDHEC-Risk European Index Survey 2011*. EDHEC Risk Institute (October): http://professoral.edhec.com/servlet/com.univ.collaboratif.utils.LectureFichiergw?ID_FICHIER=1328885973962.

Bailey, Jeffery V., Thomas M. Richards, and David E. Tierney. 2007. "Evaluating Portfolio Performance." In *Managing Investment Portfolios: A Dynamic Process*, 3rd edition. Edited by John Maginn, Donald Tuttle, Dennis McLeavey, and Jerald Pinto. Hoboken, NJ: John Wiley & Sons.

Bernstein, Peter L. 2000. "A Modest Proposal: Portfolio Management Practice for Modern Times." *Economics & Portfolio Strategy* (15 April).

Brown, Stephen, and William Goetzmann. 1997. "Mutual Fund Styles." *Journal of Financial Economics*, vol. 43, no. 3 (March):373–399.

Calverley, J.P., A.M. Meder, B.D. Singer, and R. Staub. 2007. "Capital Market Expectations." In *Managing Investment Portfolios: A Dynamic Process*, 3rd edition. Edited by John Maginn, Donald Tuttle, Dennis McLeavey, and Jerald Pinto. Hoboken, NJ: John Wiley & Sons.

Christopherson, Jon A., David R. Carino, and Wayne. E. Ferson. 2009. *Portfolio Performance Measurement and Benchmarking*. New York: McGraw–Hill.

Enderle, Francis J., Brad Pope, and Laurence B. Siegel. 2003. "Broad-Capitalization Indexes of the U.S. Equity Market." *Journal of Investing*, vol. 12, no. 1 (Spring):11–22.

Gastineau, Gary L., Andrew L. Olma, and Robert G. Zielinski. 2007. "Equity Portfolio Management." In *Managing Investment Portfolios: A Dynamic Process*, 3rd edition. Edited by John Maginn, Donald Tuttle, Dennis McLeavey, and Jerald Pinto. Hoboken, NJ: John Wiley & Sons.

Schoenfeld, Steven A. 2002. "Perfection Impossible—Why Simply 'Good' Indexes Can Result in a More Perfect Solution." *Journal of Indexes* (2nd quarter).

Schoenfeld, Steven A. 2003. *Active Index Investing—Maximizing Portfolio Performance and Minimizing Risk through Global Index Strategies*. Hoboken, NJ: John Wiley & Sons.

Siegel, L. 2003. *Benchmarks and Investment Management*. Charlottesville, VA: Research Foundation of CFA Institute.

PRACTICE PROBLEMS

1 MSCI publishes both "gross" and "net" versions of its global total return indexes. Gross indexes are gross of withholding taxes, whereas net indexes reinvest dividends after the application of withholding taxes. Withholding taxes are often applied to dividend and interest income received by foreign investors, but the investor may receive relief from tax treaties between his country and the company's country. The net indexes assume a foreign investor does not benefit from tax treaties.

Discuss the suitability of the gross and net versions as benchmarks for both domestic and foreign investors.

2 In each of the following situations, discuss the appropriate type of benchmark.

A An active manager seeks to generate alpha by investing in a subset of the MSCI EAFE Small Cap Value index.

B An investment fund taking long and short positions in equities is given as a benchmark the three-month Treasury bill return plus 150 bps.

C A defined benefit pension plan must generate the cash flows necessary to satisfy retiree benefits. The plan sponsor takes a liability-relative approach to investing.

D A manager attempts to track the performance of the S&P 500 by investing in a representative sample of stocks that are constituents of the index.

3 Over a one-year period, small-cap stocks outperform large-cap stocks by more than 400 basis points; however, there has been large variation in performance among issues. Relative to a broad market, capitalization-weighted index of the same securities, discuss the following:

A How an equal-weighted index would perform

B Which index would require more frequent rebalancing

4 In each of the following cases, discuss which property of a valid benchmark is *most likely* to have been violated.

A A traditional small-cap investment manager uses the S&P 500 as a benchmark.

B In a month in which a manager has a particularly bad return compared with his benchmark, the manager states that the portfolio's benchmark should be replaced with another benchmark that tracks better.

5 Fundamental-weighted indexes, a fairly recent innovation, weight component securities by sales, earnings, cash flow, and/or other valuation metrics. Their goal is to outperform capitalization-weighted indexes by underweighting overvalued shares and overweighting undervalued shares. They have successfully served as bases for investment vehicles for many exchange traded funds. It has been argued, however, that fundamental-weighted indexes represent nothing more than a traditional value strategy.

In light of this claim, would a fundamental-weighted index serve as a valid benchmark for most value investors?

6 The SDAX index is an index of 50 small-cap German equities provided by the Deutsche Börse. The weight of any single issue is capped at 10%. Discuss how the cap affects the index's tradeoff between completeness and investability.

© 2014 CFA Institute. All rights reserved.

SOLUTIONS

1 The gross versions of the MSCI indexes would probably not be suitable as a benchmark for a foreign investor who resided in a country that did not have tax treaties with the country where the company is domiciled. The investor would be subject to taxes that the index return did not consider. In this investor's case, the net version of the index would be more likely to serve as a valid benchmark for the investor.

The net versions of the global indexes would probably not serve as a suitable benchmark for domestic investors because the indexes incorporate an income tax that the investor may not be subject to. The gross index would be more suitable for this investor.

2 **A** The appropriate benchmark would be the MSCI EAFE Small Cap Value index because that index represents the set of securities within which the manager invests.

B The benchmark of the Treasury bill return plus l50 bps is an absolute return benchmark.

C The appropriate type of benchmark is a liability-based benchmark. Pension plans must satisfy the liabilities created by the payments owed to plan participants.

D If the investment objective is to track the performance of an index, a broad market index (here the S&P 500) would be the appropriate benchmark.

3 **A** An equal-weighted index gives a higher weight to small stocks. During periods in which small companies outperform large, an equal-weighted index should outperform an index that has greater weight in large companies, such as a capitalization-weighted index.

B To maintain equal weighting in an equal-weighted index, strong performers must be sold and replaced with weaker performers, implying a recurring need to rebalance. This is especially costly when there is large variation in the performance for component securities because there will have been greater divergence from equal weighting.

In a capitalization-weighted index, the weight to strong performers naturally increases as their price increases and the weight to weak performers naturally decreases. Thus, an explicit need to rebalance is not present unless the index is reconstituted.

4 **A** The benchmark property most likely to be violated is appropriateness. To be considered appropriate, the benchmark must be consistent with the manager's investment style or area of expertise. Given that the manager is a traditional small-cap investor, the use of a large-cap index (the S&P 500) would not be appropriate.

B The benchmark should not be considered valid if the manager is not willing to be held accountable to the benchmark across time. The manager and sponsor should agree to the benchmark before the measurement period.

5 Fundamental-weighted indexes have served as the bases for investment vehicles and are thus investable. However, they generally will not serve as valid benchmarks. Fundamental-weighted indexes are proprietary indexes whose contents reflect the index creator's view of valuation, which may result in a style that is not appropriate for the portfolio manager.

6 The cap will prevent any one security from dominating the index's performance. The cap will result in more diversified performance and help the index better serve as a gauge of market sentiment for small-cap German equities.

However, the cap may force greater weight in securities with low liquidity. The cap may make it more difficult for large institutional investors to track the index and for the index to serve as the basis for an investment vehicle. The cap thus may impair the index's investability.

CUSTOMER SERVICE

68

Glossary

Absolute return benchmark A minimum target return that an investment manager is expected to beat.

Absolute return vehicles Investments that have no direct benchmark portfolio.

Accounting defeasance Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

Accounting risk The risk associated with accounting standards that vary from country to country or with any uncertainty about how certain transactions should be recorded.

Accumulated benefit obligation (ABO) The present value of pension benefits, assuming the pension plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date.

Accumulated service Years of service of a pension plan participant as of a specified date.

Active investment strategies An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active-lives The portion of a pension fund's liabilities associated with active workers.

Active management An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active return The portfolio's return in excess of the return on the portfolio's benchmark.

Active risk The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

Active risk budgeting Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

Actual extreme events A type of scenario analysis used in stress testing. It involves evaluating how a portfolio would have performed given movements in interest rates, exchange rates, stock prices, or commodity prices at magnitudes such as occurred during past extreme market events (e.g., the stock market crash of October 1987).

Ad valorem fees Fees that are calculated by multiplying a percentage by the value of assets managed; also called assets under management (AUM) fees.

Adaptive markets hypothesis (AMH) A hypothesis that applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives.

Adverse selection risk The risk associated with information asymmetry; in the context of trading, the risk of trading with a more informed trader.

Algorithmic trading Automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints.

Allocation/selection interaction return A measure of the joint effect of weights assigned to both sectors and individual securities; the difference between the weight of the portfolio in a given sector and the portfolio's benchmark for that sector, times the difference between the portfolio's and the benchmark's returns in that sector, summed across all sectors.

Alpha Excess risk-adjusted return.

Alpha and beta separation An approach to portfolio construction that views investing to earn alpha and investing to establish systematic risk exposures as tasks that can and should be pursued separately.

Alpha research Research related to capturing excess risk-adjusted returns by a particular strategy; a way investment research is organized in some investment management firms.

Alternative investments Groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments.

Anchoring and adjustment An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring and adjustment bias An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring trap The tendency of the mind to give disproportionate weight to the first information it receives on a topic.

Angel investor An accredited individual investing chiefly in seed- and early-stage companies.

Anomalies Apparent deviations from market efficiency.

Ask price The price at which a dealer will sell a specified quantity of a security. Also called *ask*, *offer price*, or *offer*.

Ask size The quantity associated with the ask price.

Aspirational risk bucket In goal-based portfolio planning, that part of wealth allocated to investments that have the potential to increase a client's wealth substantially.

Asset covariance matrix The covariance matrix for the asset classes or markets under consideration.

Asset/liability management The management of financial risks created by the interaction of assets and liabilities.

Asset location The type of account an asset is held within, e.g., taxable or tax deferred.

Asset-only With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

Assurity of completion In the context of trading, confidence that trades will settle without problems under all market conditions.

Assurity of the contract In the context of trading, confidence that the parties to trades will be held to fulfilling their obligations.

Asynchronism A discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

AUM fee A fee based on assets under management; an *ad valorem* fee.

Authorized participants Broker/dealers who enter into an agreement with the distributor of the fund.

Automated trading Any form of trading that is not manual, including trading based on algorithms.

Availability bias An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

Average effective spread A measure of the liquidity of a security's market. The mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study.

Back office Administrative functions at an investment firm such as those pertaining to transaction processing, record keeping, and regulatory compliance.

Backtesting A method for gaining information about a model using past data. As used in reference to VaR, it is the process of comparing the number of violations of VaR thresholds over a time period with the figure implied by the user-selected probability level.

Backwardation With respect to the futures curve in a commodity futures market, the condition of being downward sloping.

Balance of payments An accounting of all cash flows between residents and nonresidents of a country.

Bancassurance The sale of insurance by banks.

Barbell A fixed income portfolio combining securities concentrated in short and long maturities relative to the benchmark.

Base With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in "one unit of a currency."

Base-rate neglect A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

Basis point value (BPV) The change in the bond price for a 1 basis point change in yield. Also called *present value of a basis point* or *price value of a basis point (PVBP)*.

Basis risk The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

Batch auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Bayes' formula A mathematical rule explaining how existing probability beliefs should be changed given new information; it is essentially an application of conditional probabilities.

Bear spread An option strategy that involves selling a put with a lower exercise price and buying a put with a higher exercise price. It can also be executed with calls.

Behavioral finance An approach to finance based on the observation that psychological variables affect and often distort individuals' investment decision making.

Behavioral finance macro A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

Behavioral finance micro A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

Benchmark In an investments context, a standard or point of reference for evaluating the performance of an investment portfolio.

Benchmark spread The yield on a credit security over the yield on a security with little or no credit risk (benchmark bond) and with a similar duration.

Best efforts order A type of order that gives the trader's agent discretion to execute the order only when the agent judges market conditions to be favorable.

Beta A measure of the sensitivity of a given investment or portfolio to movements in the overall market.

Beta research Research related to systematic (market) risk and return; a way investment research is organized in some investment management firms.

Bid The price at which a dealer will buy a specified quantity of a security. Also called *bid price*.

Bid–ask spread The difference between the current bid price and the current ask price of a security.

Bid price In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

Bid size The quantity associated with the bid price.

Block order An order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets.

Bond-yield-plus-risk-premium method An approach to estimating the required return on equity which specifies that required return as a bond yield plus a risk premium.

Bottom-up Focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development.

Bottom-up approach A credit strategy approach that involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features.

Bounded rationality The notion that people have informational and cognitive limitations when making decisions and do not necessarily optimize when arriving at their decisions.

Box spread An option strategy that combines a bull spread and a bear spread having two different exercise prices, which produces a risk-free payoff of the difference in the exercise prices.

Broad market indexes An index that is intended to measure the performance of an entire asset class. For example, the S&P 500 Index, Wilshire 5000, and Russell 3000 indexes for US common stocks.

Broker An agent of a trader in executing trades.

Brokered markets Markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.

Bubbles Episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value.

Buffering With respect to style index construction, rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style.

Build-up approach Synonym for the risk premium approach.

Bull spread An option strategy that involves buying a call with a lower exercise price and selling a call with a higher exercise price. It can also be executed with puts.

Bullet A fixed income portfolio made up of securities targeting a single segment of the curve.

Business cycle Fluctuations in GDP in relation to long-term trend growth, usually lasting 9–11 years.

Business risk The equity risk that comes from the nature of the firm's operating activities.

Butterfly spread An option strategy that combines two bull or bear spreads and has three exercise prices, or, a measure of yield curve curvature.

Buy side Investment management companies and other investors that use the services of brokerages.

Buy-side traders Professional traders that are employed by investment managers and institutional investors.

Calendar-and-percentage-of-portfolio rebalancing Monitoring a portfolio at regular frequencies, such as quarterly. Rebalancing decisions are then made based upon percentage-of-portfolio principles.

Calendar rebalancing Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

Calmar ratio The compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period.

Cap A combination of interest rate call options designed to hedge a borrower against rate increases on a floating-rate loan.

Cap weighting See *capitalization weighting*.

Capital adequacy ratio A measure of the adequacy of capital in relation to assets.

Capital flows forecasting approach An exchange rate forecasting approach that focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment.

Capital market expectations (CME) Expectations concerning the risk and return prospects of asset classes.

Capitalization weighting The most common security weighting scheme in which constituents are held in proportion to their market capitalizations, calculated as price times available shares. Also known as *market value*, *market cap*, or *cap weighting*.

Caplet Each component call option in a cap.

Carried interest A private equity fund manager's incentive fee; the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital.

Carry trade A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

Cash balance plan A defined-benefit plan whose benefits are displayed in individual recordkeeping accounts.

Cash flow at risk A variation of VaR that measures the risk to a company's cash flow, instead of its market value; the minimum cash flow loss expected to be exceeded with a given probability over a specified time period.

Cash flow matching Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps.

Cell approach See *stratified sampling*.

Certainty equivalent The maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in an opportunity.

Chain-linking A process for combining periodic returns to produce an overall time-weighted rate of return.

Cheapest-to-deliver A bond in which the amount received for delivering the bond is largest compared with the amount paid in the market for the bond.

Civil law A legal system derived from Roman law, in which judges apply general, abstract rules or concepts to particular cases. In civil systems, law is developed primarily through legislative statutes or executive action.

Clawback provision With respect to the compensation of private equity fund managers, a provision that specifies that money paid to the fund manager be returned to the investors if, at the end of a fund's life, the investors have not received back their capital contributions and contractual share of profits.

Closed-book markets Markets in which a trader does not have real-time access to all quotes in a security.

Closeout netting In a bankruptcy, a process by which multiple obligations between two counterparties are consolidated into a single overall value owed by one of the counterparties to the other.

Cobb-Douglas model A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cobb-Douglas production function A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cognitive dissonance The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

Cognitive errors Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

Collar An option strategy involving the purchase of a put and sale of a call in which the holder of an asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. Collars also can be used to provide protection against rising interest rates on a floating-rate loan by giving up gains from lower interest rates.

Commingled real estate funds (CREFs) Professionally managed vehicles for substantial commingled (i.e., pooled) investment in real estate properties.

Commitment period The period of time over which committed funds are advanced to a private equity fund.

Commodities Articles of commerce such as agricultural goods, metals, and petroleum; tangible assets that are typically relatively homogeneous in nature.

Commodity trading advisers (CTAs) Registered advisers who manage futures funds.

Common law A legal system which draws abstract rules from specific cases. In common law systems, law is developed primarily through decisions of the courts.

Community property regime A marital property regime under which each spouse has an indivisible one-half interest in property received during marriage.

Company-specific risk The non-systematic or idiosyncratic risk specific to a particular company's operations, reputation, and business environment.

Completeness fund A portfolio that, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.

Confidence band With reference to a quality control chart for performance evaluation, a range in which the manager's value-added returns are anticipated to fall a specified percentage of the time.

Confirmation bias A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

Confirming evidence trap The bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it.

Conjunction fallacy An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

Conservatism bias A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

Consistent growth A growth investment substyle that focuses on companies with consistent growth having a long history of unit-sales growth, superior profitability, and predictable earnings.

Constant returns to scale A characteristic of a production function such that a given percentage increase in capital stock and labor input results in an equal percentage increase in output.

Contingent immunization Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

Continuous auction markets Auction markets where orders can be executed at any time during the trading day.

Contrarian A value investment substyle focusing on stocks that have been beset by problems.

Controlled foreign corporation A company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law.

Convexity A measure of how interest rate sensitivity changes with a change in interest rates.

Core capital The amount of capital required to fund spending to maintain a given lifestyle, fund goals, and provide adequate reserves for unexpected commitments.

Core–satellite A way of thinking about allocating money that seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles.

Core-satellite portfolio A portfolio in which certain investments (often indexed or semi-active) are viewed as the core and the balance are viewed as satellite investments fulfilling specific roles.

Corporate governance The system of internal controls and procedures used to define and protect the rights and responsibilities of various stakeholders.

Corporate venturing Investments by companies in promising young companies in the same or a related industry.

Covered call An option strategy involving the holding of an asset and sale of a call on the asset.

Creation units Large blocks of ETF shares often traded against a basket of underlying securities.

Credit default swap A swap used to transfer credit risk to another party. A protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event.

Credit derivative A contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

Credit method When the residence country reduces its taxpayers' domestic tax liability by the amount of taxes paid to a foreign country that exercises source jurisdiction.

Credit risk The risk of loss caused by a counterparty's or debtor's failure to make a timely payment or by the change in value of a financial instrument based on changes in default risk. Also called *default risk*.

Credit spread forward A forward contract used to transfer credit risk to another party; a forward contract on a yield spread.

Credit spread option An option based on the yield spread between two securities that is used to transfer credit risk.

Credit VaR A variation of VaR related to credit risk; it reflects the minimum loss due to credit exposure with a given probability during a period of time.

Credited rates Rates of interest credited to a policyholder's reserve account.

Cross-default provision A provision stipulating that if a borrower defaults on any outstanding credit obligations, the borrower is considered to be in default on all obligations.

Cross hedge A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

Currency overlay programs A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

Current credit risk The risk of credit-related events happening in the immediate future; it relates to the risk that a payment currently due will not be paid. Also called *jump-to-default risk*.

Custom security-based benchmark Benchmarks that are custom built to accurately reflect the investment discipline of a particular investment manager. Also called *strategy benchmarks* because they reflect a manager's particular strategy.

Cyclical stocks The shares of companies whose earnings have above-average sensitivity to the business cycle.

Cyclically Adjusted P/E Ratio (CAPE) A price-to-earnings ratio in which the numerator (in a US context) is defined as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings on the S&P 500.

Day traders Traders that rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are prepared to hold a position. Day traders hold a position open somewhat longer than a scalper but closing all positions at the end of the day.

Dealer A business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order. Also called *market maker*.

Decision price The prevailing price when the decision to trade is made. Also called *arrival price* or *strike price*.

Decision-reversal risk The risk of reversing a chosen course of action at the point of maximum loss.

Decision risk The risk of changing strategies at the point of maximum loss.

Deduction method When the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income.

Deemed dispositions Tax treatment that assumes property is sold. It is sometimes seen as an alternative to estate or inheritance tax.

Deemed distribution When shareholders of a controlled foreign corporation are taxed as if the earnings were distributed to shareholders, even though no distribution has been made.

Default risk The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.

Default risk premium Compensation for the possibility that the issue of a debt instrument will fail to make a promised payment at the contracted time and in the contracted amount.

Defaultable debt Debt with some meaningful amount of credit risk.

Deferred annuity An annuity that enables an individual to purchase an income stream that will begin at a later date.

Defined-benefit plan A pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants.

Defined-contribution plan A pension plan that specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants.

Deflation A decrease in the general level of prices; an increase in the purchasing power of a unit of currency.

Delay costs Implicit trading costs that arise from the inability to complete desired trades immediately due to order size or market liquidity. Also called *slippage*.

Delta The relationship between the option price and the underlying price, which reflects the sensitivity of the price of the option to changes in the price of the underlying.

Delta hedge An option strategy in which a position in an asset is converted to a risk-free position with a position in a specific number of options. The number of options per unit of the underlying changes through time, and the position must be revised to maintain the hedge.

Delta hedging Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

Delta-normal method A measure of VaR equivalent to the analytical method but that refers to the use of delta to estimate the option's price sensitivity.

Demand deposit A deposit that can be drawn upon without prior notice, such as a checking account.

Demutualizing The process of converting an insurance company from mutual form to stock.

Descriptive statistics Methods for effectively summarizing data to describe important aspects of a dataset.

Differential returns Returns that deviate from a manager's benchmark.

Diffusion index An index that measures how many indicators are pointing up and how many are pointing down.

Direct commodity investment Commodity investment that involves the cash market purchase of physical commodities or exposure to changes in spot market values via derivatives, such as futures.

Direct market access Platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker.

Disability income insurance A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

Discounted cash flow models (DCF models) Valuation models that express the idea that an asset's value is the present value of its (expected) cash flows.

Discretionary trust A trust structure in which the trustee determines whether and how much to distribute in the sole discretion of the trustee.

Disintermediation To withdraw funds from financial intermediaries for placement with other financial intermediaries offering a higher return or yield. Or, to withdraw funds from a financial intermediary for the purposes of direct investment, such as withdrawing from a mutual fund to make direct stock investments.

Dispersion The weighted *variance* of the times to receipt of cash flow; it measures the extent to which the payments are spread out around the duration.

Disposition effect As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

Distressed debt arbitrage A distressed securities investment discipline that involves purchasing the traded bonds of bankrupt companies and selling the common equity short.

Distressed securities Securities of companies that are in financial distress or near bankruptcy; the name given to various investment disciplines employing the securities of companies in distress.

Diversification effect In reference to VaR across several portfolios (for example, across an entire firm), this effect equals the difference between the sum of the individual VaRs and total VaR.

Dividend recapitalization A method by which a buyout fund can realize the value of a holding; involves the issuance of debt by the holding to finance a special dividend to owners.

Domestic asset An asset that trades in the investor's domestic currency (or home currency).

Domestic currency The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

Domestic-currency return A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

Donor-advised fund A fund administered by a tax-exempt entity in which the donor advises on where to grant the money that he or she has donated.

Double inflection utility function A utility function that changes based on levels of wealth.

Downside deviation A measure of volatility using only rate of return data points below the investor's minimum acceptable return.

Due diligence Investigation and analysis in support of an investment action or recommendation, such as the scrutiny of operations and management and the verification of material facts.

Duration A measure of the approximate sensitivity of a security to a change in interest rates (i.e., a measure of interest rate risk).

Duration matching Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

Dynamic asset allocation A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

Dynamic hedge A hedge requiring adjustment as the price of the hedged asset changes.

Earnings at risk (EAR) A variation of VaR that reflects the risk of a company's earnings instead of its market value.

Earnings momentum A growth investment substyle that focuses on companies with earnings momentum (high quarterly year-over-year earnings growth).

Earnings risk The risk associated with the earning potential of an individual.

Econometrics The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

Economic balance sheet A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet.*

Economic exposure The risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.

Economic indicators Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

Effective convexity A second-order effect that describes how a bond's interest rate sensitivity changes with changes in yield. Effective convexity is used when the bond has cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities).

Effective duration Duration adjusted to account for embedded options.

Effective spread Two times the distance between the actual execution price and the midpoint of the market quote at the time an order is entered; a measure of execution costs that captures the effects of price improvement and market impact.

Electronic communications networks (ECNs) Computer-based auctions that operate continuously within the day using a specified set of rules to execute orders.

Emerging market debt The sovereign debt of nondeveloped countries.

Emotional biases Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Empirical duration A measure of interest rate sensitivity that is determined from market data.

Endogenous variable A variable whose values are determined within the system.

Endowment bias An emotional bias in which people value an asset more when they hold rights to it than when they do not.

Endowments Long-term funds generally owned by operating nonprofit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Enhanced derivatives products companies A type of subsidiary separate from an entity's other activities and not liable for the parent's debts. They are often used by derivatives dealers to control exposure to ratings downgrades. Also called *special purpose vehicles.*

Enhanced indexing strategy Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

Enterprise risk management An overall assessment of a company's risk position. A centralized approach to risk management sometimes called firmwide risk management.

Environmental, social, and corporate governance (ESG) Also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.

Equal probability rebalancing Rebalancing in which the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor.

Equal weighted In an equal-weighted index, each stock in the index is weighted equally.

Equal weighting Security weighting scheme in which all constituents are held at equal weights at specified rebalancing times.

Equitized Given equity market systematic risk exposure.

Equity forward sale contract A private contract for the forward sale of an equity position.

Equity monetization The realization of cash for an equity position through a manner other than an outright sale.

Equity *q* The ratio of a company's equity market capitalization divided by net worth measured at replacement cost.

Equity risk premium Compensation for the additional risk of equity compared with debt.

ESG risk The risk to a company's market valuation resulting from environmental, social, and governance factors.

Estate All of the property a person owns or controls; may consist of financial assets, tangible personal assets, immovable property, or intellectual property.

Estate planning The process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime.

Estate tax freeze A plan usually involving a corporation, partnership, or limited liability company with the goal to transfer *future* appreciation to the next generation at little or no gift or estate tax cost.

Eurozone The region of countries using the euro as a currency.

Evaluated pricing See *matrix pricing.*

***Ex post* alpha** (or Jensen's alpha) The average return achieved in a portfolio in excess of what would have been predicted by CAPM given the portfolio's risk level; an after-the-fact measure of excess risk-adjusted return.

Excess capital An investor's capital over and above that which is necessary to fund their lifestyle and reserves.

Excess return The difference between the benchmark return and the portfolio return, which may be either positive or negative.

Exchange A regulated venue for the trading of investment instruments.

Exchange fund A fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself.

Exchange-traded funds Exchange-traded Funds or ETFs are hybrid investment products with many features of mutual funds combined with the trading features of common stocks or bonds. Essentially, ETFs are typically portfolios of stocks or bonds or commodities that trade throughout the day like common stocks.

Execution uncertainty Uncertainty pertaining to the timing of execution, or if execution will even occur at all.

Exemption method When the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, in effect having only one jurisdiction impose tax.

Exogenous shocks Events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example.

Exogenous variable A variable whose values are determined outside the system.

Extended portfolio assets and liabilities Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

Externality Those consequences of a transaction (or process) that do not fall on the parties to the transaction (or process).

Factor covariance matrix The covariance matrix of factors.

Factor-model-based benchmark Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

Factor push A simple stress test that involves pushing prices and risk factors of an underlying model in the most disadvantageous way to estimate the impact of factor extremes on the portfolio's value.

Factor sensitivities In a multifactor model, the responsiveness of the dependent variable to factor movements. Also called *factor betas* or *factor loadings*.

Fallen angels Debt that has crossed the threshold from investment grade to high yield.

Fed model An equity valuation model that relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds.

Federal funds rate The interest rate on overnight loans of reserves (deposits) between US Federal Reserve System member banks.

Fee cap A limit on the total fee paid regardless of performance.

Fiduciary A person or entity standing in a special relation of trust and responsibility with respect to other parties.

Financial buyers Buyers who lack a strategic motive.

Financial capital The tangible and intangible assets (excluding human capital) owned by an individual or household.

Financial equilibrium models Models describing relationships between expected return and risk in which supply and demand are in balance.

Financial risk Risks derived from events in the external financial markets, such as changes in equity prices, interest rates, or currency exchange rates.

Fiscal policy Government activity concerning taxation and governmental spending.

Fixed trust A trust structure in which distributions to beneficiaries are prescribed in the trust document to occur at certain times or in certain amounts.

Flexible-premium variable life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *variable universal life*.

Floating supply of shares The number of shares outstanding that are actually available to investors. Also called *free float*.

Floor A combination of interest rate options designed to provide protection against interest rate decreases.

Floor broker An agent of the broker who, for certain exchanges, physically represents the trade on the exchange floor.

Floorlet Each component put option in a floor.

Forced heirship rules Legal ownership principles whereby children have the right to a fixed share of a parent's estate.

Foreign assets Assets denominated in currencies other than the investor's home currency.

Foreign currency Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

Foreign-currency return The return of the foreign asset measured in foreign-currency terms.

Formal tools Established research methods amenable to precise definition and independent replication of results.

Forward conversion with options The construction of a synthetic short forward position against the asset held long.

Forward rate bias Persistent violation of uncovered interest rate parity that is exploited by the carry trade.

Foundations Typically, grant-making institutions funded by gifts and investment assets.

Fourth market A term occasionally used for direct trading of securities between institutional investors; the fourth market would include trading on electronic crossing networks.

Framing An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Framing bias An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Front office The revenue generating functions at an investment firm such as those pertaining to trading and sales.

Front-run To trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions.

Full replication When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Full replication approach When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Fully funded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is 100 percent or greater.

Fund manager The professional manager of separate accounts or pooled assets structured in a variety of ways.

Fund of funds A fund that invests in a number of underlying funds.

Fundamental law of active management The relation that the information ratio of a portfolio manager is approximately equal to the information coefficient multiplied by the square root of the investment discipline's breadth (the number of independent, active investment decisions made each year).

Fundamental weighting Patented by Research Affiliates LLC, this scheme uses company characteristics such as sales, cash flow, book value, and dividends to weight securities.

Funded status The relationship between the value of a plan's assets and the present value of its liabilities.

Funding currencies The low-yield currencies in which borrowing occurs in a carry trade.

Funding risk The risk that liabilities funding long asset positions cannot be rolled over at reasonable cost.

G-spread The yield on a credit security over the yield of an actual or interpolated government bond.

Gain-to-loss ratio The ratio of positive returns to negative returns over a specified period of time.

Gamblers' fallacy A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

Gamma A numerical measure of the sensitivity of delta to a change in the underlying's value.

Global custodian An entity that effects trade settlement, safekeeping of assets, and the allocation of trades to individual custody accounts.

Global investable market A practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.

Goals-based With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

Goals-based investing An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

Gordon (constant) growth model A version of the dividend discount model for common share value that assumes a constant growth rate in dividends.

Government structural policies Government policies that affect the limits of economic growth and incentives within the private sector.

Grinold–Kroner model An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

Growth in total factor productivity A component of trend growth in GDP that results from increased efficiency in using capital inputs; also known as technical progress.

H-model A variant of the two-stage dividend discount model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate that holds in perpetuity.

Hague Conference on Private International Law An intergovernmental organization working toward the convergence of private international law. Its 69 members consist of countries and regional economic integration organizations.

Halo effect An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

Health insurance A type of insurance used to cover health care and medical costs.

Health risk The risk associated with illness or injury.

Hedge funds A historically loosely regulated, pooled investment vehicle that may implement various investment strategies.

Hedge ratio The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

Hedging A general strategy usually thought of as reducing, if not eliminating, risk.

Herding When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

High-water mark A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

High yield A value investment substyle that focuses on stocks offering high dividend yield with prospects of maintaining or increasing the dividend.

High-yield investing A distressed securities investment discipline that involves investment in high-yield bonds perceived to be undervalued.

Hindsight bias A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

Historical simulation method The application of historical price changes to the current portfolio.

Holdings-based style analysis An approach to style analysis that categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time.

Holistic balance sheet See *economic balance sheet.*

Home bias A preference for securities listed on the exchanges of one's home country.

Home-country bias The favoring of domestic over non-domestic investments relative to global market value weights.

Home currency See *domestic currency.*

Horizon matching Hybrid approach that combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short-and long-term liabilities.

Human capital An implied asset; the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital.*

Hybrid markets Combinations of market types, which offer elements of batch auction markets and continuous auction markets, as well as quote-driven markets.

Hypothetical events A type of scenario analysis used in stress testing that involves the evaluation of performance given events that have never happened in the markets or market outcomes to which we attach a small probability.

I-spread The yield on a credit security over the swap rate (denominated in the same currency as the credit security). Also known as interpolated spread.

Illiquidity premium Compensation for the risk of loss relative to an investment's fair value if an investment needs to be converted to cash quickly.

Illusion of control A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Illusion of control bias A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Immediate annuity An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

Immunization An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

Implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return.

Implementation shortfall strategy A strategy that attempts to minimize trading costs as measured by the implementation shortfall method. Also called *arrival price strategy*.

Implied yield A measure of the yield on the underlying bond of a futures contract implied by pricing it as though the underlying will be delivered at the futures expiration.

Incremental VaR A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.

Indexing A common passive approach to investing that involves holding a portfolio of securities designed to replicate the returns on a specified index of securities.

Indifference curve analysis A decision-making approach whereby curves of consumption bundles, among which the decision-maker is indifferent, are constructed to identify and choose the curve within budget constraints that generates the highest utility.

Indirect commodity investment Commodity investment that involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production.

Inferential statistics Methods for making estimates or forecasts about a larger group from a smaller group actually observed.

Inflation An increase in the general level of prices; a decrease in the purchasing power of a unit of currency.

Inflation hedge An asset whose returns are sufficient on average to preserve purchasing power during periods of inflation.

Inflation premium Compensation for expected inflation.

Information coefficient The correlation between forecast and actual returns.

Information-motivated traders Traders that seek to trade on information that has limited value if not quickly acted upon.

Information ratio The mean excess return of the account over the benchmark (i.e., mean active return) relative to the variability of that excess return (i.e., tracking risk); a measure of risk-adjusted performance.

Infrastructure funds Funds that make private investment in public infrastructure projects in return for rights to specified revenue streams over a contracted period.

Initial public offering The initial issuance of common stock registered for public trading by a formerly private corporation.

Input uncertainty Uncertainty concerning whether the inputs are correct.

Inside ask The lowest available ask price. Also called *market ask*.

Inside bid The highest available bid price. Also called *market bid*.

Inside bid–ask spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *market spread*.

Inside quote Combination of the highest available bid price with the lowest available ask price. Also called *market quote*.

Inside spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside bid–ask spread*, or *market spread*.

Institutional investors Corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets.

Interest rate management effect With respect to fixed-income attribution analysis, a return component reflecting how well a manager predicts interest rate changes.

Interest spread With respect to banks, the average yield on earning assets minus the average percent cost of interest-bearing liabilities.

Internal rate of return The growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows; money-weighted rate of return is a synonym.

Intestate Having made no valid will; a decedent without a valid will or with a will that does not dispose of their property is considered to have died intestate.

Intrinsic value The difference between the spot exchange rate and the strike price of a currency option.

Inventory cycle A cycle measured in terms of fluctuations in inventories, typically lasting 2–4 years.

Inverse floater A floating-rate note or bond in which the coupon is adjusted to move opposite to a benchmark interest rate.

Investment currencies The high-yielding currencies in a carry trade.

Investment skill The ability to outperform an appropriate benchmark consistently over time.

Investment style A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

Investment style indexes Indexes that represent specific portions of an asset category. For example, subgroups within the US common stock asset category such as large-capitalization growth stocks.

Investment universe The set of assets that may be considered for investment.

Investor's benchmark The benchmark an investor uses to evaluate performance of a given portfolio or asset class.

Irrevocable trust A trust arrangement wherein the settlor has no ability to revoke the trust relationship.

J factor risk The risk associated with a judge's track record in adjudicating bankruptcies and restructurings.

Joint ownership with right of survivorship Jointly owned; assets held in joint ownership with right of survivorship automatically transfer to the surviving joint owner or owners outside the probate process.

Justified P/E The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.

Key rate duration A method of measuring the interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

Knock-in/knock-out Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

Lagging economic indicators A set of economic variables whose values correlate with recent past economic activity.

Leading economic indicators A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

Legal/contract risk The possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake; for example, if a contract is voided through litigation.

Leverage-adjusted duration gap A leverage-adjusted measure of the difference between the durations of assets and liabilities which measures a bank's overall interest rate exposure.

Leveraged floating-rate note (leveraged floater) A floating-rate note or bond in which the coupon is adjusted at a multiple of a benchmark interest rate.

Leveraged recapitalization A leveraging of a company's balance sheet, usually accomplished by working with a private equity firm.

Liability-based benchmark A benchmark structured to accurately reflect the return required to meet the future obligations of an investor and to mimic the volatility of the liabilities.

Liability-driven investing An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

Liability glide path A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

Liability insurance A type of insurance used to manage liability risk.

Liability-relative With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

Liability risk The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

Life-cycle finance A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

Life insurance A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

Lifetime gratuitous transfer A lifetime gift made during the lifetime of the donor; also known as *inter vivos* transfers.

Limit order An instruction to execute an order when the best price available is at least as good as the limit price specified in the order.

Liquidity The ability to trade without delay at relatively low cost and in relatively large quantities.

Liquidity-motivated traders Traders that are motivated to trade based upon reasons other than an information advantage. For example, to release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs.

Liquidity risk Any risk of economic loss because of the need to sell relatively less liquid assets to meet liquidity requirements; the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.

Lock-up period A minimum initial holding period for investments during which no part of the investment can be withdrawn.

Locked up Said of investments that cannot be traded at all for some time.

Logical participation strategies Protocols for breaking up an order for execution over time. Typically used by institutional traders to participate in overall market volumes without being unduly visible.

Longevity risk The risk associated with living to an advanced age in retirement, including the uncertainty surrounding how long retirement will last; the risk of outliving one's financial resources.

Loss-aversion bias A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

Loss given default See *loss severity*.

Loss severity The amount of loss if a default occurs. Also called *loss given default*.

Low P/E A value investment substyle that focuses on shares selling at low prices relative to current or normal earnings.

M^2 A measure of what a portfolio would have returned if it had taken on the same total risk as the market index.

Macaulay duration The percentage change in price for a percentage change in yield. The term, named for one of the economists who first derived it, is used to distinguish the calculation from modified duration. (See also *modified duration*).

Macro attribution Performance attribution analysis conducted on the fund sponsor level.

Macro expectations Expectations concerning classes of assets.

Managed futures Pooled investment vehicles, frequently structured as limited partnerships, that invest in futures and options on futures and other instruments.

Managed futures funds Pools of private capital managed by commodity trading advisers.

Manager continuation policies Policies adopted to guide the manager evaluations conducted by fund sponsors. The goal of manager continuation policies is to reduce the costs of manager turnover while systematically acting on indications of future poor performance.

Manager monitoring A formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations; used to identify warning signs of adverse changes in existing managers' organizations.

Manager peer group See *manager universe*.

Manager review A detailed examination of a manager that currently exists within a plan sponsor's program. The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired.

Manager universe A broad group of managers with similar investment disciplines. Also called *manager peer group*.

Market-adjusted implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return, adjusted using beta to remove the effect of the return on the market.

Market ask The lowest available ask price.

Market bid The best available bid; highest price any buyer is currently willing to pay.

Market bid–ask spread Market ask price minus market bid price. Also called *inside bid–ask spread*, *inside spread*, or *market spread*.

Market cap weighting See *capitalization weighting*.

Market fragmentation A condition whereby a market contains no dominant group of sellers (or buyers) that are large enough to unduly influence the market.

Market impact The effect of the trade on transaction prices. Also called *price impact*.

Market index Represents the performance of a specified security market, market segment, or asset class.

Market integration The degree to which there are no impediments or barriers to capital mobility across markets.

Market microstructure The market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Market model A regression equation that specifies a linear relationship between the return on a security (or portfolio) and the return on a broad market index.

Market-not-held order A variation of the market order designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the floor broker is not required to trade at any specific price or in any specific time interval.

Market on close order A market order to be executed at the closing of the market.

Market on open order A market order to be executed at the opening of the market.

Market order An instruction to execute an order as soon as possible in the public markets at the best price available.

Market oriented With reference to equity investing, an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth.

Market quote Combination of the highest available bid price with the lowest available ask price. Also called *inside quote*.

Market risk The risk associated with interest rates, exchange rates, and equity prices.

Market risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to maintain the client's current standard of living.

Market segmentation The degree to which there are some meaningful impediments to capital movement across markets.

Market spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *inside bid–ask spread*.

Market value weighting See *capitalization weighting*.

Marking to market A procedure used primarily in futures markets in which the parties to a contract settle the amount owed daily. Also known as the *daily settlement*.

Mass affluent An industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services.

Matrix prices Prices determined by comparisons to other securities of similar credit risk and maturity; the result of matrix pricing.

Matrix pricing An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

Maturity premium Compensation for the increased sensitivity of the market value of debt to a change in market interest rates as maturity is extended.

Maximum loss optimization A stress test in which we would try to optimize mathematically the risk variable that would produce the maximum loss.

Mega-cap buyout funds A class of buyout funds that take public companies private.

Mental accounting bias An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

Micro attribution Performance attribution analysis carried out on the investment manager level.

Micro expectations Expectations concerning individual assets.

Middle-market buyout funds A class of buyout funds that purchase private companies whose revenues and profits are too small for them to access capital from the public equity markets.

Midquote The halfway point between the market bid and ask prices.

Minimum-variance hedge ratio A mathematical approach to determining the optimal cross hedging ratio.

Mismatch in character The potential tax inefficiency that can result if the instrument being hedged, and the tool that is being used to hedge it, produce income and loss of a different character.

Missed trade opportunity costs Unrealized profit/loss arising from the failure to execute a trade in a timely manner.

Model risk The risk that a model is incorrect or misapplied; in investments, it often refers to valuation models.

Model uncertainty Uncertainty concerning whether a selected model is correct.

Modified duration An adjustment of the duration for the level of the yield. Contrast with *Macaulay duration*.

Monetary policy Government activity concerning interest rates and the money supply.

Monetize To access an item's cash value without transferring ownership of it.

Money duration A measure of the price change in units of the currency in which the bond is denominated given a change in its yield-to-maturity.

Money markets Markets for fixed-income securities with maturities of one year or less.

Money-weighted rate of return Same as the internal rate of return; the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows.

Multifactor model A model that explains a variable in terms of the values of a set of factors.

Multiperiod Sharpe ratio A Sharpe ratio based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment.

Mutual funds A professionally managed investment pool in which investors in the fund typically each have a pro-rata claim on the income and value of the fund.

Mutuals With respect to insurance companies, companies that are owned by their policyholders, who share in the company's surplus earnings.

Natural liquidity An extensive pool of investors who are aware of and have a potential interest in buying and/or selling a security.

Net asset value Value established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.

Net employment capital See *human capital*.

Net interest margin With respect to banks, net interest income (interest income minus interest expense) divided by average earning assets.

Net interest spread With respect to the operations of insurers, the difference between interest earned and interest credited to policyholders.

Net wealth The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

Net worth tax or net wealth tax A tax based on a person's assets, less liabilities.

Nominal default-free bonds Conventional bonds that have no (or minimal) default risk.

Nominal gross domestic product A money measure of the goods and services produced within a country's borders. Also called *nominal GDP*.

Nominal risk-free interest rate The sum of the real risk-free interest rate and the inflation premium.

Non-deliverable forwards Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

Nonfinancial risk Risks that arise from sources other than the external financial markets, such as changes in accounting rules, legal environment, or tax rates.

Nonparametric Involving minimal probability-distribution assumptions.

Nonstationarity A property of a data series that reflects more than one set of underlying statistical properties.

Normal portfolio A portfolio with exposure to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Objective function A quantitative expression of the objective or goal of a process.

Offer price The price at which a counterparty is willing to sell one unit of the base currency.

Open market operations The purchase or sale by a central bank of government securities, which are settled using reserves, to influence interest rates and the supply of credit by banks.

Open outcry auction market Public auction where representatives of buyers and sellers meet at a specified location and place verbal bids and offers.

Operational risk The risk of loss from failures in a company's systems and procedures (for example, due to computer failures or human failures) or events completely outside of the control of organizations (which would include "acts of God" and terrorist actions).

Opportunistic participation strategies Passive trading combined with the opportunistic seizing of liquidity.

Optimization With respect to portfolio construction, a procedure for determining the best portfolios according to some criterion.

Option-adjusted spread The constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price.

Order-driven markets Markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices.

Ordinary life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *whole life insurance*.

Orphan equities investing A distressed securities investment discipline that involves investment in orphan equities that are perceived to be undervalued.

Orphan equity The newly issued equity of a company emerging from reorganization.

Output gap The difference between the value of GDP estimated as if the economy were on its trend growth path (potential output) and the actual value of GDP.

Overall trade balance The sum of the current account (reflecting exports and imports) and the financial account (consisting of portfolio flows).

Overbought When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

Overconfidence bias A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

Overconfidence trap The tendency of individuals to overestimate the accuracy of their forecasts.

Oversold The opposite of overbought; see *overbought*.

Pairs trade A basic long–short trade in which an investor is long and short equal currency amounts of two common stocks in a single industry. Also called *pairs arbitrage*.

Panel method A method of capital market expectations setting that involves using the viewpoints of a panel of experts.

Partial correlation In multivariate problems, the correlation between two variables after controlling for the effects of the other variables in the system.

Partial fill Execution of a purchase or sale for fewer shares than was stipulated in the order.

Participate (do not initiate) order A variant of the market-not-held order. The broker is deliberately low-key and waits for and responds to the initiatives of more active traders.

Passive investment Investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

Passive investment strategies A buy-and-hold strategy to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive management A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive traders Traders that seek liquidity in their rebalancing transactions, but are much more concerned with the cost of trading.

Payment netting A means of settling payments in which the amount owed by the first party to the second is netted with the amount owed by the second party to the first; only the net difference is paid.

Pension funds Funds consisting of assets set aside to support a promise of retirement income.

Pension surplus Pension assets at market value minus the present value of pension liabilities.

Percent-range rebalancing An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

Percentage-of-portfolio rebalancing Rebalancing is triggered based on set thresholds stated as a percentage of the portfolio's value.

Percentage-of-volume strategy A logical participation strategy in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Perfect markets Markets without any frictional costs.

Performance appraisal The evaluation of portfolio performance; a quantitative assessment of a manager's investment skill.

Performance attribution A comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns.

Performance-based fee Fees specified by a combination of a base fee plus an incentive fee for performance in excess of a benchmark's.

Performance evaluation The measurement and assessment of the outcomes of investment management decisions.

Performance measurement A component of performance evaluation; the relatively simple procedure of calculating an asset's or portfolio's rate of return.

Performance netting risk For entities that fund more than one strategy and have asymmetric incentive fee arrangements with the portfolio managers, the potential for loss in cases where the net performance of the group of managers generates insufficient fee revenue to fully cover contractual payout obligations to all portfolio managers with positive performance.

Periodic auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Permanent income hypothesis The hypothesis that consumers' spending behavior is largely determined by their long-run income expectations.

Permanent life insurance A type of life insurance that provides lifetime coverage.

Personal risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to protect the client from a drastic decrease in lifestyle.

Plan sponsor The trustee, company, or employer responsible for a public or private institutional investment plan.

Pledging requirement With respect to banks, a required collateral use of assets.

Point estimate A single-valued estimate of a quantity, as opposed to an estimate in terms of a range of values.

Policyholder reserves With respect to an insurance company, an amount representing the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Political risk The risk of war, government collapse, political instability, expropriation, confiscation, or adverse changes in taxation. Also called *geopolitical risk*.

Portable Moveable. With reference to a pension plan, one in which a plan participant can move his or her share of plan assets to a new plan, subject to certain rules, vesting schedules, and possible tax penalties and payments.

Portable alpha A strategy involving the combining of multiple positions (e.g., long and short positions) so as to separate the alpha (unsystematic risk) from beta (systematic risk) in an investment.

Portfolio trade A trade in which a number of securities are traded as a single unit. Also called *program trade* or *basket trade*.

Position a trade To take the other side of a trade, acting as a principal with capital at risk.

Post-trade transparency Degree to which completed trades are quickly and accurately reported to the public.

Potential output The value of GDP if the economy were on its trend growth path.

Preferred return With respect to the compensation of private equity fund managers, a hurdle rate.

Premature death risk The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

Premium Regarding life insurance, the asset paid by the policy holder to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy.

Prepackaged bankruptcy A bankruptcy in which the debtor seeks agreement from creditors on the terms of a reorganization before the reorganization filing.

Prepaid variable forward A collar and loan combined within a single instrument.

Present value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Present value of distribution of cash flows methodology Method used to address a portfolio's sensitivity to rate changes along the yield curve, this approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

Pretrade transparency Ability of individuals to quickly, easily, and inexpensively obtain accurate information about quotes and trades.

Price discovery Adjustment of transaction prices to balance supply and demand.

Price improvement Execution at a price that is better than the price quoted at the time of order placement.

Price uncertainty Uncertainty about the price at which an order will execute.

Price value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Price weighted With respect to index construction, an index in which each security in the index is weighted according to its absolute share price.

Price weighting Security weighting scheme in which constituents are weighted in proportion to their prices.

Priced risk Risk for which investors demand compensation.

Primary capital Assets held outside a concentrated position that are at least sufficient to provide for the owner's lifetime spending needs.

Prime brokerage A suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

Principal trade A trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell.

Private equity Ownership interests in non-publicly traded companies.

Private equity funds Pooled investment vehicles that generally invest in highly illiquid assets; include venture capital funds and buyout funds.

Private exchange A method for handling undiversified positions with built-in capital gains in which shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.

Private placement memorandum A document used to raise venture capital financing when funds are raised through an agent.

Probate The legal process to confirm the validity of a will so that executors, heirs, and other interested parties can rely on its authenticity.

Profit-sharing plans A defined-contribution plan in which contributions are based, at least in part, on the plan sponsor's profits.

Projected benefit obligation (PBO) A measure of a pension plan's liability that reflects accumulated service in the same manner as the ABO but also projects future variables, such as compensation increases.

Property insurance A type of insurance used by individuals to manage property risk.

Property risk The possibility that a person's property may be damaged, destroyed, stolen, or lost.

Prospect theory An alternative to expected utility theory, it assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses.

Protective put An option strategy in which a long position in an asset is combined with a long position in a put.

Proxy hedge See *cross hedge*.

Prudence trap The tendency to temper forecasts so that they do not appear extreme; the tendency to be overly cautious in forecasting.

Public good A good that is not divisible and not excludable (a consumer cannot be denied it).

Purchasing power parity The theory that movements in an exchange rate should offset any difference in the inflation rates between two countries.

Pure indexing Method investors use to match an underlying market index in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk.

Pure sector allocation return A component of attribution analysis that relates relative returns to the manager's sector-weighting decisions. Calculated as the difference between the allocation (weight) of the portfolio to a given sector and the portfolio's benchmark weight for that sector, multiplied by the difference between the sector benchmark's return and the overall portfolio's benchmark return, summed across all sectors.

Put spread A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

Quality control charts A graphical means of presenting performance appraisal data; charts illustrating the performance of an actively managed account versus a selected benchmark.

Quantitative easing A policy measure in which a central bank buys financial assets to inject a predetermined quantity of money in the financial system.

Quote-driven markets Markets that rely on dealers to establish firm prices at which securities can be bought and sold. Also called *dealer markets*.

Quoted depth The number of shares available for purchase or sale at the quoted bid and ask prices.

Ratio spread An option strategy in which a long position in a certain number of options is offset by a short position in a certain number of other options on the same underlying, resulting in a risk-free position.

Rational economic man A self-interested, risk-averse individual who has the ability to make judgments using all available information in order to maximize his/her expected utility.

Re-base With reference to index construction, to change the time period used as the base of the index.

Real estate Interests in land or structures attached to land.

Real estate investment trusts (REITs) Publicly traded equities representing pools of money invested in real estate properties and/or real estate debt.

Real option An option involving decisions related to tangible assets or processes.

Real risk-free interest rate The single-period interest rate for a completely risk-free security if no inflation were expected.

Rebalancing In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

Rebalancing range A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

Rebate rate The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

Recallability trap The tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory.

Recession A broad-based economic downturn, conventionally defined as two successive quarterly declines in GDP.

Regime A distinct governing set of relationships.

Regret The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

Regret-aversion bias An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

Regulatory risk The risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change.

Reinvestment risk The risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate.

Relative economic strength forecasting approach An exchange rate forecasting approach that suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate.

Relative strength indicators A price momentum indicator that involves comparing a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.

Remaindermen Beneficiaries of a trust; having a claim on the residue.

Repo rate The interest rate on a repurchase agreement.

Representativeness bias A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

Repurchase agreements (repos) In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount, while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

Repurchase yield The negative of the expected percent change in number of shares outstanding, in the Grinold–Kroner model.

Residence jurisdiction A framework used by a country to determine the basis for taxing income, based on residency.

Residence–residence conflict When two countries claim residence of the same individual, subjecting the individual's income to taxation by both countries.

Residence–source conflict When tax jurisdiction is claimed by an individual's country of residence and the country where some of their assets are sourced; the most common source of double taxation.

Residue With respect to trusts, the funds remaining in a trust when the last income beneficiary dies.

Resistance levels Price points on dealers' order boards where one would expect to see a clustering of offers.

Retired-lives The portion of a pension fund's liabilities associated with retired workers.

Returns-based benchmarks Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

Returns-based style analysis An approach to style analysis that focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns.

Reverse repos Repurchase agreement from the standpoint of the lender.

Revocable trust A trust arrangement wherein the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets.

Risk budgeting The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

Risk exposure A source of risk. Also, the state of being exposed or vulnerable to a risk.

Risk premium approach An approach to forecasting the return of a risky asset that views its expected return as the sum of the risk-free rate of interest and one or more risk premiums.

Risk reversal With respect to foreign exchange option strategies, one involving a long position in a call option and a short position in a put option.

Risk tolerance The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

Rolling return The moving average of the holding-period returns for a specified period (e.g., a calendar year) that matches the investor's time horizon.

Sale and leaseback A transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rate and term acceptable to the new owner and on financial terms consistent with the marketplace.

Sample estimator A formula for assigning a unique value (a point estimate) to a population parameter.

Sample-size neglect A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or "real" data).

Sandwich spread An option strategy that is equivalent to a short butterfly spread.

Satisfice A combination of "satisfy" and "suffice" describing decisions, actions, and outcomes that may not be optimal, but are adequate.

Savings–investment imbalances forecasting approach An exchange rate forecasting approach that explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate.

Scenario analysis A risk assessment technique involving the examination of the performance of a portfolio under specified situations.

Seagull spread An extension of the risk reversal foreign exchange option strategy that limits downside risk.

Secondary offering An offering after the initial public offering of securities.

Sector/quality effect In a fixed-income attribution analysis, a measure of a manager's ability to select the "right" issuing sector and quality group.

Security selection effect In a fixed-income attribution analysis, the residual of the security's total return after other effects are accounted for; a measure of the return due to ability in security selection.

Segmentation With respect to the management of insurance company portfolios, the notional subdivision of the overall portfolio into sub-portfolios each of which is associated with a specified group of insurance contracts.

Self-attribution bias A bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control.

Self-control bias A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

Sell side Broker/dealers that sell securities and make recommendations for various customers, such as investment managers and institutional investors.

Semi-active management A variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark with tightly controlled risk relative to the benchmark. Also called *enhanced indexing* or *risk-controlled active management.*

Separate property regime A marital property regime under which each spouse is able to own and control property as an individual.

Settlement netting risk The risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.

Settlement risk When settling a contract, the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.

Settlor (or grantor) An entity that transfers assets to a trustee, to be held and managed for the benefit of the trust beneficiaries.

Shari'a The law of Islam. In addition to the law of the land, some follow guidance provided by Shari'a or Islamic law.

Sharpe ratio A measure of risk-adjusted performance that compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. Also called *reward-to-variability*.

Short sale against the box Shorting a security that is held long.

Shortfall probability The probability of failing to meet a specific liability or goal.

Shortfall risk The risk that portfolio value will fall below some minimum acceptable level during a stated time horizon; the risk of not achieving a specified return target.

Shrinkage estimation Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

Shrinkage estimator The formula used in shrinkage estimation of a parameter.

Smart beta Involves the use of simple, transparent, rules-based strategies as a basis for investment decisions.

Smart routing The use of algorithms to intelligently route an order to the most liquid venue.

Smoothing rule With respect to spending rates, a rule that averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

Social proof A bias in which individuals tend to follow the beliefs of a group.

Socially responsible investing An approach to investing that integrates ethical values and societal concerns with investment decisions. Also called *ethical investing*.

Soft dollars The use of commissions to buy services other than execution services. Also called *soft dollar arrangements* or *soft commissions*.

Sole ownership Owned by one person; assets held in sole ownership are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will through the probate process.

Solow residual A measure of the growth in total factor productivity that is based on an economic growth model developed by economist Robert M. Solow.

Sortino ratio A performance appraisal ratio that divides the difference between a portfolio's return and a minimum acceptable return by downside deviation.

Source jurisdiction A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Source–source conflict When two countries claim source jurisdiction of the same asset; both countries may claim that the income is derived from their jurisdiction.

Sovereign risk A form of credit risk in which the borrower is the government of a sovereign nation.

Spread curve The fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Spread duration A measure used in determining a portfolio's sensitivity to changes in credit spreads.

Stale price bias Bias that arises from using prices that are stale because of infrequent trading.

Static hedge A hedge that is not sensitive to changes in the price of the asset hedged.

Stationary A series of data for which the parameters that describe a return-generating process are stable.

Status quo bias An emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change.

Status quo trap The tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past.

Sterling ratio The compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%.

Stock companies With respect to insurance companies, companies that have issued common equity shares.

Stock index futures Futures contracts on a specified stock index.

Stops Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

Straddle An option strategy involving the purchase of a put and a call on the same underlying with the same exercise price and expiration date. If the put and call are held long, it is a long straddle; if they are held short, it is a short straddle.

Straight-through processing Systems that simplify transaction processing through the minimization of manual and/or duplicative intervention in the process from trade placement to settlement.

Strangle A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

Strap An option strategy involving the purchase of two calls and one put.

Strategic asset allocation 1) The process of allocating money to IPS-permissible asset classes that integrates the investor's return objectives, risk tolerance, and investment constraints with long-run capital market expectations. 2) The result of the above process, also known as the policy portfolio.

Strategic buyers Buyers who have a strategic motive (e.g., realization of synergies) for seeking to buy a company.

Strategy benchmarks See custom security-based benchmarks.

Stratified sampling A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

Strip An option strategy involving the purchase of two puts and one call.

Structural level of unemployment The level of unemployment resulting from scarcity of a factor of production.

Structural risk Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

Structured note A variation of a floating-rate note that has some type of unusual characteristic such as a leverage factor or in which the rate moves opposite to interest rates.

Style drift Inconsistency in style.

Style index A securities index intended to reflect the average returns to a given style.

Stylized scenario A type of analysis often used in stress testing. It involves simulating the movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio.

Sunshine trades Public display of a transaction (usually high-volume) in advance of the actual order.

Support levels Price points on dealers' order boards where one would expect to see a clustering of bids.

Surplus The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

Surplus capital Capital that is in excess of primary capital.

Survey method A method of capital market expectations setting that involves surveying experts.

Survival probability The probability an individual survives in a given year; used to determine expected cash flow required in retirement.

Survivorship bias Bias that arises in a data series when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain; when a data series as of a given date reflects only entities that have survived to that date.

Swap rate The interest rate applicable to the pay-fixed-rate side of an interest rate swap.

Tactical asset allocation Asset allocation that involves making short-term adjustments to asset class weights based on short-term predictions of relative performance among asset classes.

Tactical rebalancing A variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals.

Tail risk The risk that there are more actual events in the tail of a probability distribution than would be predicted by probability models.

Tail value at risk (or conditional tail expectation) The VaR plus the expected loss in excess of VaR, when such excess loss occurs.

Target covariance matrix A component of shrinkage estimation; allows the analyst to model factors that are believed to influence the data over periods longer than observed in the historical sample.

Tax avoidance Developing strategies that minimize tax, while conforming to both the spirit and the letter of the tax codes of jurisdictions with taxing authority.

Tax efficiency The proportion of the expected pretax total return that will be retained after taxes.

Tax evasion The practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

Tax premium Compensation for the effect of taxes on the after-tax return of an asset.

Tax risk The uncertainty associated with tax laws.

Taylor rule A rule linking a central bank's target short-term interest rate to the rate of growth of the economy and inflation.

Temporary life insurance A type of life insurance that covers a certain period of time, specified at purchase. Commonly referred to as "term" life insurance.

Term life insurance A type of life insurance policy that provides coverage for a specified length of time and accumulates little or no cash values.

Territorial tax system A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Testamentary gratuitous transfer The bequeathing or transfer of assets upon one's death. From a recipient's perspective, it is called an inheritance.

Testator A person who makes a will.

Theta The change in price of an option associated with a one-day reduction in its time to expiration; the rate at which an option's time value decays.

Tick The smallest possible price movement of a security.

Time deposit A deposit requiring advance notice prior to a withdrawal.

Time-series estimators Estimators that are based on lagged values of the variable being forecast; often consist of lagged values of other selected variables.

Time to expiration The time remaining in the life of a derivative, typically expressed in years.

Time value The difference between the market price of an option and its intrinsic value, determined by the uncertainty of the underlying over the remaining life of the option.

Time-weighted average price (TWAP) strategy A logical participation strategy that assumes a flat volume profile and trades in proportion to time.

Time-weighted rate of return The compound rate of growth over a stated evaluation period of one unit of money initially invested in the account.

Tobin's *q* An asset-based valuation measure that is equal to the ratio of the market value of debt and equity to the replacement cost of total assets.

Top-down Proceeding from the macroeconomy, to the economic sector level, to the industry level, to the firm level.

Top-down approach A credit strategy approach that involves formulating a view on major macroeconomic trends and then selecting the bonds that the investor expects to perform best in the expected environment.

Total factor productivity (TFP) A variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

Total future liability With respect to defined-benefit pension plans, the present value of accumulated and projected future service benefits, including the effects of projected future compensation increases.

Total rate of return A measure of the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized).

Total return equity swap A swap contract that involves a series of exchanges of the total return on a specified asset or equity index in return for specified fixed or floating rate payments.

Total return payer Party responsible for paying the reference obligation cash flows and return to the receiver, but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Total return receiver Party receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread.

Total return swap A swap in which one party agrees to pay the total return on a security. Often used as a credit derivative, in which the underlying is a bond.

Tracking error The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking risk*.

Tracking risk The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking error*.

Trade blotter A device for entering and tracking trade executions and orders to trade.

Trade settlement Completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller.

Trading activity In fixed-income attribution analysis, the effect of sales and purchases of bonds over a given period; the total portfolio return minus the other components determining the management effect in an attribution analysis.

Transaction exposure The risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale.

Translation exposure The risk associated with the conversion of foreign financial statements into domestic currency.

Transparency Availability of timely and accurate market and trade information.

Trigger points In the context of portfolio rebalancing, the endpoints of a rebalancing range (corridor).

Twist With respect to the yield curve, a movement in contrary directions of interest rates at two maturities; a nonparallel movement in the yield curve.

Type I error With respect to manager selection, keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct).

Type II error With respect to manager selection, firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect).

Underfunded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is less than 100 percent.

Underwriting (profitability) cycle A cycle affecting the profitability of insurance companies' underwriting operations.

Unit-linked life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *variable life insurance*.

Universal life insurance A type of life insurance policy that provides for premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element.

Unrelated business income With respect to the US tax code, income that is not substantially related to a foundation's charitable purposes.

Unstructured modeling Modeling without a theory on the underlying structure.

Uptick rules Trading rules that specify that a short sale must not be on a downtick relative to the last trade at a different price.

Urgency of the trade The importance of certainty of execution.

Utility The level of relative satisfaction received from the consumption of goods and services.

Utility theory Theory whereby people maximize the present value of utility subject to a present value budget constraint.

Valuation reserve With respect to insurance companies, an allowance, created by a charge against earnings, to provide for losses in the value of the assets.

Value The amount for which one can sell something, or the amount one must pay to acquire something.

Value at risk (VaR) A probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy over a specified period of time.

Value-motivated traders Traders that act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range.

Value weighted With respect to index construction, an index in which each security in the index is weighted according to its market capitalization. Also called *market-capitalization weighted*.

Variable life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *unit-linked life insurance*.

Variable prepaid forward A monetization strategy that involves the combination of a collar with a loan against the value of the underlying shares. When the loan comes due, shares are sold to pay off the loan and part of any appreciation is shared with the lender.

Variable universal life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *flexible-premium variable life*.

Vega A measure of the sensitivity of an option's price to changes in the underlying's volatility.

Venture capital The equity financing of new or growing private companies.

Venture capital firms Firms representing dedicated pools of capital for providing equity or equity-linked financing to privately held companies.

Venture capital fund A pooled investment vehicle for venture capital investing.

Venture capital trust An exchange-traded, closed-end vehicle for venture capital investing.

Venture capitalists Specialists who seek to identify companies that have good business opportunities but need financial, managerial, and strategic support.

Vested With respect to pension benefits or assets, said of an unconditional ownership interest.

Vintage year With reference to a private equity fund, the year it closed.

Vintage year effects The effects on returns shared by private equity funds closed in the same year.

Volatility Represented by the Greek letter sigma (σ), the standard deviation of price outcomes associated with an underlying asset.

Volatility clustering The tendency for large (small) swings in prices to be followed by large (small) swings of random direction.

Volume-weighted average price (VWAP) The average price at which a security is traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade.

Volume-weighted average price (VWAP) strategy A logical participation strategy that involves breaking up an order over time according to a prespecified volume profile.

Wealth relative The ending value of one unit of money invested at specified rates of return.

Whole life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *ordinary life insurance*.

Will A document associated with estate planning that outlines the rights others will have over one's property after death. Also called *testament*.

Within-sector selection return In attribution analysis, a measure of the impact of a manager's security selection decisions relative to the holdings of the sector benchmark.

Worst-case scenario analysis A stress test in which we examine the worst case that we actually expect to occur.

Yardeni model An equity valuation model, more complex than the Fed model, that incorporates the expected growth rate in earnings.

Yield beta A measure of the sensitivity of a bond's yield to a general measure of bond yields in the market that is used to refine the hedge ratio.

Yield curve The relationship between yield and time to maturity.

Yield to worst The yield on a callable bond that assumes a bond is called at the earliest opportunity.

Z-spread The yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. Also known as zero-volatility spread.

Zero-cost collar A transaction in which a position in the underlying is protected by buying a put and selling a call with the premium from the sale of the call offsetting the premium from the purchase of the put. It can also be used to protect a floating-rate borrower against interest rate increases with the premium on a long cap offsetting the premium on a short floor.

Zero-premium collar A hedging strategy involving the simultaneous purchase of puts and sale of call options on a stock. The puts are struck below and the calls are struck above the underlying's market price.

CUSTOMER SERVICE

68

Index

A
absolute contribution to total risk (ACTR), 267–268
absolute return benchmarks, 468
accountable benchmarks, 465n.4
active currency management
  carry trade in, 402–404
  and currency risk, 393–394
  economic fundamentals in, 399–400
  example, 407–409
  technical analysis in, 401–402
  volatility trading in, 404–409
active investing, strategies for, 466
active management
  of allocations to asset classes, 217–219
  of asset class weights, 216–217
  benchmarks for, 464, 465
active risk budgeting, 221
ACTR. *see* absolute contribution to total risk
ACWI. *see* MSCI All Country World Index
after-tax portfolio optimization, 341–344
allocation, asset. *see* asset allocation
all-or-nothing options, 425
ALM. *see* asset–liability management
alpha, 395
alpha research, 8
alternative investments, smoothed data for, 14–16
anchoring trap, 21
appraisal data, capital market expectations and, 14–16
ARCH time-series models. *see* autoregressive conditional heteroskedasticity time-series models
Argentina
  currency crisis, 78
  market integration, 43
  trade partners, 84
arithmetic mean return, geometric vs., 24
Asia. *see also* MSCI EAFE (Europe, Australasia, and Far East) Index; *specific countries*
  economic indicators, 83
  foundations in, 337
  inflation in, 56
Asian financial crisis (1997)
  and currency values, 100
  as exogenous shock, 75
  and inflation, 56
  international interactions in, 76, 80
  liquidity in, 329
aspirational risk bucket, 214
asset allocation, 177–234
  approaches, 191–201
    modeling asset class risk, 195–201
    relevant objectives, 194
    relevant risk concepts, 194–195
    types of, 191–193
  and currency risk, 389
  and economic balance sheet, 188–191
  implementation choices, 216–221
    of allocations to asset classes, 217–219
    of asset class weights, 216–217
    risk budgeting perspectives in, 221
  importance in investment management, 178–180
  investment governance background, 180–188
    allocation of rights and responsibilities, 182–184
    articulating investment objectives, 181–182
    governance audit, 185–186
    governance structures, 180–181
    investment policy statement, 184
    rebalancing policy, 185
    reporting framework, 185
  market indexes for, 471
  mitigating behavioral biases in, 367–369
  overview of, 177–178
  practice problems, 230–232
  rebalancing, 222–226
    framework for, 223–224
    strategic considerations in, 225–226
  robustness of alternatives to, 287–288
  short-term shifts in, 359–361
  solutions to problems, 233–234
  strategic, 201–216
    asset-only allocation, 203–208
    goals-based allocation, 211–216
    liability-relative allocation, 208–211
    real-world constraints in, 349–355
    steps in selecting, 202–203
    utility theory in, 201–202
asset allocation principles, 235–317
  asset-only allocation, 237–272
    allocating to less liquid asset classes, 265–266
    criticisms of mean–variance optimization, 252–265
    factor-based allocation, 269–272
    mean–variance optimization, 237–249
    Monte Carlo simulation, 249–252
    risk budgeting, 267–269
  goals-based allocation, 289–306
    description of client goals for, 293–295
    issues related to, 304–306
    module process in, 300–304
    overall portfolio in, 298–300
    process for, 291–293
    revisiting overall asset allocation in, 304
    sub-portfolio construction for, 295–298
  liability-relative allocation, 273–287
    approaches to, 276–289
    characterization of liabilities in, 273–276
    factor modeling in, 289
    robustness of asset allocation alternatives, 287–288
    other approaches to, 306–311
    overview, 236–237
    portfolio rebalancing in practice, 311–315
asset allocation with real-world constraints, 321–371
  behavioral biases, 361–369
    availability bias, 366–367
    framing bias, 365–366
    illusion of control, 362–363
    loss aversion, 362
    mental accounting, 363–364
    representative bias, 364–365
  constraints in asset allocation, 322–340
    asset size, 322–327
    liquidity, 327–330
    regulatory and other external constraints, 334–340
    time horizon, 330–334
  overview, 321
  strategic asset allocation, 349–355
  tactical asset allocation, 356–361
    discretionary, 357–358
    systematic, 358–359
  taxes, 340–349
    after-tax portfolio optimization, 341–344
    and portfolio rebalancing, 344–345
    strategies to reduce tax impact, 345–346
asset-based models of equity market, 157–161
asset class(es)
  allocations to less liquid, 265–266
  in asset allocation implementation, 217–219
  and factors, 270
  forecasting returns of, 89–104
    cash and equivalents, 89–90
    common shares, 93–97
    currencies, 99–100
    defaultable debt, 92
    emerging market bonds, 92
    and exchange rates, 100–103
    and government intervention, 104
    and historical capital market expectations, 97–99
    inflation-indexed bonds, 92–93
    nominal default-free bonds, 91–92
    real estate, 97
  foreign exchange as, 394, 395
  inflation/deflation effects for, 59
  and investor constraints, 323–324
  and liquidity, 266
  in liquidity assessments, 329
  modeling risk in, 195–201
    classification of, 195–198
    diversification with, 197
    sub-asset classes, 199
  negative interest rates effects for, 67
  optimal corridor width of, 312–313
  value signals of, 358

asset class risk, modeling, 195–201
asset class weights
  in asset allocation implementation, 216–217
  changes to, in mean–variance optimization, 253–254
  and rebalancing, 314–315
  and reverse optimization, 256
asset composition, in foreign-currency portfolios, 390
asset covariance matrix, 28
asset–liability management (ALM), 285
asset location, holistic approach to, 349
asset-only allocation, 203–208, 237–272
  allocating to less liquid asset classes, 265–266
  criticisms of mean–variance optimization, 252–265
    Black–Litterman model, 256–259
    constraints beyond budget constraints, 259
    non-normal optimization approaches, 261–265
    resampled mean–variance optimization, 260–261
    reverse optimization, 254–256
  defined, 192
  for defined benefit pension plan, 209–210
  factor-based allocation, 269–272
  investment objectives of, 194
  mean–variance optimization, 237–249
  Monte Carlo simulation, 249–252
  risk budgeting, 267–269
  risk concepts relevant to, 194–195
  tactical asset allocation as, 356
asset owners, in investment policy statements, 184
asset-pricing theory, risk premiums in, 50
assets
  correlations of (*see* correlations of assets)
  domestic, 381
  extended portfolio, 188
  foreign, 382–384
  illiquid, and rebalancing, 226
  real, 59, 198
  risk-free, 246–247
  size of, as asset allocation constraint, 322–327
asynchronism, 17n.8
at-the-money (ATM) options, 405
audit, governance, 185–186
Aussie-dollar market (USD/AUD), 376, 428
Australia. *see also* MSCI EAFE (Europe, Australasia, and Far East) Index
  Conference Board index, 84
  equity risk premium, 39
  expected returns for equities/bonds, 24
  market integration, 43
  real GDP growth rate, 32
Australian dollar
  as commodity currency, 439
  currency code, 375
  in currency pairs, 376, 428
Austria, 9n., 83, 337
autoregressive conditional heteroskedasticity (ARCH) time-series models, 27n.25
availability bias, 366–367

B
Bahrain, 76
baht, Thai, 329, 438
Bailey, Jeffery V., 465, 468, 480
balance of payments, 79n.64
Bank of England, 65
Bank of Japan, 65, 83
Bank of Thailand, 100
banks
  central, 56–57, 63, 90
  integrated asset–liability approach for, 285
Barker, William A., 399n.15
base currency, 375–377
basis risk, 284
behavioral biases, 361–369
  availability bias, 366–367
  framing bias, 365–366
  illusion of control, 362–363
  loss aversion, 362
  mental accounting, 363–364
  representative bias, 364–365
behavioral finance, 23
Belgium
  equity risk premium, 39
  Eurozone membership, 9n.
  expected returns for equities/bonds, 24
  trade partners, 83
beliefs, changes in, 351–353
benchmarks
  about, 463–464
  in asset allocation reporting, 185
  defined, 463
  indexes as, 479, 480
  market indexes vs., 465
  selection example, 481–483
  types of, 468–471
  unconditional, 19
  uses of, 466–468
  valid, 464, 465, 480
Bernstein, Peter L., 10, 470–471
beta research, 8
biases
  in analyst methods, 18–19
  behavioral (*see* behavioral biases)
  data measurement, 14–16
  data-mining, 18
  familiarity, 366–367
  forward rate, 403, 415
  hindsight, 363
  "home," 366, 374
  home-country, 208
  recency, 364
  small-issuer, 478
  survivorship, 14
  time-period, 18–19
bid price, spot currency, 377
"big figure," currency quote, 376
Big Four European countries, CLI for, 82
binary options, 425
Black, Fischer, 256
Black–Litterman approach, 12, 40
Black–Litterman model, 256–259
Bloomberg, 104, 105
Bloomberg Barclays, 471
Bloomberg Barclays Aggregate index, 44
Bloomberg Barclays Corporate Bond Index, 482
Bloomberg Barclays Global Government Bond Index, 482
Bloomberg Barclays Inflation-Linked Bond Index, 482
Bloomberg Barclays Sterling Aggregate Bond Index, 465
Bloomberg Barclays Sterling Gilts Index, 465
BLS. *see* Bureau of Labor Statistics
boards of directors, benchmarks for, 467
bonds. *see also* fixed-income investments
  in current and previous investing environments, 351–352
  emerging market, 92
  expected returns, 24–25, 36
  high-yield
    expected return and taxation of, 343–344
    strategic asset location for, 346–348
  inflation/deflation effects for, 59
  inflation-indexed, 92–93
  investment grade
    expected return and taxation of, 343–344
    strategic asset location for, 346–348
  nominal default-free, 91–92
  Treasury
    and Fed model, 35, 149
    T-bill yield vs., 55
  yield to maturity of, 35
bond-yield-plus-risk-premium method, 38
bond yields
  nominal, 76–77
  real, 91, 93
  yield to maturity, 35
  yield to worst, 35n.38
bottom-up forecasts, 140–146
  earnings forecast revisions based on, 145–146
  of market earnings per share, 144, 146
  portfolio suitability for, 142–143
  top-down vs., 141, 144–145
  using top-down forecasts with, 143–145
Brazil
  market integration, 43
  pension funds in, 335
Brazilian Institute for Geography and Statistics, 84
Brazilian real, 375, 440–441
Brazil Industrial Production, 84
BRC survey. *see* British Retail Consortium survey
British pound
  currency code, 375
  in currency pairs, 376
British Retail Consortium (BRC) survey, 61
broad market indexes, 469
bubbles, 31n.31
budget constraints, 238, 259
budget deficits
  and fiscal policy, 67–68
  and government structural policies, 72–73

build-up approach, 36–40
Bureau of Labor Statistics (BLS), 13
Burgiss, 469
business cycle analysis, 51–66
factors affecting, 60–68
business investment, 61–62
consumer spending, 61
fiscal policy, 67–68
monetary policy, 62–67
inflation and deflation in, 55–59
inventory cycle, 51, 52
market expectations in, 59–60
and P/E ratio, 96–97
and returns for common shares, 94
stages of business cycle, 53–55
business cycles
and consumer confidence, 53, 54
defined, 51
stages of, 53–55
business investment, in business cycle analysis, 61–62
buy and hold strategies, 466n.5

C
CAC 40 (index), 471, 474
CAD/USD. *see* Dollar-Canada market
calendar rebalancing, 224, 312
Cambridge Associates, 469
Campbell, John Y., 390–391, 432
Canada
CLI for, 82
equity risk premium, 39
expected returns for equities/bonds, 24
real GDP growth rate, 32
trade partners, 84
Canadian dollar, 375, 376, 377n.4
CAPE. *see* Cyclically Adjusted P/E Ratio
capital, human. *see* human capital
capital asset pricing model (CAPM), market indexes and, 472, 477
capital assets, 195
capital flows
and currency returns, 100
forecasting approach based on, 102
and USD/euro exchange rate, 103
capital gains, taxation of, 340, 341
capitalization-weighted indexes
advantages and disadvantages of, 477–478
as benchmarks, 479–480
float-adjusted, 479–480
capitalization weighting, 473–474
capital market expectations (CME), 5–124
for asset class, 301
and asset class returns, 97–99
in business cycle analysis, 59–60
defined, 6
economic analysis of, 50–103
business cycle analysis, 51–66
and economic forecasting, 80–89
exogenous shocks in, 74–75
forecasting asset class returns with, 89–104
growth trends, 68–73
information sources for, 104–105
international interactions in, 75–80
forecasting of, 13–23
biases of analyst methods, 18–19
conditioning information, 19–20
correlations in, 20–21
data measurement errors and biases, 14–16
economic data, 13–14
and *ex post* risk, 18
and GNP vs. GDP, 14
with historical estimates, 16–18
and model uncertainty, 23
psychological traps with, 21–22
framework, 7–13
and expected return estimates, 11–12
historical analysis in, 10
and inconsistency of correlation estimates, 12–13
information requirements, 8–10
modifying, 97–99
and negative interest rates, 66–67
practice problems, 108–115
setting, 23–50
with formal tools, 23–48
and judgment, 50
with survey and panel methods, 48–49
solutions to problems, 116–124
capital markets
anomalies in, 23
business cycle effects on, 53, 54
forecasts of, 43–45
CAPM. *see* capital asset pricing model, market indexes and
cap weighting, 473–474. *see also* capitalization-weighted indexes
carry trade, 402–404, 415
cash
in asset allocation, 245–246
forecasts of returns, 89–90
inflation/deflation effects for, 59
and liquidity, 265
cash equivalents, forecasts of returns, 89–90
cash flow, uncertainties in, 283–284
causality relationships, 21
CBOE. *see* Chicago Board Options Exchange
central banks
monetary policy of, 56–57, 63
negative interest rates, 65
central bank watching, 90
Central Europe. *see specific countries*
checklist approach to economic forecasting, 86–89
CHF/EUR. *see* Euro-Swiss market
CHF/USD. *see* Dollar-Swiss market
Chicago Board Options Exchange (CBOE), 472
Chicago Mercantile Exchange (CME), 410–411
Chile
degree of specialization, 75
market integration, 43
regulatory constraints in, 335
sovereign wealth funds in, 338
Chilean peso, 438
China
Cobb-Douglas model for economic growth in, 126, 128–131
economic experience, 128–129
future economic growth, 130–131
historical growth accounting, 128
H-model for estimating P/E, 132–139
macroeconomic linkages, 75
pension funds in, 335
regulatory constraints in, 335
TFP growth, 71
trade partners, 83, 84
China Industrial Production index, 83
Chinese yuan, 375, 440
Citi Non-US World Government Bond Index, 44
client goals, 293–295
CME. *see* capital market expectations; Chicago Mercantile Exchange
Cobb-Douglas production function (Cobb-Douglas model), 126–130
for Chinese economic growth, 126, 128–131
and neoclassical approach to growth accounting, 126–127
projections of economic growth from, 130–131
cognitive bias, illusion of control as, 362–363
commodity currencies, 439
commodity trading advisors (CTAs), 411
common shares, earnings of, 93–96
common stock, strategic asset location for, 346–348
competition, government structural policies and, 73
completeness, market index, 475
compliance, using benchmarks to demonstrate, 468
concentrated stock positions, 364
conditional value at risk (CVaR), 365–366
conditioning information, 19–20
Conference Board, 82, 84, 85, 104
confirming evidence trap, 21
Congressional Budget Office, 105
constant growth model. *see* Gordon growth model
constant returns to scale, 127
constraints in asset allocation, 322–340
asset size, 322–327
beyond budget constraints, 259
liquidity, 327–330
regulatory and other external constraints, 334–340
endowments and foundations, 337–338
insurance companies, 335
pension funds, 335–337
sovereign wealth funds, 338
revising strategic asset allocation for change in, 350–351
time horizon, 330–334
consultants, benchmarks for, 467
consumable/transformable assets, 195
consumer confidence, business cycle and, 53, 54
consumer income growth, in econometric modeling, 81
consumers, economic growth trends and, 69–70
consumer spending
and business cycle, 60, 61
in business cycle analysis, 60, 61
in econometric modeling, 81
in United Kingdom, 49

contagion, in emerging markets, 439–440
contingent liabilities, 273
convexity, portfolio, 421
core hedge, 434
corner portfolios, 243n.6
correlations of assets
  in asset-only allocation, 240–241
  inconsistency of estimates, 12–13
  judgment in estimates, 50
  misinterpretations of, 20–21
  nonlinear, 20
  partial, 20
  in portfolio rebalancing, 313
  and taxation estimates, 342
cost(s)
  hedging, 420–428
    example, 426–428
    exotic options, 424–425
    over-/under-hedging with forward contracts, 421
    protective puts with OTM options, 422
    put spreads, 422–423
    risk reversal, 422
    seagull spreads, 423–424
  opportunity, 392
  in strategic currency decisions, 391–392
  trading
    for currency hedging, 391–392
    with emerging market currencies, 438–440
  transaction, 314–315
cost–benefit approach, 225
costless hedge, 389n.10
country risk, in emerging markets, 77–80
covariance, estimating, 28, 29
covariance matrix
  multifactor model for estimating, 28–31
  shrinkage estimator of, 25–26
  target, 25–26
CPI. *see* US Consumer Price Index
CPI-U. *see* US Consumer Price Index for All Urban Consumers
credit considerations, 338
credit spread, 201
Credit Suisse/Tremont, 469
Credit Support Annexes (CSAs), 410n.23
cross hedging, currency, 428–430
cross-sectional momentum, 358n.21
CSAs. *see* Credit Support Annexes
CTA managed accounts. *see* managed futures
CTAs. *see* commodity trading advisors
currency(-ies)
  base, 375–377
  commodity, 439
  in country risk analysis, 78–79
  emerging market, 438–441
  forecasts of returns, 99–100
  foreign, 382
  funding, 404
  haven, 439
  home (domestic), 381
  investment, 404
  price, 375–377
currency codes, 375
currency exposure
  international, 381–384
  and portfolio returns, 381–386
    international exposure, 381–384
    risk and return, 381–386
    volatility of returns, 384–385
  strategic decisions about, 389–392
    cost considerations, 391–392
    diversification considerations, 389–391
currency hedging
  costs, 392, 420–428
    example, 426–428
    exotic options, 424–425
    over-/under-hedging with forward contracts, 421
    protective puts with OTM options, 422
    put spreads, 422–423
    risk reversals, 422
    seagull spreads, 423–424
  discretionary, 393
  for fixed-income portfolios, 390
  and market conditions, 390–391
  multiple currencies, 428–433
    cross hedges, 428–430
    macro hedges, 430
    minimum-variance hedge ratio, 431–433
  over- and under-, 421
  passive, 393
  and time horizons, 389–390
currency management, 373–461
  currency risk and portfolio return/risk, 381–386
  emerging market currencies, 438–441
    non-deliverable forwards, 440–441
    trading costs and extreme market events, 438–440
  foreign exchange markets, 374–381
    currency options markets, 381
    forward markets, 377–380
    spot markets, 375–377
    swap markets, 380–381
  formulating programs for, 396–398
  globalization and, 373–374
  portfolio return, 381–386
    and international exposure, 381–384
    and risk, 381–386
    volatility of, 384–385
  practice problems, 445–453
  solutions to problems, 454–461
  strategic decisions, 387–398
    currency exposures, 389–392
    currency risk, 392–396
    formulating currency management programs, 396–398
    in Investment Policy Statements, 387–388
    portfolio optimization, 388–389
  tactical decisions, 399–409
    carry trade in, 402–404
    economic fundamentals in, 399–400
    example, 407–409
    technical analysis in, 401–402
    volatility trading in, 404–409
  tools, 409–438
    "correct" approach, 434–438
    currency options, 406–407, 417–420
    forward contracts, 410–417
    hedging multiple currencies, 428–433
    reduction of hedging costs, 420–428
currency options, 381, 406–407, 417–421
currency overlay programs, 394–396
currency risk. *see also* currency management
  asset allocation with, 389
  and portfolio return/risk, 381–386
  strategic decisions about, 392–396
    active currency management, 393–394
    currency overlay programs, 394–396
    discretionary hedging, 393
    passive hedging, 393
current account deficits, 78–79, 102–103
current account receipts, 79
custom security-based benchmarks, 470
CVaR. *see* conditional value at risk
Cyclically Adjusted P/E Ratio (CAPE), 153–157, 161, 162
cyclical stocks, 94
Cyprus, 9n.

D

DAA. *see* dynamic asset allocation
Darnell, R. Max, 390
data measurement, biases and errors in, 14–16
data-mining biases, 18
DAX 30 (index), 474
DB pension plans. *see* defined-benefit pension plans
DCF models. *see* discounted cash flow models
debt
  defaultable, 92
  emerging market, 92
  external, 79
  fiscal debt to GDP ratio, 78
  foreign debt to GDP ratio, 79
  Treasury, 37
debt to current account receipts, 79
deci-pips, 377n.3
decision making, based on investment objectives, 182
decision-reversal risk, 186
declining-balance portfolio, 292n.27
defaultable debt, 92
default risk premiums, 36
deficits
  budget, 67–68, 72–73
  current account, 78–79, 102–103
  twin deficits problem, 72–73
defined benefit (DB) pension plans
  asset size and performance of, 323
  contingent liabilities of, 273
  investment objective of, 181
  liabilities of, 274–276
  liability-relative allocation for, 208–211
deflation
  in business cycle analysis, 55–59
  defined, 58
delta
  and currency option quotes, 406–407
  defined, 404
  and volatility trading, 405–406

delta hedge, 405
Denmark
  equity risk premium, 39
  expected returns for equities/bonds, 24
  negative interest rates, 65
  real GDP growth rate, 32
de-risking, 349
derivatives, 472. *see also specific types, e.g.:* options
descriptive statistics, 23
Deutsche Börse, 485
developed economies
  analysis of emerging vs., 77
  justified P/E estimates for, 139–140
DFA. *see* dynamic financial analysis
diffusion index, 82
digital options, 425
discounted cash flow (DCF) models, 12, 31–35
discount rate
  in hedging portfolio approach, 283–284
  and liabilities, 276
  and longevity risk, 215
discretionary hedging, 393
disinflation, 55
diversification
  with asset classes, 197
  and strategic decisions about currency exposures, 389–391
dividend income, taxation of, 340
DJIA. *see* Dow Jones Industrial Average
dollar, Australian
  as commodity currency, 439
  currency code, 375
  in currency pairs, 376, 428
dollar, Canadian, 375, 376, 377n.4
dollar, New Zealand
  as commodity currency, 439
  currency code, 375
  in currency pairs, 376, 428
dollar, US
  benefits of currency exposure for, 390–391
  currency code, 375
  in currency pairs, 103, 376, 377, 378n.7, 411, 428
  as haven currency, 439
Dollar-Canada market (CAD/USD), 376, 377n.4
Dollar-Swiss market (CHF/USD), 376
Dollar-yen market (JPY/USD), 376, 377, 378n.7, 411
domestic assets, 381
domestic currency, 381
domestic-currency returns, 382–385
Dow Jones Euro Stoxx 50 Index, 139–140
Dow Jones Industrial Average (DJIA)
  historical track record of, 478
  price weighting, 474
  uses of, 471
drawdown controls, 302
duration, risk factor exposure to, 201
dynamic asset allocation (DAA), 216
dynamic financial analysis (DFA), 285
dynamic hedges
  over- and under-hedging, 421
  rebalancing with, 412–414
dynastic goals, 214

E
early upswing phase (business cycle), 53, 54, 94
earnings-based models for equity market
  Cyclically Adjusted P/E Ratio, 153–157
  Fed model, 147–150
    with UK data, 150
    with US data, 147–148
  Yardeni model, 150–153
Eastern Bloc, historical data from, 139. *see also specific countries*
Eastern Europe. *see specific countries*
EBS, 411
ECB. *see* European Central Bank
econometric modeling, 80–81, 89
econometrics, 80
economic analysis, 50–103
  business cycle analysis, 51–66
    factors affecting, 60–68
    inflation and deflation in, 55–59
    inventory cycle, 51, 52
    market expectations in, 59–60
    stages of business cycle, 53–55
  and economic forecasting, 80–89
    checklist approach, 86–89
    econometric modeling, 80–81
    economic indicators, 81–86
    strengths and weaknesses of forecasting, 88–89
  exogenous shocks in, 74–75
  forecasting asset class returns with, 89–104
    cash and equivalents, 89–90
    common shares, 93–97
    currencies, 99–100
    defaultable debt, 92
    emerging market bonds, 92
    and forecasting exchange rates, 100–103
    and historical capital market expectations, 97–99
    inflation-indexed bonds, 92–93
    nominal default-free bonds, 91–92
    real estate, 97
  growth trends, 68–73
    consumer impact on, 69–70
    in GDP, 70–72
    and government structural policies, 72–73
  information sources for, 104–105
  international interactions, 75–80
    in emerging markets, 77–80
    interest rate/exchange rate linkages, 75–77
    macroeconomic linkages, 75
economic balance sheet, 188–191
economic data, for CME forecasts, 13–14
economic forecasting, 80–89
  checklist approach, 86–89
  econometric modeling, 80–81
  with economic indicators, 81–86
    for Asia Pacific, 83
    for Europe, 82–83
    for North America, 84–86
    for South America, 83–84
    worldwide, 82
  strengths and weaknesses of forecasting, 88–89
Economic Freedom Index, 78
economic fundamentals, 399–400
economic growth
  checklist for, 86–89
  in country risk analysis, 78
  future growth predicted for China, 130–131
  trends in, 51, 68–73
    consumer impact on, 69–70
    for GDP, 70–72
    and government structural policies, 72–73
economic indicators
  advantages and disadvantages of, 89
  for Asia Pacific, 83
  economic forecasting with, 81–86
  for Europe, 82–83
  for North America, 84–86
  for South America, 83–84
  worldwide, 82
Economic Optimism Index, 49
economic shocks, 68–69, 74–75
efficient asset mixes, 239
efficient frontier
  for asset allocation in pension funds, 337
  for asset-only allocation, 281
  balance sheet approach, 249
  and Black–Litterman model, 257–259
  expected returns in, 253
  factor-based allocation, 271–272
  generated in mean–variance optimization, 241–245
  with resampling, 260–261
  surplus, 279–281
  and taxation, 342–344
elective professional clients, 325
EMBI. *see* JP Morgan Emerging Markets Bond Index
EMBI Global Index (EMBIG), 469
emerging market bonds, 92
emerging market debt, 92
emerging market equities, 198
emerging markets, 438–441
  common shares in, 97
  country risk analysis, 77–80
  developed vs. emerging economies, 77
  in economic analysis, 77–80
  non-deliverable forwards, 440–441
  trading costs and extreme market events, 438–440
emotional biases
  loss aversion, 362
  overconfidence as, 362
EMU. *see* European Monetary Union
endogenous variables, 20
endowment model, 308–309
endowments
  in asset allocation constraints, 337–338
  investment objective of, 181
  as liabilities, 273
Engle, Robert F., 27
enhanced-index managers, 473
Enron, 68
environmental, social, and governance (ESG) considerations, for sovereign wealth funds, 338
equal probability rebalancing, 313
equal-weighted indexes, 478
equal weighting, 474

equilibrium
of inflation premium and real interest rate, 37–38
rational belief, 23n.18
equilibrium models, for capital market expectations, 40–48
equities. *see also specific types*
in current and previous investing environments, 351–352
drivers of returns for, 125–126
expected returns, 24–25
inflation/deflation effects for, 59
strategic asset location for, 346
taxation of, 343–344
equity–bonds covariance matrix, 28–31
equity market
asset-based models, 157–161
constant growth model, 31–33
discounted cash flow models, 31–35
earnings-based models, 147–157
Cyclically Adjusted P/E Ratio, 153–157
Fed model, 147–150
Yardeni model, 150–153
forecasts of, 140–146
market EPS, 144, 146
portfolio suitability of, 142–143
revising earnings forecasts, 145–146
types of forecasts, 141
using both forecasting approaches, 143–145
relative value models, 147–162
equity market valuation, 125–173
with dividend discount models, 137–138
drivers of equity returns, 125–126
justified P/E estimates, 126–140
for China, 128–129
creating valuation from estimates, 131–140
for developed economies, 139–140
and neoclassical approach to growth accounting, 126–127, 129–130
quantifying future economic growth from, 130–131
practice problems, 165–171
relative value models, 147–162
asset-based models, 157–161
earnings-based models, 147–157, 160–161
solutions to problems, 172–174
in systematic TAA, 358
and top-down/bottom-up forecasts, 140–146
gaps in, 143–145
of market earnings per share, 144, 146
portfolio suitability for, 142–143
revising earnings forecasts, 145–146
top-down vs. bottom-up forecasting, 141, 144–145
equity *q* ratio
and asset-based models, 158–160
strengths and limitations, 161
equity risk premium
for capital market expectations, 38–40
and Fed model, 148
Grinold–Kroner model for forecasting, 34–35
ESG considerations. *See* environmental, social, and governance (ESG) considerations
estimates
correlation, 12–13
covariance, 28, 29
expected return, 11–12
historical, 16–18
justified P/E, 126–140
for China, 128–139
for developed economies, 139–140
and neoclassical approach to growth accounting, 126–127, 129–130
point, 24n.19
estimators
sample, 24–25
shrinkage, 25–26
time-series, 26–27
Estonia, 9n.
ETFs. *see* exchange-traded funds
EU. *see* European Union
euro(s)
currency code, 375
in currency pairs, 103, 375, 376
exchange rate pegging, 76
Euro-dollar market (USD/EUR), 103, 376
Euronext, 471
Europe. *see also* MSCI EAFE (Europe, Australasia, and Far East) Index; *specific countries*
China stock market volatility vs., 136
economic indicators, 82–83
and justified P/E estimates, 133
and neoclassical approach to growth accounting, 129
TFP growth, 71, 72
European Central Bank (ECB)
monetary policy, 66, 102
open market operations by, 90
quantitative easing, 65
European Monetary Union (EMU), 82
European Union (EU)
economic growth projections, 130
historical growth accounting, 128
Euro-sterling market (GBP/EUR), 376
Euro-Swiss market (CHF/EUR), 376
Euro-yen market (JPY/EUR), 376
Eurozone, 9n.
capital flows forecasting approach, 102
CLI, 82
deflation, 56–57
economy valuation, 139–140
monetary policy, 66
negative interest rates, 65
open market operations, 90
Eurozone Harmonized Index of Consumer Prices (HICP), 82–83
ex ante risk
for equities, 40
from *ex post* risk, 18
excess corporate growth, 32
excess returns, 467
Exchange Rate Mechanism, 76
exchange rates
defined, 375
in emerging markets, 440
forecasts of, 100–103
capital flows, 102
government intervention, 104
purchasing power parity, 101
relative economic strength, 101
savings–investment imbalances, 102–103
USD/euro exchange rate, 103
and interest rates, 75–77, 101
real, 399–400
exchange-traded funds (ETFs), 472
exchange-traded futures, in FX market, 410–411
exogenous economic shocks, 74–75
exogenous variables, 20
exotic options, 421, 424–425
expectations, capital market. *see* capital market expectations
expected income return, 34
expected nominal earnings growth return, 34
expected repricing return, 34
expected returns
in asset-only allocation, 240
estimates of, 11–12
and framing bias, 365
in goals-based allocation, 291
Gordon growth model, 31–33
Grinold–Kroner approach, 34–35
risk premium approach, 36
and taxation, 341, 343–344
unconditional, 19–20
ex post performance benchmarks, 472
ex post risk, 18
exposures. *see* risk exposures
extended portfolio assets and liabilities, 188
external accounts, in country risk analysis, 78–79
external constraints, 334–340
endowments and foundations, 337–338
insurance companies, 335
pension funds, 335–337
sovereign wealth funds, 338
external debt, in country risk analysis, 79
externalities, 73n.63
extreme market events, 440

F

factor-based allocation, 199–201, 226, 269–272
factor betas, 28–29
factor covariance matrix, 28–30
factor loadings, 28–29
factor-model-based benchmarks, 469–470
factor modeling, 289
factor sensitivities, 28–29
familiarity bias, 366–367
FDI. *see* foreign direct investment
fear index, 357
federal funds rate (fed funds), 64, 90
Federal Reserve
economic data from, 104
fed funds rate, 64, 90
Flow of Funds Accounts of the United States-Z.1, 158
monetary policy, 102
monetary policy in recessions, 60
quantitative easing, 65
response to financial crisis, 75
Federal Reserve Bank of New York, 329

Federal Reserve Bank of Philadelphia, 48
fed funds. *see* federal funds rate
Fed model, 35, 147–150
  strengths and limitations, 160
  with UK data, 150
  with US data, 147–148
  Yardeni model vs., 161–162
financial crises, as exogenous shocks, 75. *see also specific crises*
financial market equilibrium models, 40–48
Financial Times Actuaries Share Indexes, 473–474
Financial Times Stock Exchange (FTSE), 471, 474
Finland, 9n.
fiscal debt to GDP ratio, 78
fiscal policy
  in business cycle analysis, 54, 67–68
  in country risk analysis, 78
  defined, 60
  and government structural policies, 72–73
  and monetary policy, 68
fixed-income investments. *see also* bonds
  and emerging market equities, 198
  in pension funds, 349
fixed-income markets, discounted cash flow models in, 35
fixed-income portfolios, currency hedging for, 390
fixed-income premiums, for capital market expectations, 36–38
Flow of Funds Accounts of the United States-Z.1, 158
forecasts
  asset class returns, 89–104
    cash and equivalents, 89–90
    common shares, 93–97
    currencies, 99–100
    defaultable debt, 92
    emerging market bonds, 92
    and forecasting exchange rates, 100–103
    and historical capital market expectations, 97–99
    inflation-indexed bonds, 92–93
    nominal default-free bonds, 91–92
    real estate, 97
  capital market expectations, 13–23, 43–45
    and biases of analyst methods, 18–19
    conditioning information, 19–20
    correlations in, 20–21
    data measurement errors and biases, 14–16
    economic data, 13–14
    and *ex post* risk, 18
    and GNP vs. GDP, 14
    with historical estimates, 16–18
    and model uncertainty, 23
    psychological traps with, 21–22
  economic, 80–89
    checklist approach, 86–89
    econometric modeling, 80–81
    economic indicators, 81–86
    strengths and weaknesses of forecasting, 88–89
  equity market, 140–146
    market EPS, 144, 146
    portfolio suitability of, 142–143
    types of forecasts, 140–141
    using both forecasting approaches, 143–145
  equity risk premium, 34–35
  exchange rates, 100–103
    capital flows, 102
    government intervention, 104
    purchasing power parity, 101
    relative economic strength, 101
    savings–investment imbalances, 102–103
    USD/euro exchange rate, 103
  returns, 34–35
foreign assets, 382–384
foreign currency, 382
foreign-currency portfolios, asset composition in, 390
foreign-currency returns, 382
foreign debt to GDP ratio, 79
foreign direct investment (FDI), 102
foreign exchange, as asset class, 394, 395
foreign exchange (FX) market
  exchange-traded futures in, 410–411
  forward, 377–380
  spot, 375–377
  swap, 380–381
foreign trade, business cycle and, 60
formal tools for capital market expectations, 23–48
  discounted cash flow models, 31–35
  financial market equilibrium models, 40–48
  and justification of capital market forecasts, 43–45
  risk premium approach, 36–40
  Singer–Terhaar approach, 40–48
  statistical methods, 23–31
forward contracts (forwards)
  basis risk with, 432n.34
  currency management with, 410–417, 420, 421
    hedge ratios, 411–414
    roll yield, 414–416
  futures vs., 410–411
  non-deliverable, 440–441
  over-/under-hedging with, 421
forward curve, roll yield and, 414–415
forward justified P/E estimates, 133
forward markets, foreign exchange, 377–380
forward rate bias, 403, 415
foundations, 337–338
framing bias, 365–366
franc, Swiss
  benefits of currency exposure for, 391n.11
  currency code, 375
  in currency pairs, 376
  as haven currency, 439
France
  CLI, 82
  Conference Board index, 84
  equity risk premium, 39
  Eurozone membership, 9n.
  expected returns for equities/bonds, 24
  market integration, 43
  real GDP growth rate, 32
  trade partners, 83
free float, of market indexes, 474, 476
French Monthly Business Survey, 83
FTSE. *see* Financial Times Stock Exchange
FTSE 100 Index
  and Fed model with UK data, 150
  forecasting approaches for, 140
  formulating CMEs from, 24
  as market index, 465
  uses of, 471
fundamental-weighted indexes, 478–479
fundamental weighting, 474
funding currencies, 404
funding ratio, 275–276
fund managers, 466, 467, 472
fungibility, 212n.26
futures (futures contracts). *see also* managed futures
  basis risk with, 432n.34
  forwards vs., 410–411
future wealth, predicting, 250
FX market. *see* foreign exchange market

G
G–7
  CLI, 82
  expansion phases in, 97
GBI. *see* goals-based investing
GBP/EUR. *see* Euro-sterling market
GDP. *see* gross domestic product
generalized peso problem, 18n.10
geometric mean return, arithmetic vs., 24
German IFO Business Survey, 83
German Industrial Production index, 83
Germany
  bond yields, 76
  CLI, 82
  Conference Board index, 84
  equity risk premium, 39
  Eurozone membership, 9n.
  expected returns for equities/bonds, 25
  inflation forecast, 57–58
  market integration, 43
  real GDP growth rate, 32
  reunification, 74, 75
  trade partners, 84
  volatility index in, 357
GIM. *see* global investable market
GIPS. *see* Global Investment Performance Standards
glide paths
  based on "120 minus your age" rule, 306
  liability, 211
  of life-cycle balanced fund, 189–190
  in portfolio rebalancing, 353
global financial crisis (2007-2009), 66
  asset allocation changes due to, 361
  liquidity in, 329, 366
  low interest rates caused by, 56–57
global fixed income, 198
global investable market (GIM), 40
Global Investment Performance Standards (GIPS), 467–468
globalization, currency management and, 373–374

global market portfolio, 308
  in asset-only allocation, 207–208
  to mitigate illusion of control bias, 363
  in passive management, 217
global private equity, 197
global public equity, 197
global tactical asset allocation (GTAA), 216, 356n.18
GNP. *see* gross national product
goals
  classification of, 213–214
  describing clients', 293–295
  dynastic, 214
  importance of, 213
  of individuals vs. institutions, 290
  negative, 294n.30
  revising strategic asset allocation for change in, 350
goals-based allocation, 211–216, 289–306
  defined, 192
  description of client goals for, 293–295
  for institutional investors, 192–193
  investment objectives of, 194
  issues related to, 304–306
  liability-relative allocation vs., 193
  loss aversion in, 362
  and mental accounting, 364
  module process in, 300–304
  overall portfolio in, 298–300
  process for, 291–293
  rebalancing, 315
  rebalancing in, 226
  revisiting overall asset allocation in, 304
  risk concepts relevant to, 195
  sub-portfolio construction for, 295–298
goals-based investing (GBI), 192, 193
Goldman Sachs, 49
Gordon (constant) growth model
  for equity markets, 31–33
  and Fed model, 148
governance. *see also* investment governance
  mitigating behavioral biases with, 367
  structures for, 180–181
governance audit, 185–186
governance models, 181
governance reporting, 185
Government Pension Fund Global (Norway), 309
government policy(-ies)
  and business cycle, 61
  and exogenous shocks, 74
  structural, 72–73
Granger, Clive W. J., 27n.25
Granger causation, 20n.17
Greece, 9n.
Grinold–Kroner model, 33–35
gross domestic product (GDP)
  in business cycles, 51
  in econometric modeling, 80
  and economic growth trends, 70–72
  fiscal debt to GDP ratio, 78
  foreign debt to GDP ratio, 79
  GNP vs., 14
  growth rate of nominal, 32
  growth rate of real, 32–33
gross national product (GNP), 14
growth accounting, neoclassical approach, 126–127, 129–130
growth investment style, 469n.9
growth managers, 467
GTAA. *see* global tactical asset allocation
Gulf Cooperation Council, 76

H
"handle," currency quote, 376
haven currencies, 439
Hedge Fund Research, 469
hedge funds, 325, 469
hedge ratios
  defined, 381
  with forward contracts, 411–414
hedges
  core, 434
  delta, 405
  dynamic, 412–414, 421
  macro, 430
  natural, 435
  static, 412
  Texas, 432n.34
hedging. *see also* currency hedging
  compared to other approaches, 286–287
  cross, 428–430
  defined, 276
  and liability-relative allocation, 282–285
  over- and under-, 421
  proxy, 428–430
HICP. *see* Eurozone Harmonized Index of Consumer Prices
high-yield (HY) bonds
  expected return and taxation of, 343–344
  strategic asset location for, 346–348
hindsight bias, 363
historical analysis
  for asset allocation, 288
  and capital market expectations, 7, 10, 11
  Grinold–Kroner model, 33–35
historical estimates, capital market expectations from, 16–18
historical statistical approach to formulating CMEs, 24–25
hitting the bid, 377
H-model for estimating P/E, 132–139
"home bias," 366, 374
home-country bias, 208
home currency, 381
Hong Kong
  Asian financial crisis (1997), 329
  Economic Freedom Index, 78
  exchange rate pegging, 76
  regulatory constraints in, 325
  and SPDR S&P China ETF, 132
  trade partners, 83
household savings rate, 61
human capital
  and government structural policies, 73
  in life-cycle balanced funds, 188–190
  in mean–variance optimization, 247–249
  "120 minus your age" rule, 306
  in time horizon, 331
Humphrey-Hawkins report, 147
HY bonds. *see* high-yield bonds

I
ICAPM. *see* international CAPM-based approach
IG bonds. *see* investment grade bonds
ILGS. *see* Index-Linked Gilts
illiquid assets
  allocation to, 265–266
  and rebalancing, 226
illiquidity, of emerging market currencies, 439
illiquidity premium, 36
illusion of control (bias), 362–363
IMF. *see* International Monetary Fund
implementation (of asset allocation), 216–221
  of allocations to asset classes, 217–219
  of asset class weights, 216–217
  for global market portfolio, 209
  risk budgeting perspectives in, 221
implied annual capital gains tax rate, 341n.11
income
  and consumption, 69–70
  in econometric modeling, 81
  expected return for, 34
  permanent income hypothesis, 69–70
  taxation of interest, 340
indexes. *see also specific indexes*
  as benchmarks, 479, 480
  capitalization-weighted, 477–478
  diffusion, 82
  equal-weighted, 478
  fundamental-weighted, 478–479
  limitations of data on, 13, 14
  market
    about, 464
    as benchmarks, 480
    benchmarks vs., 465
    construction of, 473–477
    index weighting schemes, 477–481
  in passive and active management, 217–218
  price-weighted, 478
Index-Linked Gilts (ILGS), 92–93
Index of Leading Economic Indicators (LEI), 84–86
index weighting, 477–481
  capitalization-weighted indexes, 477–478
  defining, for index construction, 473–474
  equal-weighted indexes, 478
  fundamental-weighted indexes, 478–479
  with index used as benchmark, 479
  and market index as benchmarks, 480
  price-weighted indexes, 478
Indian rupee, 375, 440
individual investors
  asset size as constraint for, 325
  changing goals of, 350
  changing liabilities of, 331
  CME research, 8
  extended portfolio assets and liabilities of, 188
  goals-based allocation for, 289–290

investment objectives of, 181
liabilities for, 193
individual local market, 42
Indonesia, 83, 329
inferential statistics, 23
inflation
in business cycle analysis, 55–59
and nominal default-free bonds, 91–92
and P/E ratios, 97
reducing risk factor exposure to, 201
inflation-indexed bonds, 92–93
inflation premiums, 36–38
inflection point, inventory cycle, 52
information
for capital market expectations, 8–10
conditioning, 19–20
for economic analysis, 104–105
information-processing biases
availability bias as, 366
framing bias as, 365
mental accounting as, 363
infrastructure, 73
initial recovery phase (business cycle), 53, 54
input uncertainty, 23
Institute of Supply Management (ISM), 62, 85, 104
institutional investors
asset size as constraint for, 325
changing goals of, 350
CME research, 8
extended portfolio assets and liabilities of, 188
goals-based allocation for, 192–193
goals defined by, 290
legal liabilities of, 275
liabilities for, 193
and loss aversion, 362
portfolio rebalancing for, 344–345
insurance companies
in asset allocation constraints, 335
integrated asset–liability approach for, 285
integrated asset–liability approach, 285–286
compared to other approaches, 286–287
defined, 276
integrated markets, 42–43
interest income, taxation of, 340
interest rates
and exchange rate, 75–77, 101
long-term real risk-free, 37
and monetary policy, 63, 65–66
neutral level of, 63
nominal risk-free, 36
real risk-free, 36, 37
international CAPM-based approach (ICAPM), 40–48
international currency exposure, 381–384
international interactions in economic analysis, 75–80
for emerging markets, 77–80
interest rate/exchange rate linkages, 75–77
macroeconomic linkages, 75
International Monetary Fund (IMF), 77, 104
internet bubble (1995-2001), 222–223
intrinsic value, currency option, 418
introduction, of investment policy statement, 184
inventory cycle, 51, 52
inventory/sales ratio, 52
investability, market index, 475
investment
in econometric modeling, 81
and economic growth, 70–71
investment committees, 181, 352
investment constraints, in investment policy statements, 184
investment currencies, 404
investment environment
for capital market expectations, 7–8, 11
changing, and strategic asset allocation, 351–352
investment governance, 180–188
allocation of rights and responsibilities, 182–184
articulating investment objectives, 181–182
governance audit, 185–186
governance structures, 180–181
investment policy statement, 184
rebalancing policy, 185
reporting framework, 185
investment grade (IG) bonds
expected return and taxation of, 343–344
strategic asset location for, 346–348
investment management
challenges of large and small assets in, 323–324
governance vs., 180–181
importance of asset allocation, 178–180
knowledge required for, 183–184
and market indexes, 472
investment objectives
articulating, for asset allocation, 181–182
in asset allocation, 194
of asset allocation approaches, 194
decision making based on, 182
of defined benefit pension fund, 181
of endowment fund, 181
of individual investors, 181
in investment policy statement, 184
and risk tolerance, 182
Investment Policy Statements (IPSs)
and asset allocation, 184
in currency management programs, 396–398
currency management strategies based on, 387–388
investment process, 179–180
investment styles, 469
investment universes, 464
investment vehicles, market indexes as basis for, 472–473
investors
asset allocation constraints of, 323–324
individual
asset size as constraint for, 325
changing goals of, 350
changing liabilities of, 331
CME research, 8
extended portfolio assets and liabilities of, 188
goals-based allocation for, 289–290
investment objectives of, 181
liabilities for, 193
institutional
asset size as constraint for, 325
changing goals of, 350
CME research, 8
extended portfolio assets and liabilities of, 188
goals-based allocation for, 192–193
goals defined by, 290
legal liabilities of, 275
liabilities for, 193
and loss aversion, 362
portfolio rebalancing for, 344–345
IPSs. *see* Investment Policy Statements
Ireland
equity risk premium, 39
Eurozone membership, 9n.
expected returns for equities/bonds, 25
iShares Core S&P 500 ETF, 465
ISM. *see* Institute of Supply Management
Israel, 335
Italy
CLI, 82
equity risk premium, 39
Eurozone membership, 9n.
expected returns for equities/bonds, 25
real GDP growth rate, 32
trade partners, 83

J

Japan
China stock market volatility vs., 136
CLI, 82
Conference Board index, 84
economic growth, 69
emerging market debt, 92
equity risk premium, 39
expected returns for equities/bonds, 25
and justified P/E estimates, 133
negative interest rates, 65
pension funds in, 335
population growth, 131
real GDP growth rate, 32
savings–investment imbalances forecasting approach, 102
TFP growth, 71
trade partners, 83, 84
Japanese yen
benefits of currency exposure for, 391n.11
currency code, 375
in currency pairs, 376, 377, 378n.7, 411
as haven currency, 439
JP Morgan, 27, 469, 471
JP Morgan Emerging Markets Bond Index (EMBI), 469, 471
JPY/EUR. *see* Euro-yen market
JPY/GBP. *see* Sterling-yen market
JPY/USD. *see* Dollar-yen market
judgment, analyst, 50

justified P/E estimates, 126–140
for China, 128–139
and economic experience, 128–129
and future economic growth, 130–131
H-model for estimating P/E, 132–139
for developed economies, 139–140
and neoclassical approach to growth accounting, 126–127, 129–130

K
knock-in options, 424–425
knock-out options, 424–425
knowledge, for investment management, 183–184
Korea
regulatory constraints in, 335
sovereign wealth funds in, 338
Korean won, 375, 440
krona, Swedish, 375
Kuwait, 76

L
labor force, economic growth and, 71
lagging economic indicators, 81
late upswing phase (business cycle), 53, 54
Latin American debt crisis, 75
LDI. *see* liability-driven investing
leading economic indicator (LEI), 81–82
legal liabilities, 273
legs, swap, 380
LEI. *see* Index of Leading Economic Indicators; leading economic indicator
levered risk parity portfolios, 310
liabilities. *see also* asset–liability management
characterization of, 273–276
contingent, 273
extended portfolio, 188
for individual vs. institutional investors, 193
legal, 273
quasi-liabilities, 273
in time horizon, 331–333
liability-based benchmarks, 470–471
liability-driven investing (LDI), 192, 193
liability glide path, 211
liability-relative allocation, 208–211, 273–287
approaches to, 276–289
comparison of, 286–287
hedging/return-seeking portfolio approach, 282–285
integrated asset–liability approach, 285–286
surplus optimization, 277–282
characterization of liabilities in, 273–276
defined, 192
factor modeling in, 289
goals-based allocation vs., 193
investment objectives of, 194
rebalancing in, 226
risk concepts relevant to, 195
robustness of asset allocation alternatives, 287–288
life-cycle balanced funds, 188–190
Lipper/TASS, 469
liquidity
as asset allocation constraint, 327–330
in country risk analysis, 79
of emerging market currencies, 439
in financial crises, 329–330
illiquidity premium, 36
and rebalancing, 226
Litterman, Robert, 256
Livingston, Joseph, 48
Livingston Survey, 48
locked up investments, 43
London Stock Exchange, 474
long data series, capital market expectations from, 17
longevity risk, 215
long positions
in risk reversals, 422
in seagull spreads, 423
Long-Term Capital Management (LTCM), 75, 329–330
long-term inputs, 262
long-term real risk-free interest rate, 37
loss aversion, 362
LTCM. *see* Long-Term Capital Management
Luxembourg, 9n.

M
macro-consistency, 477
macroeconomics, 75, 140
macro expectations, 6
macro hedges, 430
maintenance rules, market index, 475
Malta, 9n.
managed futures funds, 411
management reporting, in asset allocation, 185
manager peer groups, 468–469
managers. *see also* portfolio managers
enhanced-index, 473
fund, 466, 467, 472
growth, 467
value, 467
manager universes, 468–469
marginal contribution to portfolio risk, 267
marginal contribution to total risk (MCTR), 267–268
margin borrowing, 357
margin requirements, for futures, 410
market capitalization, 255
market cap weighting, 473–474. *see also* capitalization-weighted indexes
market conditions, currency hedging and, 390–391
market EPS, forecasts of, 144, 146
market indexes
about, 464
as benchmarks, 480
benchmarks vs., 465
construction of, 473–477
approach, 473–475
tradeoffs in, 475–477
index weighting schemes, 477–481
capitalization-weighted indexes, 477–478
equal-weighted indexes, 478
fundamental-weighted indexes, 478–479
with index used as benchmark, 479
and market index as benchmarks, 480
price-weighted indexes, 478
Nikkei 225 as, 480–481
uses of, 471–473
market risk bucket, 214
markets. *see also* emerging markets
capital
anomalies in, 23
business cycle effects on, 53, 54
forecasts of, 43–45
emerging
common shares in, 97
country risk analysis, 77–80
developed vs. emerging economies, 77
in economic analysis, 77–80
equity
asset-based models, 157–161
constant growth model, 31–33
discounted cash flow models, 31–35
earnings-based models, 147–157
forecasts of, 140–146
relative value models, 147–162
fixed-income, 35
foreign exchange
exchange-traded futures in, 410–411
forward, 377–380
spot, 375–377
swap, 380–381
global investable, 40
integrated, 42–43
perfect, 41
segmented, 42–43
market sentiment, 357, 472
market stress, 328
market value weighting, 473–474. *see also* capitalization-weighted indexes
Market Volatility Index (MVI), 472
marking to market, 378
Markit, 471
Markit iBoxx USD Liquid Investment Grade Index, 471
Martellini, Lionel, 193
Martini, Giulio, 390
matched swaps, 380–381, 412
maturity, yield curve and, 55
maturity premiums, 37
McKinsey Global Institute, 352
MCTR. *see* marginal contribution to total risk
mean returns
arithmetic vs. geometric, 24
shrinkage estimator of, 26
mean–variance approach, 24
mean–variance optimization (MVO)
asset-only allocation, 237–249
as asset-only approach, 192
criticisms of, 252–265
Black–Litterman model, 256–259
constraints beyond budget constraints, 259
non-normal optimization approaches, 261–265
resampled mean–variance optimization, 260–261
reverse optimization, 254–256
investment objectives of, 194
measurable benchmarks, 465n.4

mental accounting, 363–364
Mexican peso, 18n.10, 375
Mexico
  CLI, 82
  Conference Board index, 84
  currency crisis, 75
  pension funds in, 335
  trade partners, 84
microeconomics, 141
micro expectations, 6
Middle East, oil shocks, 74. *see also specific countries*
minimum expectations
  in goals-based allocation, 291
  in sub-portfolio construction, 296
minimum-variance hedge ratio, 431–433
mismatched swaps, 380, 381
model portfolios, 292–293, 295–298
model uncertainty, capital market expectations and, 23
module process, in goals-based allocation, 300–304
momentum factor, 358
monetary policy
  in business cycle analysis, 54, 62–67
    with interest rates at zero or negative, 65–66
    money supply trends, 65
    and Taylor rule, 63–64
    in United States vs. Eurozone, 66
  in country risk analysis, 78
  defined, 60
  and fiscal policy, 68
  in recessions, 60
money managers, forecasting by, 89–90
money supply, trends in, 65
Monte Carlo simulation
  in asset-only allocation, 249–252
  in resampling, 260
Morgan Stanley Capital International (MSCI), 471, 474, 485, 486
moving averages, 402
MPSR. *see* multiperiod Sharpe ratio
MSCI. *see* Morgan Stanley Capital International
MSCI All Country World Index (ACWI), 208, 266
MSCI China Index, 134n.14, 135, 136
MSCI EAFE (Europe, Australasia, and Far East) Index, 44
MSCI indexes
  capitalization weighting of, 473
  emerging markets on, 198
MSCI World Index, 469, 482, 483
multifactor models, for capital market expectations, 27–31
multi-factor risk models, 200
multi-period portfolio models, 282
multiperiod Sharpe ratio (MPSR), 45
mutual funds, manager universes for, 469
MVI. *see* Market Volatility Index
MVO. *see* mean–variance optimization

N

NAFTA. *see* North American Free Trade Agreement
National Bureau of Statistics (NBS), 83
National Council of Real Estate Investment Fiduciaries (NCREIF), 44
National Futures Association, 411
natural hedge, 435
NBS. *see* National Bureau of Statistics
NCREIF. *see* National Council of Real Estate Investment Fiduciaries
negative goals, 294n.30
negative interest rates, 65–67
neoclassical approach to growth accounting, 126–127, 129–130
Netherlands
  equity risk premium, 39
  Eurozone membership, 9n.
  expected returns for equities/bonds, 25
  market integration, 43
  real GDP growth rate, 32
  trade partners, 83, 84
neutral level of interest rates, 63
New Zealand dollar
  as commodity currency, 439
  currency code, 375
  in currency pairs, 376, 428
Nikkei 225 Index, 140
  as benchmark, 480–481
  price-weighting of, 478n.16
Nikkei Stock Average, 474
nominal bond yields, 76–77
nominal default-free bonds, 91–92
nominal gross domestic product
  growth rate of, 32
  and money supply, 65
nominal risk-free interest rate, 36
non-deliverable forwards, 440–441
Nonfarm Nonfinancial Corporate Business, 158–159
nonlinear correlations of assets, 20
non-normal optimization approaches, 261–265
nonstationarity, 17
North America, 84–86. *see also specific countries*
North American Free Trade Agreement (NAFTA), 82
Norway
  equity risk premium, 39
  expected returns for equities/bonds, 25
  sovereign wealth funds in, 338
Norway model, 309

O

objectivity, market index, 476
OECD. *see* Organization for Economic Cooperation and Development
offer price, spot currency, 377
oil shocks, 74
Oman, 76
1/*N* rule, 311
"120 minus your age" rule, 306–307
OPEC. *see* Organization of the Petroleum Exporting Countries
open market operations, 89–90
opportunity costs, with currency hedging, 392
optimal corridor width, 312–313
optimization
  as asset-only approach, 192
  non-normal, 261–265
  of portfolios with currencies, 388–389
  surplus, 192
options. *see specific types, e.g.:* currency options
Organization for Economic Cooperation and Development (OECD)
  CLI, 82
  economic data from, 104
Organization of the Petroleum Exporting Countries (OPEC), 74
outcome monitoring, for capital market expectations, 8
out-of-the-money (OTM) options
  protective puts with, 422
  put spreads with, 422–423
  risk reversal with, 422
  seagull spreads with, 423–424
  strangles with, 405
output gap, business cycle, 51
overall asset allocation, revisiting, 304
overall portfolio, in goals-based allocation, 298–300
overall trade balance, 79n.64
overbought (term), 401
overconfidence (bias), 362
overconfidence trap, 21
over-hedging, 421
oversold (term), 401
owned benchmarks, 465n.4

P

panel methods, 48–49
partial correlation of assets, 20
passive hedging, 393
passive investing, investment strategies for, 466
passive management
  of allocations to asset classes, 217–219
  of asset class weights, 216–217
  benchmarks for, 465
paying the offer, 377
P/E. *see* price to earnings ratio
peer groups, manager, 468–469
pension plans. *see also* defined benefit pension plans
  allocations to fixed income in, 349
  in asset allocation constraints, 335–337
  asset size and performance of, 323
  changing liabilities of, 331
  liquidity as constraint for, 328
  portfolio rebalancing in, 353
  taxation of, 341
percent-range rebalancing, 224, 312
perfect markets, 41
performance, fund manager, 467, 472
period-by-period approach, 132n.11
permanent income hypothesis, 69–70
personal goals, 214
personal risk bucket, 214
peso, Chilean, 438
peso, Mexican, 18n.10, 375
philanthropic goals, 214
Philippines, 329
pips, 376
plan sponsors, 466–467
PMI. *see* purchasing managers index
point estimates, 24n.19
points, forward exchange rate, 377
Poland, 76

policy portfolio, 201. *see also* strategic asset allocation
political leadership, 79
pooled assets, 325
population mean, estimating, 17n.7
portfolio(s)
  declining-balance, 292n.27
  fixed-income, 390
  market indexes in analysis of, 472
  model, 292–293
  multi-period portfolio models, 282
  optimization of, 388–389
  sub-portfolios, 214–216, 292–293
  suitability of equity market forecasts for, 142–143
portfolio construction, 179–180
portfolio managers, mandates for, 472
portfolio rebalancing. *see* rebalancing
portfolio returns, 381–386
  currency risk and return, 381–386
  international currency exposure, 381–384
  volatility of returns, 384–385
portfolio weights, 385, 388
Portugal, 9n.
potential output, 51
pound, British
  currency code, 375
  in currency pairs, 376
power utility functions, 202
PPP. *see* Purchasing Power Parity
premiums
  bond-yield-plus-risk-premium method, 38
  currency option, 418
  default risk, 36
  equity risk, 34–35, 38–40, 148
  fixed-income, 36–38
  illiquidity, 36
  inflation, 36–38
  maturity, 37
  risk, 11, 36–40, 50
  tax, 37
Prequin, 469
price(s)
  bid, 377
  offer, 377
price currency, 375–377
priced risk, 36
price to earnings ratio (P/E)
  of common shares, 96–97
  H-model for estimating, 132–139
  justified estimates, 126–140
    for China, 128–139
    for developed economies, 139–140
    and neoclassical approach to growth accounting, 126–127, 129–130
price-weighted indexes, 478
price weighting, 474
private equity, 469
private sector, government structural policies in, 73
productivity, total factor
  growth in, 70–72
  and neoclassical approach to growth accounting, 127
Professional Investor, 325
property/casualty insurance companies, 285
protective puts
  defined, 418
  with OTM options, 422
proxy hedging, 428–430
prudence trap, 21–22
psychological traps, in capital market expectations, 21–22
public good, 73n.63
public sector, government structural policies in, 73
purchasing managers index (PMI), 62
Purchasing Power Parity (PPP), 101
put options (puts), protective, 418, 422
put spreads, 422–423

Q
Qatar, 76
QE. *see* quantitative easing
qualified purchasers, 325
quantitative easing (QE), 56–57, 65, 66
quasi-liabilities, 273

R
rand, South African, 375, 439
random walks, 364
rational belief equilibrium, 23n.18
real, Brazilian, 375, 440–441
real assets
  as asset class, 198
  inflation/deflation effects for, 59
real bond yields, 91, 93
real estate
  forecasts of returns, 97
  inflation/deflation effects for, 59
  and liquidity, 266
real exchange rate, 399–400
real gross domestic product, growth rate of, 32–33
real interest rate
  and inflation premium, 37
  reducing risk factor exposure to, 201
real risk-free interest rate, 36, 37
rebalancing
  asset allocation, 222–226
    framework for, 223–224
    in practice, 311–315
    strategic considerations in, 225–226
  defining, 311
  in goals-based allocation, 304
  of market indexes, 476
  and taxes, 344–345
rebalancing policy, 185
rebalancing range, 224
rebalancing returns, 312n.44
re-basing, of indexes, 14
recallability trap, 22
recency bias, 364
recession phase (business cycle), 54
  defined, 51
  earnings in, 94
  and market expectations, 59–60
  yield curve as predictor of, 54
reconstitution, of market indexes, 476
reflective of current investment opinions (term), 465n.4
regimes, 17–18
regression analysis, regime changes and, 17–18
regulations, compliance with, 468
regulatory constraints. *see also* external constraints
  in asset allocation constraints, 334
  for small asset owners, 325
relative economic strength forecasting approach, 101, 103
relative value models for equity market, 147–162
  asset-based models, 157–161
  earnings-based models, 147–157
    Cyclically Adjusted P/E Ratio, 153–157
    Fed model, 147–150
    Yardeni model, 150–153
reporting framework, 184, 185
representative bias, 364–365
repurchase yield, 33
resampled mean–variance optimization, 260–261
rescaling, of appraisal data, 16
residuals, 71
resistance levels, 401
responsibilities
  allocation of, 182–184
  in investment policy statement, 184
retirement accounts
  Monte Carlo simulation for, 250–252
  taxation of, 341
return(s)
  domestic-currency, 382–385
  drivers of, 125–126
  excess, 467
  expected
    in asset-only allocation, 240
    estimates of, 11–12
    and framing bias, 365
    in goals-based allocation, 291
    Gordon growth model, 31–33
    Grinold–Kroner approach, 34–35
    risk premium approach, 36
    and taxation, 341, 343–344
    unconditional, 19–20
  forecasting, 89–104
    for cash and equivalents, 89–90
    for common shares, 93–97
    for currencies, 99–100
    for defaultable debt, 92
    for emerging market bonds, 92
    and exchange rates, 100–103
    and historical capital market expectations, 97–99
    for inflation-indexed bonds, 92–93
    for nominal default-free bonds, 91–92
    for real estate, 97
  foreign-currency, 382
  mean, 24, 26
  portfolio, 381–386
    currency risk and return, 381–386
    international currency exposure, 381–384
    volatility of returns, 384–385
  roll, 414–416
returns-based benchmarks, 470
return-seeking portfolio approach, 282–285
  compared to other approaches, 286–287
  defined, 276

Reuters, 105, 411
reverse optimization, 254–257
Richards, Thomas M., 465, 468, 480
rights, allocation of, 182–184
risk
  and asset allocation, 194–195, 239
  basis, 284
  country, 77–80
  currency (*see also* currency management)
    asset allocation with, 389
    and portfolio return/risk, 381–386
    strategic decisions about, 392–396
  decision-reversal, 186
  efficient allocation of, 349
  ex ante, 18, 40
  ex post, 18
  and framing bias, 365
  longevity, 215
  modeling asset class risk, 195–201
  in negative interest rate environment, 66
  and portfolio return, 381–386
  priced, 36
  and rebalancing portfolios, 223
  time diversification of, 334
risk aversion coefficient
  in asset allocation, 238
  in efficient frontier, 242
  estimating, 239
risk budgeting
  in asset allocation implementation, 221
  asset-only allocation, 267–269
  in risk parity–based allocation, 310
risk exposures
  benchmarks in identification/evaluation of, 467
  currency
    international, 381–384
    and portfolio returns, 381–386
    strategic decisions about, 389–392
risk factor approach, 210–211
risk-free assets, 246–247
risk-free interest rates, 36, 37
risk management
  currency (*see* currency management)
  in investment policy statement, 184
RiskMetrics Group, 27
risk parity–based allocation, 309–311
risk premium approach to capital market expectations, 11, 36–40
  equity risk premiums, 38–40
  fixed-income premiums, 36–38
  general expression, 36
risk premiums
  about, 37–38
  in asset-pricing theory, 50
  default, 36
  equity
    for capital market expectations, 38–40
    and Fed model, 148
    Grinold–Kroner model for forecasting, 34–35
  financial market equilibrium models for, 40–48
  fixed-income, 36–38
risk reversals, 422
risk tolerance
  in asset-only allocation, 205–206
  and investment objectives, 182
  "120 minus your age" rule for, 306–307
risky-asset holdings, 246
roll return, 414–416
roll yield, 414–416
Rosenberg, Michael R., 399n.15
ruble, Russian, 375, 440
rupee, Indian, 375, 440
Russell 2500 Index, 44
Russell indexes, capitalization weighting of, 473
Russell Investments, 471, 474
Russia, 75, 329
Russian financial crisis (1998), 329–330
Russian ruble, 375, 440

S
sales, inventory and, 52
sample estimators, 24–25
sampling theory, 17n.7
Saudi Arabia, 76, 83
savings–investment imbalances forecasting approach, 102–103
scenario analysis, 288
Schroder Salomon Smith Barney, 49
SDAX index, 485
seagull spreads, 423–424
SEC. *see* US Securities and Exchange Commission
securities, eligibility rules of market indexes for, 473
security-based benchmarks, 470
segmented markets, 42–43
sensitivity analysis, 287–288
September 11 terrorist attacks, 60
Serfaty-de Medeiros, Karine, 390–391
settlement, 377
share repurchases, Grinold–Kroner model for, 33–34
Sharia law, on investments, 338
Sharpe ratio, 242, 243
Sharpe style analysis, 470
shortfall probability, 362, 366
short interest, 357
short positions
  in risk reversals, 422
  in seagull spreads, 423–424
short-term borrowing, country risk and, 79
short-term forecasts, 357
short-term inputs, 262
short-term shifts, 359–361
shrinkage estimation, 25–26
Siegel, L., 475, 477
simulated frontiers, 260
simulation analysis, 288
Singapore, 71, 78
Singer–Terhaar approach, 40–48
60/40 stock/bond heuristic, 307–308
Slovakia, 9n.
Slovenia, 9n.
slowdown phase (business cycle), 53–54
small-cap stock effect, 18
small-issuer bias, 478
smoothed data, 14–16
Solow residual, 127
Solvency II regulatory standards, 335
South Africa
  equity risk premium, 39
  expected returns for equities/bonds, 25
South African rand, 375, 439
South America, 71, 83–84. *see also specific countries*
South Korea, 83, 84, 329
sovereign wealth funds (SWFs)
  in asset allocation constraints, 338
  and asset size constraints, 325
Soviet Union, 128, 129
S&P 500 Index
  appraisal data on, 15, 16
  Asian financial crisis (1997), 329
  as benchmark, 465
  capitalization weighting of, 473
  in capital market forecasts, 44
  Chinese stock market returns vs., 134–136
  concentration in, 477
  and Fed model, 147–148, 150
  forecasting approaches for, 140
  Grinold–Kroner analysis, 34
  and justified P/E estimates, 134–135
  in LEI, 85
  market earnings per share forecasting, 144–146
  and time diversification, 334
  and Yardeni model, 151–152
Spain
  Conference Board index, 84
  equity risk premium, 39
  Eurozone membership, 9n.
  expected returns for equities/bonds, 25
S&P China BMI Index
  dividend discount model, 137–139
  H-model, 132
  and justified P/E estimates, 134–135
  US stock market returns vs., 134–136
S&P/Citigroup, 471, 474
S&P Citigroup International Treasury Bond Index Series, 471
S&P Dow Jones Global Index, 474
S&P Dow Jones Indexes, 471
SPDR S&P China ETF, 132
specified in advance (term), 465n.4
spending. *see* consumer spending
sponsors, plan, 466–467
spot markets, foreign exchange, 375–377
spreads
  put, 422–423
  seagull, 423–424
standard deviation
  in asset-only allocation, 240
  and framing bias, 365
  and taxation, 342
statement of duties and responsibilities, of investment policy statement, 184
statement of investment objectives, of investment policy statement, 184
State Street Global Advisors, 132
static hedges, 412
stationary time series, 24
statistical methods for setting capital market expectations, 23–31
  multifactor models, 27–31
  sample estimators, 24–25
  shrinkage estimators, 25–26
  time-series estimators, 26–27

Statistisches Bundesamt Deutschland, 83
status quo trap, 21
Sterling-dollar market (USD/GBP), 376
Sterling-yen market (JPY/GBP), 376
stocks
  cyclical, 94
  small-cap stock effect, 18
stops, 401–402
store of value assets, 195
straddles, 405
strangles, 405
strategic asset allocation (SAA), 201–216
  asset-only allocation, 203–208
  goals-based allocation, 211–216
  liability-relative allocation, 208–211
  as long term, 262
  Monte Carlo simulations used in, 249–250
  real-world constraints in, 349–355
  steps in selecting, 202–203
  utility theory in, 201–202
strategic asset location, 341, 345
strategic currency management decisions, 387–398
  currency exposures, 389–392
    cost considerations, 391–392
    diversification considerations, 389–391
  currency risk, 392–396
    active currency management, 393–394
    currency overlay programs, 394–396
    discretionary hedging, 393
    passive hedging, 393
  formulating currency management programs, 396–398
  Investment Policy Statements, 387–388
  portfolio optimization, 388–389
strategy benchmarks, 470
structural level of unemployment, 73
structural policies, government, 72–73
sub-asset classes, 199
sub-portfolios
  construction of
    for goals-based allocation, 292–293, 295–298
    module process, 300–304
  in goals-based allocation, 214–216
  time horizon management with, 332
support levels, 401
surplus, liabilities and, 275, 276
surplus efficient frontier, 279–280
surplus optimization, 277–282
  compared to other approaches, 286–287
  defined, 276
  as liability-relative approach, 192
survey methods, 48–49
survivorship bias, 14
swap markets, foreign exchange, 380–381
swaps
  matched, 380–381, 412
  mismatched, 380, 381
Sweden
  equity risk premium, 39
  expected returns for equities/bonds, 25
  negative interest rates, 65
  real GDP growth rate, 32
Swedish krona, 375
Swenson, David, 308
SWFs. *see* sovereign wealth funds
Swiss franc
  benefits of currency exposure for, 391n.11
  currency code, 375
  in currency pairs, 376
  as haven currency, 439
Switzerland
  equity risk premium, 39
  expected returns for equities/bonds, 25
  market integration, 43
  negative interest rates, 65
  real GDP growth rate, 33
  regulatory constraints in, 335
  trade partners, 83

T
T + 1 settlement, 377n.4
T + 2 settlement, 377
TAA. *see* tactical asset allocation
tactical asset allocation (TAA), 216
  discretionary TAA, 357–358
  real-world constraints in, 356–361
  as short term, 262
  systematic TAA, 358–359
tactical currency management decisions, 399–409
  carry trade in, 402–404
  economic fundamentals in, 399–400
  example, 407–409
  technical analysis in, 401–402
  volatility trading in, 404–409
Tankan Survey, 83
target covariance matrix, 25–26
target-date funds. *see also* life-cycle balanced funds
  asset allocation and human capital in, 188
  and glide paths, 353
  use of "120 minus your age" rule by, 306–307
tax-deferred accounts, 345–346
taxes
  after-tax portfolio optimization, 341–344
  for endowments and foundations, 337–338
  and government structural policies, 73
  and portfolio rebalancing, 344–345
  and rebalancing, 226
  strategies to reduce tax impact, 345–346
tax-exempt accounts, 345
tax-loss harvesting, 345
tax premiums, 37
Taylor rule, 63–64
T-bills. *see* US Treasury bills
T-bonds. *see* US Treasury bonds
technical analysis, currency management and, 401–402
Texas hedge, 432n.34
TFP. *see* total factor productivity
Thai baht, 329, 438
Thailand, 83, 329
Thomson Venture Economics, 469
Tierney, David E., 465, 468, 480
time diversification, of risk, 334
time horizon
  in asset allocation, 240
  as asset allocation constraint, 330–334
  for capital market expectations, 7, 10
  and currency hedging, 389–390
  revisiting, in goals-based allocation, 304
  in sub-portfolio construction, 296
time-period biases, 18–19
time-series estimators, 26–27
time-series momentum, 358n.21
time value of currency options, 418
TIPS. *see* US Treasury Inflation-Protected Securities
Tobin's *q* ratio
  and asset-based models, 157–160
  strengths and limitations, 161
Tokyo Stock Exchange, 474
Tokyo Stock Exchange Price Index (TOPIX), 474
tolerance bands, 314
top-down forecasts, 140–146
  bottom-up vs., 141, 144–145
  earnings forecast revisions based on, 145–146
  of market earnings per share, 144, 146
  portfolio suitability for, 142–143
  using bottom-up forecasts with, 143–145
TOPIX. *see* Tokyo Stock Exchange Price Index
total factor productivity (TFP)
  growth in, 70–72
  and neoclassical approach to growth accounting, 127
trade
  and business cycle, 60
  and currency returns, 100
trade balance, overall, 79n.64
trading costs
  for currency hedging, 391–392
  with emerging market currencies, 438–440
transaction costs, 314–315
transcription errors, 14
transparency, market index, 476
trend following, 358–359
trends, and representative bias, 364
trigger points, 224
turnover, market index, 476
twin deficits problem, 72–73
two-fund separation, 246
two-layer factor approach for modeling covariance, 30
two-portfolio approach, 282–283

U
Ukraine, 335
unambiguous benchmarks, 465n.4
uncertainty
  in cash flow, 283–284
  input and model, 23
unconditional benchmarks, 19
unconditional expected returns, 19–20
unconditional inputs, 262
uncovered interest rate parity theorem, 402

under-hedging, 421
underlying (term), 404n.21
unemployment, structural level of, 73
unilateral pegging of currency, 75–76
United Arab Emirates, 76, 83
United Kingdom
  BRC survey, 61
  CLI, 82
  Conference Board index, 84
  deflation, 56–57
  denationalization, 136
  economic growth, 69
  equity risk premium, 39
  expected returns for equities/bonds, 25
  Fed model with UK data, 150
  inflation, 55–56
  inflation-indexed bonds, 92–93
  market integration, 43
  real GDP growth rate, 33
  regulatory constraints in, 325
  return on government bonds, 91
  short-term consumer spending, 49
  Solvency II program in, 335n.7
  tax incentives in, 351
  TFP growth, 71
  trade partners, 83
  volatility index in, 357
United Nations System of National Accounts (UNSNA), 14
United States
  asset class classification in, 241
  bond yields, 76
  capital flows forecasting approach, 102
  China equity market valuation vs., 135–137
  CLI, 82
  deflation, 56–57
  degree of specialization, 75
  de-risking in, 349
  Economic Freedom Index, 78
  economic growth, 128, 130
  equity risk premium, 34–35, 39
  exchange rate linkages with, 76
  expected returns for equities/bonds, 25
  Fed model with US data, 147–148
  GDP growth and business cycles, 70–71
  growth accounting in, 128, 129
  inflation, 55–56
  inflation-indexed bonds, 92–93
  interest income taxation in, 340
  inventory/sales ratio, 52
  macroeconomic linkages, 75
  market integration, 43
  monetary policy, 66
  pension fund regulations in, 336
  P/E ratios, 97
  PMI, 62
  public foundations in, 337
  real GDP growth rate, 33
  recessions, 60
  regulatory changes in, 351
  regulatory constraints in, 325
  return on government bonds, 91–92
  TFP growth, 71
  trade partners, 83, 84
  volatility index in, 357
US Commerce Department, 84
US Commodity Futures Trading Commission, 411
US Consumer Price Index (CPI), 153, 154
US Consumer Price Index for All Urban Consumers (CPI-U), 13, 44
US dollar, 103
  benefits of currency exposure for, 390–391
  currency code, 375
  in currency pairs, 376, 377, 378n.7, 411, 428
  as haven currency, 439
US Securities and Exchange Commission (SEC), 468
US Treasury bills (T-bills)
  in capital market forecasts, 44
  nominal risk-free interest rate, 36
  yield curve of T-bonds and, 55
US Treasury bonds (T-bonds)
  and Fed model, 35, 149
  yield curve of T-bills and, 55
US Treasury debt, maturity premium for, 37
US Treasury Inflation-Protected Securities (TIPS), 92–93
US Treasury notes, 150
US Treasury securities, Fed model and, 147–149
unity constraint, 238
universes, manager, 468–469
University of Michigan Survey, 104
unrealized capital gains, 341
UNSNA. *see* United Nations System of National Accounts
unstructured modeling, 80n.65
Uruguay, 43
USD/AUD. *see* Aussie-dollar market
USD/EUR. *see* Euro-dollar market
USD/GBP. *see* Sterling-dollar market
USD/NZD currency pair, 428
utility curves, 242
utility theory, 201–202

V
V2X, 357
valid benchmarks, 464, 465, 480
valuation. *see* equity market valuation
value at risk (VaR), 365
value factor, 358
value investment style, 469n.9
Value Line Composite Average, 474
value managers, 467
vanilla options, 424
VaR. *see* value at risk
variables, endogenous vs. exogenous, 20
variance, of domestic-currency returns, 384–385
VDAX-NEW, 357
vega
  defined, 404
  in volatility trading, 405
VE Post Venture Capital Index, 44
Viceira, Luis M., 390–391
VIX, 357
volatility
  of emerging markets, 77
  and historical analysis, 17
  in portfolio rebalancing, 313
  of portfolio returns, 384–385
  reducing risk factor exposure to, 201
volatility clustering, 27
volatility index, 357
volatility overlay programs, 406
volatility pumping, 312n.44
volatility trading, currency management and, 404–409
Volcker, Paul, 60

W
Wal-Mart Stores, 71
wealth effect, permanent income hypothesis and, 69–70
Wen Jiabao, 130
Western Europe, 131. *see also specific countries*
Wilshire, 469
Wilshire 5000 Index, 469, 475
Winkleman, Kurt, 267
won, Korean, 375, 440
World Bank, 77, 104
worldwide economic indicators, 82

Y
Yale model, 308. *see also* endowment model
Yale University Investments Office, 308–309
Yardeni, Edward, 147
Yardeni model, 150–153, 160–162
yen, Japanese
  benefits of currency exposure for, 391n.11
  currency code, 375
  in currency pairs, 376, 377, 378n.7, 411
  as haven currency, 439
yield
  bond
    nominal, 76–77
    real, 91, 93
    yield to maturity, 35
    yield to worst, 35n.38
  repurchase, 33
  roll, 414–416
yield curve
  and monetary/fiscal policy, 68
  as predictor of economic growth, 55
yield to maturity (YTM), bond, 35
yield to worst, 35n.38
yuan, Chinese, 375, 440

Z
zero lower bound, 65
Zheng, Hu, and Bigsten (ZHB) projections, 130–131

CFA Institute®
CFA Program

FIXED INCOME AND EQUITY PORTFOLIO MANAGEMENT

CFA® Program Curriculum
2018 • LEVEL III • VOLUME 4

WILEY

CONTENTS

How to Use the CFA Program Curriculum v

Curriculum Development Process v
Organization of the Curriculum vi
Features of the Curriculum vi
Designing Your Personal Study Program viii
Feedback ix

Portfolio Management

Study Session 10 **Fixed-Income Portfolio Management (1)** 3

Reading 21 **Introduction to Fixed-Income Portfolio Management** 5
Introduction 5
Roles of Fixed-Income Securities in Portfolios 6
Diversification Benefits 6
Benefits of Regular Cash Flows 8
Inflation Hedging Potential 9
Fixed-Income Mandates 11
Liability-Based Mandates 11
Total Return Mandates 15
Bond Market Liquidity 19
Liquidity among Bond Market Sub-Sectors 20
The Effects of Liquidity on Fixed-Income Portfolio Management 21
A Model for Fixed-Income Returns 23
Decomposing Expected Returns 23
Estimation of the Inputs 26
Limitations of the Expected Return Decomposition 26
Leverage 27
Using Leverage 27
Methods for Leveraging Fixed-Income Portfolios 28
Risks of Leverage 31
Fixed-Income Portfolio Taxation 32
Principles of Fixed-Income Taxation 32
Investment Vehicles and Taxes 33
Summary 35
Practice Problems 38
Solutions 43

Reading 22	**Liability-Driven and Index-Based Strategies**	**47**
	Introduction	**47**
	Liability-Driven Investing	**48**
	Interest Rate Immunization—Managing the Interest Rate Risk of a Single Liability	**52**
	Interest Rate Immunization—Managing the Interest Rate Risk of Multiple Liabilities	**64**
	Cash Flow Matching	**64**
	Duration Matching	**67**
	Derivatives Overlay	**73**
	Contingent Immunization	**77**
	Liability-Driven Investing—An Example of a Defined Benefit Pension Plan	**78**
	Risks in Liability-Driven Investing	**88**
	Bond Indexes and the Challenges of Matching a Fixed-Income Portfolio to an Index	**92**
	Alternative Methods for Establishing Passive Bond Market Exposure	**98**
	Benchmark Selection	**104**
	Laddered Bond Portfolios	**107**
	Summary	**110**
	Practice Problems	**115**
	Solutions	**118**
Study Session 11	**Fixed-Income Portfolio Management (2)**	**121**
Reading 23	**Yield Curve Strategies**	**123**
	Introduction	**123**
	Foundational Concepts for Active Management of Yield Curve Strategies	**124**
	A Review of Yield Curve Dynamics	**125**
	Duration and Convexity	**130**
	Major Types of Yield Curve Strategies	**132**
	Strategies under Assumptions of a Stable Yield Curve	**133**
	Strategies for Changes in Market Level, Slope, or Curvature	**135**
	Formulating a Portfolio Positioning Strategy Given a Market View	**146**
	Duration Positioning in Anticipation of a Parallel Upward Shift in the Yield Curve	**146**
	Portfolio Positioning in Anticipation of a Change in Interest Rates, Direction Uncertain	**150**
	Performance of Duration-Neutral Bullets, Barbells, and Butterflies Given a Change in the Yield Curve	**151**
	Using Options	**164**
	Comparing the Performance of Various Duration-Neutral Portfolios in Multiple Curve Environments	**169**
	The Baseline Portfolio	**169**
	The Yield Curve Scenarios	**170**
	Extreme Barbell vs. Laddered Portfolio	**172**
	Extreme Bullet	**173**
	A Less Extreme Barbell Portfolio vs. Laddered Portfolio	**174**
	Comparing the Extreme and Less Extreme Barbell Portfolios	**175**
	A Framework for Evaluating Yield Curve Trades	**178**

	Summary	**185**
	Practice Problems	**187**
	Solutions	**189**
Reading 24	**Fixed-Income Active Management: Credit Strategies**	**191**
	Introduction	**191**
	Investment-Grade and High-Yield Corporate Bond Portfolios	**192**
	Credit Risk	**193**
	Credit Migration Risk and Spread Risk	**194**
	Interest Rate Risk	**195**
	Liquidity and Trading	**198**
	Credit Spreads	**200**
	Credit Spread Measures	**200**
	Excess Return	**205**
	Credit Strategy Approaches	**206**
	The Bottom-Up Approach	**206**
	The Top-Down Approach	**215**
	Comparing the Bottom-Up and Top-Down Approaches	**224**
	ESG Considerations in Credit Portfolio Management	**225**
	Liquidity Risk and Tail Risk in Credit Portfolios	**226**
	Liquidity Risk	**226**
	Tail Risk	**231**
	International Credit Portfolios	**233**
	Relative Value in International Credit Portfolios	**233**
	Emerging Markets Credit	**235**
	Global Liquidity Considerations	**236**
	Currency Risk in Global Credit Portfolios	**236**
	Legal Risk	**236**
	Structured Financial Instruments	**236**
	Mortgage-Backed Securities	**237**
	Asset-Backed Securities	**239**
	Collateralized Debt Obligations	**239**
	Covered Bonds	**240**
	Summary	**241**
	Practice Problems	**243**
	Solutions	**248**
Study Session 12	**Equity Portfolio Management**	**251**
Reading 25	**Equity Portfolio Management**	**253**
	Introduction	**254**
	The Role of the Equity Portfolio	**255**
	Approaches to Equity Investment	**257**
	Passive Equity Investing	**258**
	Equity Indexes	**260**
	Passive Investment Vehicles	**267**
	Active Equity Investing	**276**
	Equity Styles	**276**
	Socially Responsible Investing	**296**

Long–Short Investing **297**
Sell Disciplines/Trading **302**
Semi-Active Equity Investing **303**
Managing a Portfolio of Managers **306**
Core-Satellite **309**
Completeness Fund **312**
Other Approaches: Alpha and Beta Separation **313**
Identifying, Selecting, and Contracting with Equity Portfolio Managers **314**
Developing a Universe of Suitable Manager Candidates **314**
The Predictive Power of Past Performance **314**
Fee Structures **315**
The Equity Manager Questionnaire **315**
Structuring Equity Research and Security Selection **322**
Top-Down versus Bottom-Up Approaches **322**
Buy-Side versus Sell-Side Research **323**
Industry Classification **323**
Summary **324**
Practice Problems **327**
Solutions **334**

Glossary **G-1**
Index **I-1**

How to Use the CFA Program Curriculum

Congratulations on reaching Level III of the Chartered Financial Analyst® (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities it develops. Your commitment to the CFA Program should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. The CFA Program represents the first step toward a career-long commitment to professional education.

The CFA examination measures your mastery of the core skills required to succeed as an investment professional. These core skills are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major topic areas covered in the CFA Program (www.cfainstitute.org/cbok);
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/level_III);
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- The CFA Program curriculum, which contains the readings and end-of-reading questions, that candidates receive upon exam registration.

Therefore, the key to your success on the CFA examinations is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, and tips for developing an effective study program.

CURRICULUM DEVELOPMENT PROCESS

The CFA Program is grounded in the practice of the investment profession. Beginning with the Global Body of Investment Knowledge (GBIK), CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the knowledge, skills, and abilities (competencies) that are relevant to the profession. Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback from the GBIK collaborative website. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

© 2017 CFA Institute. All rights reserved.

The Education Advisory Committee, consisting of practicing charterholders, in conjunction with CFA Institute staff, designs the CFA Program curriculum in order to deliver the CBOK to candidates. The examinations, also written by charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit www.cfainstitute.org.

ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into 10 topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected.

Each topic area is then divided into one or more study sessions. These study sessions—18 sessions in the Level III curriculum—should form the basic structure of your reading and preparation.

Each study session includes a statement of its structure and objective and is further divided into specific reading assignments. An outline illustrating the organization of these 18 study sessions can be found at the front of each volume of the curriculum.

The readings and end-of-reading questions are the basis for all examination questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK. These readings are drawn from content commissioned by CFA Institute, textbook chapters, professional journal articles, research analyst reports, and cases. All readings include problems and solutions to help you understand and master the topic areas.

Reading-specific Learning Outcome Statements (LOS) are listed at the beginning of each reading. These LOS indicate what you should be able to accomplish after studying the reading. The LOS, the reading, and the end-of-reading questions are dependent on each other, with the reading and questions providing context for understanding the scope of the LOS.

You should use the LOS to guide and focus your study because each examination question is based on the assigned readings and one or more LOS. The readings provide context for the LOS and enable you to apply a principle or concept in a variety of scenarios. The candidate is responsible for the entirety of the required material in a study session, which includes the assigned readings as well as the end-of-reading questions and problems.

We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfaprogram/courseofstudy/Pages/study_sessions.aspx), including the descriptions of LOS "command words" (www.cfainstitute.org/programs/Documents/cfa_and_cipm_los_command_words.pdf).

FEATURES OF THE CURRICULUM

OPTIONAL SEGMENT

Required vs. Optional Segments You should read all of an assigned reading. In some cases, though, we have reprinted an entire chapter or article and marked certain parts of the reading as "optional." The CFA examination is based only on the required segments, and the optional segments are included only when it is determined that they might help you to better understand the required segments (by seeing the required material in its full context). When an optional segment begins, you will see an icon and a dashed

vertical bar in the outside margin that will continue until the optional segment ends, accompanied by another icon. *Unless the material is specifically marked as optional, you should assume it is required.* You should rely on the required segments and the reading-specific LOS in preparing for the examination.

END OPTIONAL SEGMENT

End-of-Reading Problems/Solutions *All problems in the readings as well as their solutions (which are provided directly following the problems) are part of the curriculum and are required material for the exam.* When appropriate, we have included problems within and after the readings to demonstrate practical application and reinforce your understanding of the concepts presented. The problems are designed to help you learn these concepts and may serve as a basis for exam questions. Many of these questions are adapted from past CFA examinations.

Glossary and Index For your convenience, we have printed a comprehensive glossary in each volume. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the glossary. The curriculum eBook is searchable, but we also publish an index that can be found on the CFA Institute website with the Level III study sessions.

LOS Self-Check We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

Source Material The authorship, publisher, and copyright owners are given for each reading for your reference. We recommend that you use the CFA Institute curriculum rather than the original source materials because the curriculum may include only selected pages from outside readings, updated sections within the readings, and problems and solutions tailored to the CFA Program. Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*®, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and 11 Nobel laureates have contributed a total of 45 articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this practice-oriented publication. Candidates have full online access to the *Financial Analysts Journal* and associated resources. All you need is to log in on www.cfapubs.org using your candidate credentials.

DESIGNING YOUR PERSONAL STUDY PROGRAM

Create a Schedule An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all reading assignments and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skill, or ability described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

As you prepare for your exam, we will e-mail you important exam updates, testing policies, and study tips. Be sure to read these carefully. Curriculum errata are periodically updated and posted on the study session page at www.cfainstitute.org.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience. For each level of the curriculum, there are 18 study sessions. So, a good plan is to devote 15–20 hours per week for 18 weeks to studying the material. Use the final four to six weeks before the exam to review what you have learned and practice with topic tests and mock exams. This recommendation, however, may underestimate the hours needed for appropriate examination preparation depending on your individual circumstances, relevant experience, and academic background. You will undoubtedly adjust your study time to conform to your own strengths and weaknesses and to your educational and professional background.

You will probably spend more time on some study sessions than on others, but on average you should plan on devoting 15–20 hours per study session. You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

An interactive study planner is available in the candidate resources area of our website to help you plan your study time. The interactive study planner recommends completion dates for each topic of the curriculum. Dates are determined based on study time available, exam topic weights, and curriculum weights. As you progress through the curriculum, the interactive study planner dynamically adjusts your study plan when you are running off schedule to help you stay on track for completion prior to the examination.

CFA Institute Topic Tests The CFA Institute topic tests are intended to assess your mastery of individual topic areas as you progress through your studies. After each test, you will receive immediate feedback noting the correct responses and indicating the relevant assigned reading so you can identify areas of weakness for further study. For more information on the topic tests, please visit www.cfainstitute.org.

CFA Institute Mock Exams The three-hour mock exams simulate the morning and afternoon sessions of the actual CFA examination, and are intended to be taken after you complete your study of the full curriculum so you can test your understanding of the curriculum and your readiness for the exam. You will receive feedback at the end of the mock exam, noting the correct responses and indicating the relevant assigned readings so you can assess areas of weakness for further study during your review period. We recommend that you take mock exams during the final stages of your preparation for the actual CFA examination. For more information on the mock examinations, please visit www.cfainstitute.org.

Preparatory Providers After you enroll in the CFA Program, you may receive numerous solicitations for preparatory courses and review materials. When considering a prep course, make sure the provider is in compliance with the CFA Institute Approved

Prep Provider Program (www.cfainstitute.org/utility/examprep/Pages/index.aspx). Just remember, there are no shortcuts to success on the CFA examinations; reading and studying the CFA curriculum is the key to success on the examination. The CFA examinations reference only the CFA Institute assigned curriculum—no preparatory course or review course materials are consulted or referenced.

SUMMARY

Every question on the CFA examination is based on the content contained in the required readings and on one or more LOS. Frequently, an examination question is based on a specific example highlighted within a reading or on a specific end-of-reading question and/or problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the examination except for occasional sections marked as optional. You may read optional pages as background, but you will not be tested on them.
2. All questions, problems, and their solutions—found at the end of readings—are part of the curriculum and are required study material for the examination.
3. You should make appropriate use of the topic tests and mock examinations and other resources available at www.cfainstitute.org.
4. Use the interactive study planner to create a schedule and commit sufficient study time to cover the 18 study sessions, review the materials, and take topic tests and mock examinations.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and member feedback as we work to incorporate content, design, and packaging improvements. You can be assured that we will continue to listen to your suggestions. Please send any comments or feedback to info@cfainstitute.org. Ongoing improvements in the curriculum will help you prepare for success on the upcoming examinations and for a lifetime of learning as a serious investment professional.

CUSTOMER SERVICE

68

Portfolio Management

STUDY SESSIONS

Study Session 3	Behavioral Finance
Study Session 4	Private Wealth Management (1)
Study Session 5	Private Wealth Management (2)
Study Session 6	Portfolio Management for Institutional Investors
Study Session 7	Applications of Economic Analysis to Portfolio Management
Study Session 8	Asset Allocation and Related Decisions in Portfolio Management (1)
Study Session 9	Asset Allocation and Related Decisions in Portfolio Management (2)
Study Session 10	Fixed-Income Portfolio Management (1)
Study Session 11	Fixed-Income Portfolio Management (2)
Study Session 12	Equity Portfolio Management
Study Session 13	Alternative Investments for Portfolio Management
Study Session 14	Risk Management
Study Session 15	Risk Management Application of Derivatives
Study Session 16	Trading, Monitoring, and Rebalancing
Study Session 17	Performance Evaluation
Study Session 18	Global Investment Performance Standards

This volume includes Study Sessions 10–12.

© 2017 CFA Institute. All rights reserved.

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; evaluate portfolio performance; and analyze a presentation of investment returns for consistency with Global Investment Performance Standards (GIPS®).

PORTFOLIO MANAGEMENT
STUDY SESSION

10

Fixed-Income Portfolio Management (1)

Fixed-income securities represent a significant portion of all available financial assets and are included in most investor portfolios.

This study session begins by explaining the role played by fixed-income securities in portfolios and then introduces the two primary types of fixed-income mandates (liability-based and total return). A model for decomposing expected bond returns, which identifies the driving forces behind expected returns, is presented. The effects of illiquidity, leverage, and taxes on fixed-income portfolios are discussed. Next, liability-driven and index-based strategies are examined in greater detail. Coverage includes approaches, risks, and challenges associated with both immunization of single and multiple liabilities and the indexation and laddering of a fixed-income portfolio.

READING ASSIGNMENTS

Reading 21	Introduction to Fixed-Income Portfolio Management by Bernd Hanke, PhD, CFA, and Brian J. Henderson, PhD, CFA
Reading 22	Liability-Driven and Index-Based Strategies by James F. Adams, PhD, CFA, and Donald J. Smith, PhD

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

21

Introduction to Fixed-Income Portfolio Management

by Bernd Hanke, PhD, CFA, and Brian J. Henderson, PhD, CFA

Bernd Hanke, PhD, CFA, is at Global Systematic Investors LLP (United Kingdom). Brian J. Henderson, PhD, CFA, is at The George Washington University (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss roles of fixed-income securities in portfolios;
☐	**b.** describe how fixed-income mandates may be classified and compare features of the mandates;
☐	**c.** describe bond market liquidity, including the differences among market sub-sectors, and discuss the effect of liquidity on fixed-income portfolio management;
☐	**d.** describe and interpret a model for fixed-income returns;
☐	**e.** discuss the use of leverage, alternative methods for leveraging, and risks that leverage creates in fixed-income portfolios;
☐	**f.** discuss differences in managing fixed-income portfolios for taxable and tax exempt investors.

INTRODUCTION

1

Globally, fixed-income markets represent the largest asset class in financial markets, and most investors' portfolios include fixed-income investments. Fixed-income markets include publicly traded securities (such as commercial paper, notes, and bonds) and non-publicly traded instruments (such as loans and privately placed securities). Loans may be securitized and become part of the pool of assets supporting an asset-backed security.

This reading discusses why investor portfolios include fixed-income securities and provides an overview of fixed-income portfolio management. Section 2 discusses different roles of fixed-income securities in portfolios, including diversification, regular cash flows, and inflation hedging potential. Section 3 describes the two main types of fixed-income portfolio mandates: liability-based (or structured) mandates and

© 2017 CFA Institute. All rights reserved.

total return mandates. It also describes approaches to implementing these mandates. Section 4 discusses bond market liquidity and its effects on pricing and portfolio construction. Section 5 introduces a model of how a bond position's total expected return can be decomposed. The model provides a better understanding of the driving forces behind expected returns to fixed-income securities. Section 6 discusses the use of leverage in fixed-income portfolios. Section 7 describes considerations in managing fixed-income portfolios for both taxable and tax-exempt investors. A summary of key points completes the reading.

2 ROLES OF FIXED-INCOME SECURITIES IN PORTFOLIOS

Fixed-income securities serve important roles in investment portfolios, including diversification, regular cash flows, and possible inflation hedging. The correlations of fixed-income securities with equity securities vary, but adding fixed-income securities to portfolios that include equity securities is usually an effective way to obtain diversification benefits. Fixed-income securities typically specify schedules for principal repayments and interest payments. The scheduled nature of their cash flows enables investors—both individual and institutional—to fund, with some degree of predictability, known future obligations such as tuition payments or corporate pension obligations. Some fixed-income securities, such as inflation-linked bonds, may also provide a hedge for inflation.

2.1 Diversification Benefits

In a portfolio context, fixed-income investments can provide diversification benefits when combined with other asset classes. Recall that a major reason that portfolios can effectively reduce risk is that combining securities whose returns are not perfectly correlated (i.e., a correlation coefficient of less than +1.0) provides risk diversification. Lower correlations are associated with lower risk. The challenge in diversifying risk is to find assets that have a correlation that is much lower than +1.0.

Exhibit 1 shows the correlation matrix across several bond market sectors and the S&P 500 Index (an index of large-cap US equity securities) for the period January 2003 to September 2015. The bond market sectors in the matrix are represented by indexes of four investment-grade bond sub-sectors of the US bond market:

1. The Bloomberg Barclays US Aggregate (US dollar–denominated bonds with maturity greater than 1 year, including Treasuries, government-related and corporate securities, mortgage-backed securities, asset-backed securities, and commercial mortgage-backed securities);
2. The Bloomberg Barclays US Treasury Bond 10-Year Term (US Treasury bonds with maturities of 7–10 years);
3. The Bloomberg Barclays US Corporate (US dollar–denominated corporate bonds with maturity greater than 1 year); and
4. The Bloomberg Barclays US TIPS (Series-L) (US Treasury Inflation-Protected Securities [TIPS] with maturity greater than 1 year).

In addition to investment-grade bonds, the matrix includes a high-yield (non-investment-grade) bond market index: the Bloomberg Barclays US Corporate High-Yield (US dollar–denominated high-yield corporate bonds with maturity greater than

one year). The matrix also includes two international bond indexes: the Bloomberg Barclays Global Aggregate (international investment-grade bonds) and the JP Morgan Government Bond Index–Emerging Markets Global (GBI–EM Global).

Exhibit 1 Correlation Matrix

Index	Bloomberg Barclays US Aggregate	Bloomberg Barclays US Treasury 10-Year Term	Bloomberg Barclays US Corporate	Bloomberg Barclays US TIPS	Bloomberg Barclays Global Aggregate	Bloomberg Barclays US Corporate High Yield	JP Morgan GBI-EM Global	S&P 500
Bloomberg Barclays US Aggregate	1.00	0.95	0.92	0.81	0.54	0.03	−0.01	−0.27
Bloomberg Barclays US Treasury 10-Year Term	0.95	1.00	0.88	0.79	0.50	−0.13	−0.12	−0.35
Bloomberg Barclays US Corporate	0.92	0.88	1.00	0.77	0.50	0.16	0.04	−0.25
Bloomberg Barclays US TIPS	0.81	0.79	0.77	1.00	0.49	0.07	0.08	−0.21
Bloomberg Barclays Global Aggregate	0.54	0.50	0.50	0.49	1.00	0.09	0.46	0.04
Bloomberg Barclays US Corporate High Yield	0.03	−0.13	0.16	0.07	0.09	1.00	0.47	0.32
JP Morgan GBI-EM Global	−0.01	−0.12	0.04	0.08	0.46	0.47	1.00	0.36
S&P 500	−0.27	−0.35	−0.25	−0.21	0.04	0.32	0.36	1.00

Source: Authors' calculations for the period January 2003 to September 2015, based on data from Barclays Risk Analytics and Index Solutions; J.P. Morgan Index Research; S&P Dow Jones Indices.

For the period January 2003 to September 2015, the correlation matrix shows the following:

- The US bond market's investment-grade sub-sectors were highly correlated with each other, as evidenced by the correlations ranging from 0.77 to 0.95.
- International investment-grade bonds, which include US investment-grade bonds, show a 0.54 correlation with the overall US investment-grade bond sector. Because the US Aggregate Index and the US Aggregate Index portion of the Global Aggregate Index have a correlation of 1.0, the non-US investment-grade bonds must have had an even lower correlation with US investment-grade bonds. During this period, significant diversification benefits existed for including both US and non-US bonds in portfolios.

- The US investment-grade bond sub-sectors exhibited low (and in some cases, negative) correlations with equities, US high-yield bonds, and emerging market bonds. International investment-grade bonds also exhibited low correlations with equities and US high-yield bonds but were moderately correlated with emerging market bonds. The low or negative correlations indicate that investment-grade bonds would have provided significant diversification benefits if combined with these other, more-volatile asset classes.
- High-yield bonds, emerging market bonds, and equities exhibited positive correlations with each other, ranging from 0.32 to 0.47.

Based on Exhibit 1, it appears that combining investment-grade, high-yield, and emerging market bonds and equities can result in portfolio diversification benefits. Fixed-income investments may also provide diversification benefits through their low correlations with other asset classes, such as real estate and commodities.

Importantly, these correlations are not constant over time. During a long historical period, the average correlation of returns between two asset classes may be low, but in any particular period, the correlation can differ from the average correlation. Correlation estimates can vary based on the capital market dynamics during the period when the correlations are measured. The correlation between the asset classes may increase or decrease, depending on the circumstances. During periods of market stress, investors may exhibit a "flight to quality" by buying safer assets such as government bonds (increasing their prices) and selling riskier assets such as equity securities and high-yield bonds (lowering their prices). These actions may decrease the correlation between government bonds and equity securities, as well as between government bonds and high-yield bonds. At the same time, the correlation between riskier assets such as equity securities and high-yield bonds may increase.

Correlation among assets is the primary determinant of diversification benefits and a reduction in portfolio risk, but volatility of each asset class also affects portfolio risk. Bonds are generally less volatile than other major asset classes such as equity securities. Consider the standard deviation of daily returns to the indexes shown in Exhibit 1, covering the same period (January 2003 to September 2015). The Bloomberg Barclays US Aggregate (Bond) Index exhibited annualized return standard deviations of approximately 4%. The Bloomberg Barclays US Corporate High-Yield Index and the JP Morgan GBI–EM Index, which are higher-risk sectors of the bond market, exhibited 6.3% and 9.8% annualized return standard deviations, respectively. By comparison, the S&P 500 exhibited an annualized return standard deviation of 19.4%. Including diversified fixed-income positions in an investment portfolio, combined with exposure to other major asset classes, may significantly lower portfolio risk.

It is important to note that similar to correlations, volatility (standard deviation) of asset class returns may also vary over time. If interest rate volatility increases, bonds, particularly those with long maturities, can exhibit higher near-term volatility relative to the average volatility during a long historical period. The standard deviation of returns for lower credit quality (high-yield) bonds can rise significantly during times of financial stress, because as credit quality declines and the probability of default increases, investors often view these bonds as being more similar to equities.

2.2 Benefits of Regular Cash Flows

Fixed-income investments typically produce regular cash flows to a portfolio. Regular cash flows allow investors—both individual and institutional—to plan how to meet, with some degree of predictability, known future obligations such as tuition payments, pension obligations, or payouts on life insurance policies. In these cases, future liabilities can be estimated with some reasonable certainty. Fixed-income securities are often

acquired and "dedicated" to funding those future liabilities. In dedicated portfolios, fixed-income securities are selected such that the timing and magnitude of their cash flows match the timing and magnitude of the projected future liabilities.

Frequently, investors will "ladder" bond portfolios by staggering the maturity dates of portfolio bonds throughout the investment horizon. This approach can help to balance price risk and reinvestment risk. Buy-and-hold portfolios can also be tailored to fit an investor's specific investment horizon. For example, if an investor seeks regular income over a 10-year horizon, coupon-paying bonds that mature approximately 10 years in the future are good building blocks for such a portfolio.

It is important to note that reliance on regular cash flows assumes that no credit event (such as an issuer missing a scheduled interest or principal payment) or other market event (such as a decrease in interest rates increasing prepayments of mortgages underlying mortgage-backed securities) will occur. These events may cause actual cash flows of fixed-income securities to differ from expected cash flows. If any credit or market event occurs, a portfolio manager may need to adjust the portfolio.

2.3 Inflation Hedging Potential

Some fixed-income securities can provide a hedge for inflation. Bonds with floating-rate coupons protect interest income from inflation because the reference rate should adjust for inflation. The principal payment at maturity is unadjusted for inflation. Inflation-linked bonds provide investors with valuable inflation hedging benefits by paying a return that is directly linked to an index of consumer prices and adjusting the principal for inflation. There are several different structures for inflation-linked bonds, such as zero-coupon bonds with the inflation adjustment made to the principal payment, and capital-indexed bonds where a fixed coupon rate is applied to a principal amount that is adjusted for inflation throughout the bond's life.

The return on inflation-linked bonds includes a real return plus an additional component that is tied directly to the inflation rate. Inflation-linked bonds typically exhibit lower return volatility than conventional bonds and equities because the volatility of the returns on inflation-linked bonds depends on the volatility of *real,* rather than *nominal,* interest rates. The volatility of real interest rates is typically lower than the volatility of nominal interest rates that drive the returns of conventional bonds and equities.

Many governments in developed countries have issued inflation-linked bonds, including the United States, United Kingdom, France, Germany, Sweden, and Canada, as well as some in developing countries such as Brazil, Chile, and Argentina. Corporate issuers of inflation-linked bonds have included both financial and non-financial companies. For investors with long investment horizons, especially institutions facing long-term liabilities (for example, defined benefit pension plans and life insurance companies), inflation-linked bonds are particularly useful.

Exhibit 2 illustrates inflation protection provided by type of bond.

Exhibit 2 Protection against Inflation

	Coupon	Principal
Fixed-coupon bonds	Inflation unprotected	Inflation unprotected
Floating-coupon bonds	Inflation protected	Inflation unprotected
Inflation-linked bonds	Inflation protected	Inflation protected

Adding inflation-indexed bonds to diversified portfolios of bonds and equities typically results in superior risk-adjusted real portfolio returns. This improvement occurs because inflation-linked bonds can effectively represent a separate asset class, as they offer returns that differ from other asset classes and add to market completeness. Introducing inflation-linked bonds to an asset allocation strategy can result in a superior mean-efficient frontier.

EXAMPLE 1

Adding Fixed-Income Securities to a Portfolio

Mary Baker is anxious about the level of risk in her portfolio based on a recent period of increased equity market volatility. Most of her wealth is invested in a diversified global equities portfolio.

Baker contacts two wealth management firms, Atlantic Investments (AI) and West Coast Capital (WCC), for advice. In conversation with each adviser, she expresses her desire to reduce her portfolio's risk and to have a portfolio that generates a cash flow stream with consistent purchasing power over her 15-year investment horizon.

The correlation coefficient of Baker's diversified global equities portfolio with a diversified fixed-coupon bond portfolio is –0.10 and with a diversified inflation-linked bond portfolio is 0.10. The correlation coefficient between a diversified fixed-coupon bond portfolio and a diversified inflation-linked bond portfolio is 0.65.

The adviser from AI suggests diversifying half of her investment assets into nominal fixed-coupon bonds. The adviser from WCC also suggests diversification but recommends that Baker invest 25% of her investment assets into fixed-coupon bonds and 25% into inflation-linked bonds.

Evaluate the advice given to Baker by each adviser based on her stated desires regarding portfolio risk reduction and cash flow stream. Recommend which advice Baker should follow, making sure to discuss the following concepts in your answer:

a Diversification benefits

b Cash flow benefits

c Inflation hedging benefits

Solution:

Advice from AI:

Diversifying into fixed-coupon bonds would offer substantial diversification benefits in lowering overall portfolio volatility (risk) given the negative correlation of –0.10. The portfolio's volatility, measured by standard deviation, would be lower than the weighted standard deviations of the diversified global equities portfolio and the diversified fixed-coupon bond portfolio. The portfolio will generate regular cash flows because it includes fixed-coupon bonds. This advice, however, does not address Baker's desire to have the cash flows maintain purchasing power over time and thus serve as an inflation hedge.

Advice from WCC:

Diversifying into both fixed-coupon bonds and inflation-linked bonds offers additional diversification benefits beyond that offered by fixed-coupon bonds only. The correlation between diversified global equities and inflation-linked bonds is only 0.10. The correlation between nominal fixed-coupon bonds and

inflation-linked bonds is 0.65, which is also less than 1.0. The portfolio will generate regular cash flows because of the inclusion of fixed-coupon and inflation-linked bonds. Adding the inflation-linked bonds helps to at least partially address Baker's desire for consistent purchasing power over her investment horizon.

Based on her stated desires and the analysis above, Baker should follow the advice provided by WCC.

FIXED-INCOME MANDATES

3

The previous section discussed the roles of fixed-income securities in portfolios and the benefits these securities provide. When investment mandates include an allocation to fixed income, investors need to decide how to add fixed-income securities to portfolios. Fixed-income mandates can be broadly classified into liability-based mandates and total return mandates. Liability-based mandates are managed to match or cover expected liability payments with future projected cash inflows. As such, they are also referred to as structured mandates, asset/liability management (ALM), or liability-driven investments (LDI). These types of mandates are structured in a way to ensure that a liability or a stream of liabilities (e.g., a company's pension liabilities) can be covered and that any risk of shortfalls or deficient cash inflows is minimized.

Total return mandates are generally managed in an attempt to either track or outperform a market-weighted fixed-income benchmark such as the Bloomberg Barclays Global Aggregate Index. Both liability-based and total return mandates exhibit common features, such as the attempt by investors to achieve the highest risk-adjusted returns (or perhaps highest yields) given a set of constraints. The two types of mandates have fundamentally different objectives, however.

Some fixed-income mandates include a requirement that environmental, social, and governance (ESG) factors are considered during the investment process. When considering these factors, an analyst or portfolio manager may look for evidence on whether the portfolio contains companies whose operations are favorable or unfavorable in the context of ESG, and whether such companies' actions and resource management practices reflect a sustainable business model. For example, the analyst or portfolio manager may consider whether a company experienced incidents involving significant environmental damage, instances of unfair labor practices, or lapses in corporate governance integrity. For companies that do not fare favorably in an ESG analysis, investors may assume that these companies are more likely to encounter future ESG-related incidents that could cause serious reputational and financial damage to the company. Such incidents could impair a company's credit quality and result in a decline in both the price of the company's bonds and the performance of a portfolio containing those bonds.

3.1 Liability-Based Mandates

Users of liability-based mandates include individuals funding specific cash flow and lifestyle needs as well as institutions such as banks, insurance companies, and pension funds. These types of institutions have a need to match future liabilities, such as payouts on life insurance policies and pension benefits, with corresponding cash inflows. Pension funds are perhaps the largest users of liability-based mandates based on assets invested. Regulators in many jurisdictions impose minimum funding levels on pension liabilities to ensure the safety of retiree pensions. Insurance companies

project future cash outflows based on expected claims from policyholders. Additionally, life insurance companies may offer annuities and guaranteed investment contracts, both of which require cash outflows for extended periods.

There are two main approaches to liability-based mandates: **cash flow matching** and **duration matching**, which are immunization approaches. Immunization is the process of structuring and managing a fixed-income portfolio to minimize the variance in the realized rate of return over a known time horizon. This variance arises from the volatility of future interest rates. Immunization is an asset/liability management approach that structures investments in bonds to reduce or eliminate the risks associated with a change in market interest rates. In addition, several variations use or combine elements of these approaches, including contingent immunization and horizon matching.[1] The following discussion provides an overview of these approaches.

3.1.1 *Cash Flow Matching*

Cash flow matching is an immunization approach that may be the simplest and most intuitive way to match a liability stream and a stream of cash inflows. This approach, unlike duration matching, essentially has no underlying assumptions. Cash flow matching attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps. Exhibit 3 shows the results of a cash flow matching approach for a liability stream and a bond portfolio. Future liability payouts are exactly mirrored by coupon and principal payments arising from the bond portfolio. Bond cash inflows coincide with liability cash outflows. Therefore, there is no need for reinvestment of cash inflows.

Exhibit 3 Cash Flow Matching

In practice, perfect matching of cash flows is difficult to achieve. It is rare that a combination of fixed-income securities can be found that exactly matches the timing and amount of the required cash outflows. Further, implementing a cash flow matching approach may result in relatively high transaction costs, even if quantitative optimization techniques are used to construct a cash flow matching portfolio at the lowest possible cost. Timing mismatches, such as some cash inflows preceding corresponding cash outflows, tend to exist because it may be less costly and more practical to not match cash flows precisely. Such a mismatch, however, results in some reinvestment risk.

Although in theory a cash flow matching portfolio does not need to be rebalanced once in place, it is often desirable or necessary to do so. As market conditions change, the lowest-cost cash flow matching portfolio may change because the universe of

1 Leibowitz (1986a and 1986b) provides an insightful summary of the main approaches.

securities eligible for inclusion into the portfolio changes and the characteristics of securities change. A portfolio manager, therefore, has an incentive to rebalance the portfolio periodically despite incurring transaction costs.

For some types of fixed-income securities, the timing or amount of cash flows may change. For example, a corporate bond issuer may default and subsequent cash flows cease, or a bond with an embedded option may be called before maturity. Although these types of "imperfections" can often be avoided by restricting the universe of eligible securities and including only certain types of bonds (e.g., government bonds) in the portfolio, it is usually not optimal to do so. Securities that are not included in a smaller restricted universe might provide better return-to-risk tradeoffs.

3.1.2 *Duration Matching*

Duration matching is an immunization approach that is based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates. Conditions that need to be satisfied to achieve immunization using duration matching include the following: (1) A bond portfolio's duration must equal the duration of the liability portfolio; and (2) the present value of the bond portfolio's assets must equal the present value of the liabilities at current interest rate levels. The idea is that changes in the bond portfolio's market value closely match changes in the liability portfolio, whether interest rates rise or fall.

If interest rates increase or decrease, changes in reinvestment income and changes in bond prices immunize against the effect of interest rate changes. If interest rates decrease, reduced reinvestment income is offset by an increase in bond prices. If interest rates increase, higher reinvestment income offsets the decrease in bond prices. A crucial limitation of immunization is that it protects against only a parallel change in the yield curve—that is, the same yield change across the entire maturity spectrum of the yield curve. In practice, however, changes in the bond market environment may lead to changes in yield curve shape, such as steepening, flattening, or changes in the curvature.[2] Hence immunization remains imperfect, and the strategy design needs to incorporate some margin for error.

It is important to note other considerations for an immunized portfolio:

- A portfolio is an immunized portfolio only at a given point in time. As market conditions change, the immunization conditions will be violated, and the portfolio therefore needs to be rebalanced periodically to continue to achieve its immunization objective.
- The need to rebalance makes liquidity considerations important. Moreover, if bond portfolio cash flows (e.g., scheduled coupon and principal payments) are not perfectly matched with liability cash flows under immunization, bond positions may need to be liquidated in order to satisfy the liability outflows.
- Rebalancing and the need to liquidate positions can result in high portfolio turnover.

2 There are extensions to the classical immunization approach (Redington 1952) that can incorporate non-parallel yield curve shifts (see, for example, Fong and Vasicek 1984). These approaches are more complex, however, and are not discussed here.

- Immunization assumes that bond issuers do not default, and it does not protect against issuer- or bond-specific interest rate changes such as those resulting from an individual bond issuer's change in credit quality.
- Immunization can accommodate bonds with embedded options (such as certain corporate bonds and mortgage-backed securities) to the extent that a bond's duration is replaced by its effective duration as an input to the methodology. Effective duration takes into account that future interest rate changes can affect the expected cash flows for a bond with embedded options.

In summary, the duration matching approach requires that reinvestment risk and the risk of bond price movements in a portfolio are offset. In practice, however, some immunization risk almost always remains. An exception would be a portfolio of zero-coupon bonds that are designed to match liability cash flows. In this case, because the zero-coupon bonds are held to maturity, the effect of interest rate changes on price are irrelevant and there are no interim cash flows to reinvest. In effect, there is no price risk, no reinvestment risk, and therefore no immunization risk, although credit risk remains.

Exhibit 4 gives an overview of key features of duration matching and cash flow matching.

Exhibit 4 Liability-Based Mandates: Key Features

	Duration Matching	Cash Flow Matching
Yield curve assumptions	Parallel yield curve shifts	None
Mechanism	Risk of shortfall in cash flows is minimized by matching duration and present value of liability stream	Bond portfolio cash flows match liabilities
Basic principle	Cash flows come from coupon and principal repayments of the bond portfolio and offset liability cash flows	Cash flows, coupons, and principal repayments of the bond portfolio offset liability cash flows
Rebalancing	Frequent rebalancing required	Not required but often desirable
Complexity	High	Low

3.1.3 *Contingent Immunization*

Variations of both duration and cash flow matching approaches exist. A commonly used hybrid approach is known as **contingent immunization**, which combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio. In other words, there is a surplus. The portfolio manager is allowed to actively manage the asset portfolio, or some portion of the asset portfolio, as long as the value of the actively managed portfolio exceeds a specified value (threshold). The actively managed portfolio can potentially be invested into any asset category, including equity, fixed-income, and alternative investments. If the actively managed portfolio value falls to the specified threshold, active management ceases and a conventional duration matching or a cash flow matching approach is put in place.

3.1.4 *Horizon Matching*

Another hybrid approach, **horizon matching**, combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short- and long-term liabilities. The short-term liability portion (usually liabilities up to about

four or five years) is covered by a cash flow matching approach, whereas the long-term liabilities are covered by a duration matching approach. This approach combines desirable features of both approaches—a portfolio manager has more flexibility over the less certain, longer horizon and can still meet more certain, shorter-term obligations.

EXAMPLE 2

Liability-Based Mandates (1)

Dave Wilson, a fixed-income analyst, has been asked by his manager to analyze different liability-based mandates for a pension fund client. The pension plan currently has a very large surplus of assets over liabilities. Evaluate whether an immunization or contingent immunization approach would be most suitable for the pension fund.

Solution:

Because the pension fund currently has a large surplus of assets over liabilities, a contingent immunization approach would be most suitable. A pure immunization approach would not be appropriate, because a key assumption under this approach is that the present value of the fund's assets equals the present value of its liabilities. The contingent immunization approach allows the pension fund's portfolio manager to follow an active management approach as long as the portfolio remains above a specified value. If the pension fund's portfolio decreases to the specified value, a duration matching or even a cash flow matching approach would be put in place to ensure adequate funding of the pension plan's liabilities.

EXAMPLE 3

Liability-Based Mandates (2)

If the yield curve experiences a one-time parallel shift of 1%, what is the likely effect on the match between a portfolio's assets and liabilities for a duration matching approach and a cash flow matching approach?

Solution:

There should be no effect on the match between assets and liabilities for either a duration matching or cash flow matching portfolio. Duration matching insures against any adverse effects of a one-time parallel shift in the yield curve. By contrast, non-parallel shifts would cause mismatches between assets and liabilities in a duration matching approach. In a cash flow matching approach, asset and liability matching remains in place even if market conditions change.

3.2 Total Return Mandates

In contrast to liability-based mandates, total return mandates do not attempt to match future liabilities. Total return mandates can establish objectives based on a specified absolute return or a relative return. Generally structured to either track or outperform a specified bond index, total return mandates are the focus of this discussion. Total return and risk are both critical considerations for these types of mandates, with **active return** and **active risk** representing key metrics. Active return is defined

as the portfolio return minus the benchmark return. Active risk is the annualized standard deviation of active returns, which may also be referred to as **tracking error** (also sometimes called **tracking risk**).

Total return mandates can be classified into different approaches based on their target active return and active risk levels. Approaches range from a pure indexing approach that has targeted active return and active risk (tracking error) of zero to fully active approaches that substantially deviate from the benchmarks and attempt to generate significant excess (or active) returns. Portfolios that attempt to closely match a bond index, as compared with an equity index, are more challenging to construct and monitor.

3.2.1 *Pure Indexing*

A pure indexing approach attempts to replicate a bond index as closely as possible. Under this approach, the targeted active return and active risk are both zero. In practice, even if the tracking error is zero, the portfolio return will almost always be lower than the corresponding index return because of trading costs and management fees. Theoretically, the portfolio should include all of the underlying securities in the same proportions as the index. It is generally very difficult and costly, however, to precisely replicate most bond indexes because many bonds included in standard indexes are illiquid. Illiquidity is typically higher for bonds with small issuance size, less familiarity of the bond issuer among investors, and longer period outstanding. To help deal with bond market illiquidity, portfolio managers are generally allowed some flexibility around index holdings in an attempt to reduce costs and make the portfolio more implementable in practice.

An index manager, who is allowed some flexibility in holdings, is expected to match the risk factor exposures of the benchmark index, such as duration, credit (or quality) risk, sector risk, call risk, and prepayment risk. In this way, all or most of the known systematic risk factors can be matched to the extent possible. The risk that remains is then mostly issuer-specific (or idiosyncratic) risk, which can be largely mitigated if both the benchmark index and the portfolio are sufficiently diversified. Overall, a pure indexing approach that allows some flexibility in holdings is generally less costly and easier to implement than precise replication of an index. Portfolio turnover for pure indexing approaches is normally consistent with benchmark turnover but considerably lower than that of most active management approaches.[3]

3.2.2 *Enhanced Indexing*

An enhanced indexing approach maintains a close link to the benchmark but attempts to generate at least a modest amount of outperformance relative to the benchmark. As with the pure indexing approach in practice, enhanced indexing allows small deviations in portfolio holdings from the benchmark index but tracks the benchmark's primary risk factor exposures very closely (particularly duration). Unlike the pure indexing approach, however, minor risk factor mismatches (e.g., sector or quality bets) are allowed under enhanced indexing. The intent of the mismatches is to generate higher returns than the benchmark. A target active risk or tracking error of less than 50 bps per year is typical. The turnover of this type of approach is generally only marginally higher than that of a pure indexing portfolio. Any potential outperformance of an

3 In general, bond index turnover is considerably higher than equity index turnover. This is true because higher cash flows are received as a result of bonds maturing or being called by issuers and also as a result of coupon payments. Cash flows from equity indexes are typically lower than those of bond indexes, and they mostly come from dividends as well as corporate actions. Bond index turnover depends to a large extent on the index's average maturity as well as its duration. Shorter-term bond indexes incur more-frequent principal repayments as bonds mature, which need to be reinvested in new bonds being added to these indexes. As a result, turnover for shorter-term bond indexes tends to be high.

enhanced indexing approach is likely to be modest. As a result, managers need to monitor turnover and the associated transaction costs closely in order to achieve positive active returns net of fees and costs. Management fees for an enhanced indexing approach are normally higher than those of a pure indexing approach portfolio. The higher fees largely reflect the manager's efforts to outperform the index. Management fees for an enhanced indexing approach are considerably lower than those of a fully active management approach.

3.2.3 *Active Management*

Active management allows larger risk factor mismatches relative to a benchmark index. These mismatches may cause significant return differences between the active portfolio and the underlying benchmark. Most notably, portfolio managers may take views on portfolio duration that differ markedly from the duration of the underlying benchmark. To take advantage of potential opportunities in changing market environments, active managers may incur significant portfolio turnover—often considerably higher than the underlying benchmark's turnover. Active portfolio managers normally charge higher management fees than pure or enhanced index managers. The higher fees and transaction costs increase the rate of return necessary to achieve positive active returns net of fees and costs.

As with enhanced indexing, actively managed portfolios seek to outperform the underlying benchmark. In practice, however, most active managers (in both fixed income and equity) have historically underperformed their benchmarks after fees and transaction costs. Bond index funds have also historically underperformed their benchmark indexes, but to a lesser extent than active fixed-income portfolios, because of lower turnover and management fees in bond index funds. A key challenge for investors is identifying, in advance, portfolio managers that will outperform their benchmarks.

Exhibit 5 summarizes the key features of the total return approaches discussed here.

Exhibit 5 Total Return Approaches: Key Features

	Pure Indexing	Enhanced Indexing	Active Management
Objective	Match benchmark return and risk as closely as possible	Modest outperformance (generally 20 bps to 30 bps) of benchmark while active risk is kept low (typically around 50 bps or lower)	Higher outperformance (generally around 50 bps or more) of benchmark and higher active risk levels
Portfolio weights	Ideally the same as benchmark or only slight mismatches	Small deviations from underlying benchmark	Significant deviations from underlying benchmark
Risk factor matching	Risk factors are matched exactly	Most primary risk factors are closely matched (in particular, duration)	Large risk factor deviations from benchmark (in particular, duration)
Turnover	Similar to underlying benchmark	Slightly higher than underlying benchmark	Considerably higher turnover than the underlying benchmark

EXAMPLE 4

The Characteristics of Different Total Return Approaches

Diane Walker is a consultant for a large corporate pension plan. She is looking at three funds (Funds X, Y, and Z) as part of the pension plan's global fixed-income allocation. All three funds use the Bloomberg Barclays Global Aggregate Index as a benchmark. Exhibit 6 provides characteristics of each fund and the index as of February 2016.

Identify the approach (pure indexing, enhanced indexing, or active management) that is *most likely* used by each fund, and support your choices by referencing the information in Exhibit 6.

Exhibit 6 Characteristics of Funds X, Y, and Z and the Bloomberg Barclays Global Aggregate Index

Risk and Return Characteristics	Fund X	Fund Y	Fund Z	Bloomberg Barclays Global Aggregate Index
Average maturity (years)	8.61	8.35	9.45	8.34
Modified duration (years)	6.37	6.35	7.37	6.34
Average yield (%)	1.49	1.42	1.55	1.43
Convexity	0.65	0.60	0.72	0.60
Quality				
AAA	41.10	41.20	40.11	41.24
AA	15.32	15.13	14.15	15.05
A	28.01	28.51	29.32	28.78
BBB	14.53	14.51	15.23	14.55
BB	0.59	0.55	1.02	0.35
Not rated	0.45	0.10	0.17	0.05
Maturity Exposure				
0–3 Years	21.43	21.67	19.20	21.80
3–5 Years	23.01	24.17	22.21	24.23
5–10 Years	32.23	31.55	35.21	31.67
10+ Years	23.33	22.61	23.38	22.30
Country Exposure				
United States	42.55	39.44	35.11	39.56
Japan	11.43	18.33	13.33	18.36
France	7.10	6.11	6.01	6.08
United Kingdom	3.44	5.87	4.33	5.99
Germany	6.70	5.23	4.50	5.30
Italy	4.80	4.01	4.43	4.07

Exhibit 6 (Continued)

Country Exposure				
Canada	4.44	3.12	5.32	3.15
Other	19.54	17.89	26.97	17.49

Notes: Quality, Maturity Exposure, and Country Exposure are shown as a percentage of the total for each fund and the index. Weights do not always sum to 100 because of rounding.
Source: Barclays Research.

Solution:

Fund X most likely uses an enhanced indexing approach. Fund X's modified duration and convexity are very close to those of the benchmark but still differ slightly. The average maturity of Fund X is slightly longer than that of the benchmark, whereas Fund X's average yield is slightly higher than that of the benchmark. Fund X also has deviations in quality, maturity exposure, and country exposures from the benchmark, providing further evidence of an enhanced indexing approach. Some of these deviations are meaningful; for example, Fund X has a relatively strong underweight in Japan.

Fund Y most likely uses a pure indexing approach because it provides the closest match to the Bloomberg Barclays Global Aggregate Index. The risk and return characteristics are almost identical between Fund Y and the benchmark. Furthermore, quality, maturity exposure, and country exposure deviations from the benchmark are very minor.

Fund Z most likely uses an active management approach because risk and return characteristics, quality, maturity exposure, and country exposure differ markedly from the index. The difference can be seen most notably with the mismatch in modified duration (7.37 for Fund Z versus 6.34 for the benchmark). Other differences exist between Fund Z and the index, but a sizable duration mismatch provides the strongest evidence of an active management approach.

BOND MARKET LIQUIDITY

4

A liquid security is one that may be transacted quickly with little effect on the security's price. Fixed-income securities vary greatly in their liquidity. Recently issued "on-the-run" sovereign government bonds may be very liquid and trade frequently at narrow bid–ask spreads. Other bonds, such as corporate and non-sovereign government bonds, may be very illiquid. These bonds may trade infrequently, in small quantities, or possibly never; and bid–ask spreads, if they are available, may be very wide.

Compared with equities, fixed-income markets are generally less liquid. The global fixed-income universe contains a multitude of individual bonds with varying features. Many issuers have multiple bonds outstanding with their own unique maturity dates, coupon rates, early redemption features, and other specific features. In other words, even for a single issuer, bonds are very heterogeneous. In contrast, each share of a single issuing company's common stock has identical features. Investors must understand the implications of varying features on bond values.

An important structural feature affecting liquidity is that fixed-income markets are typically over-the-counter dealer markets. Search costs (the costs of finding a willing counterparty) exist in bond markets because investors may have to locate desired

bonds. In addition, when either buying or selling, investors may have to obtain quotes from various dealers to obtain the most advantageous pricing. With limited, although improving, sources for transaction prices and quotes, bond markets are ordinarily less transparent than equity markets. Liquidity, search costs, and price transparency are closely related to the type of issuer and its credit quality. An investor is likely to find that bonds of a highly creditworthy government issuer are more liquid, have greater price transparency, and have lower search costs than bonds of, for example, a corporate issuer with a lower credit quality.

Bond liquidity is typically highest right after issuance. For example, an on-the-run bond issue of a highly creditworthy sovereign entity is typically more liquid than a bond with similar features—including maturity—that was issued previously (an off-the-run bond). This difference in liquidity is typically found even if the off-the-run bond was issued only one or two months earlier. One reason for this phenomenon is that soon after bonds are issued, dealers normally have a supply of the bonds in inventory, but as time goes by and bonds are traded, many are purchased by buy-and-hold investors. Once in the possession of such investors, those bonds are no longer available for trading. Typically, after issuance, the available supply of bonds in an issue is reduced and liquidity is impaired.

Liquidity typically affects bond yields. Bond investors require higher yields for investing in illiquid securities relative to otherwise identical securities that are more liquid. The higher yield compensates investors for the costs they may encounter if they try to sell illiquid bonds prior to maturity. These costs include the opportunity costs associated with the delays in finding trading counterparties, as well as the bid–ask spread (which is a direct loss of wealth). The incremental yield investors require for holding illiquid bonds instead of liquid bonds is referred to as a liquidity premium. The magnitude of the liquidity premium normally varies depending on such factors as the issuer, the issue size, and date of maturity. For example, the off-the-run 10-year US Treasury bond typically trades at several basis points higher yield than the on-the-run bond.

4.1 Liquidity among Bond Market Sub-Sectors

Bond market liquidity varies across sub-sectors. These sub-sectors can be categorized by key features such as issuer type, credit quality, issue size, and maturity. The global bond market includes sovereign government bonds, non-sovereign government bonds, government-related bonds, corporate bonds, and securitized bonds (such as asset-backed securities and commercial mortgage-backed securities). For simplicity, in this section we focus on sovereign government and corporate bonds.

Sovereign government bonds are typically more liquid than corporate and non-sovereign government bonds. Their superior liquidity relates to their large issuance size, use as benchmark bonds, acceptance as collateral in the repo market, and well-recognized issuers. Sovereign government bonds of countries with high credit quality are typically more liquid than bonds of lower-credit-quality countries.

In contrast to sovereign government bonds, corporate bonds are issued by many different companies and represent a wide spectrum of credit quality. For corporate bonds with low credit quality, it can be difficult to find a counterparty dealer with the securities in inventory or willing to take them into inventory. Bonds of infrequent issuers are often less liquid than the bonds of issuers with many outstanding issues because market participants are less familiar with companies that seldom issue debt.

Liquidity among sub-sectors can vary across additional dimensions, such as issue size and maturity. For example, in the corporate bond market, smaller issues are generally less liquid than larger issues because small bond issues are typically excluded from major bond indexes with minimum issue size requirements. Further, market participants generally have less incentive to dedicate resources to monitoring smaller

issuers, whose bonds may constitute a small proportion of an investor's portfolio. Bonds with longer maturities tend to be less liquid than nearer-term bonds because investors frequently purchase bonds with the intention to hold them until maturity, so such bonds may be unavailable for trading for a long period.

4.2 The Effects of Liquidity on Fixed-Income Portfolio Management

Liquidity concerns influence fixed-income portfolio management in multiple ways, including pricing, portfolio construction, and consideration of alternatives to bonds (such as derivatives).

4.2.1 *Pricing*

As mentioned earlier, pricing in bond markets is generally less transparent than pricing in equity markets. Sources for recent bond transactions—notably corporate bonds—are not always readily available. It should be noted that price transparency is improving in some bond markets. For example, in the United States, the Financial Industry Regulatory Authority's (FINRA) Trade Reporting and Compliance Engine (TRACE) and the Municipal Securities Rulemaking Board's Electronic Municipal Market Access (EMMA) are electronic systems that help to increase transparency in US corporate and municipal bond markets. Outside the United States, corporate bonds traded on market exchanges serve a similar role as TRACE in increasing pricing transparency. In most bond markets, however, the lack of transparency in corporate bond trading presents a challenge.

Because many bonds do not trade, or trade infrequently, using recent transaction prices to represent current value is not practical. Reliance on last traded prices, which may be out-of-date prices that do not incorporate current market conditions, could result in costly trading decisions. The determinants of corporate bond value, including interest rates, credit spreads, and liquidity premiums, change frequently.

For bonds that trade infrequently, a common investor approach is matrix pricing. Matrix pricing uses the recent transaction prices of comparable bonds to estimate the market discount rate or required rate of return on less frequently traded bonds. The comparable bonds have similar features such as credit quality, time to maturity, and coupon rate to the illiquid bond. A benefit of matrix pricing is that it does not require sophisticated financial modeling of bond market characteristics such as term structure and credit spreads. A disadvantage is that some value-relevant features between different bonds (for example, call features) may be ignored.

4.2.2 *Portfolio Construction*

Investors' liquidity needs directly influence portfolio construction. In constructing a portfolio, investors must consider an important trade-off between yield and liquidity. As mentioned previously, illiquid bonds typically have higher yields; a buy-and-hold investor that seeks yield will likely prefer less liquid bonds for these higher yields. By contrast, investors that emphasize liquidity will likely give up some yield and choose more-liquid bonds. Some investors may restrict their portfolio holdings to bonds within a certain maturity range. This restriction reduces the need to sell bonds to generate needed cash inflows. In such cases, the investors that anticipate their liquidity needs may give up the higher yield typically available to longer-term bonds. In addition to avoiding longer-term bonds, investors that have liquidity concerns may also avoid bonds with generally lower liquidity, such as small issues and private placements of corporate bonds.

A challenge in bond portfolio construction relates to the dealer market. Bond dealers often carry an inventory of bonds because buy and sell orders do not arrive simultaneously. A dealer is not certain how long bonds will remain in its inventory. Less liquid bonds are likely to remain in inventory longer than liquid bonds. A dealer provides bid–ask quotes (prices at which it will buy and sell) on bonds of its choice. Some illiquid bonds will not have quotes, particularly bid quotes, from any dealer. A number of different factors determine the bid–ask spread. Riskier bonds often have higher bid–ask spreads because of dealers' aversion to hold those bonds in inventory. Because bond dealers must finance their inventories, the dealers incur costs in both obtaining funding and holding those bonds. Dealers seek to cover their costs and make a profit through the bid–ask spread, and therefore the spread will be higher on illiquid bonds that are likely to remain in inventory longer.

A bond's bid–ask spread is also a function of the bond's complexity and how easily market participants can analyze the issuer's creditworthiness. Bid–ask spreads in government bonds are generally lower than spreads in corporate bonds or structured financial instruments, such as asset-backed securities. Conventional (plain vanilla) corporate bonds normally have lower spreads than corporate bonds with non-standard or complex features, such as embedded options. Bonds of large, high-credit-quality corporations that have many outstanding bond issues are the most liquid among corporate bonds, and thus they have relatively low bid–ask spreads compared with smaller, less creditworthy companies.

Illiquidity directly increases bid–ask spreads on bonds, which increases the cost of trading. Higher transaction costs reduce the benefits to active portfolio decisions and may decrease portfolio managers' willingness to adjust their portfolios to take advantage of opportunities that present themselves.

4.2.3 *Alternatives to Direct Investment in Bonds*

As we have discussed, transacting in fixed-income securities may present challenges because of low liquidity in many global bond markets. As an alternative, investors can use fixed-income derivatives, which are often more liquid than their underlying bonds. Such fixed-income derivatives include those traded on an exchange (for example, futures and options on futures) and those traded over the counter (for example, interest rate swaps and credit default swaps). In particular, bond futures, which are exchange traded and standardized, provide a liquid alternative for investors to gain exposure to the underlying bond(s).

Based on notional amount outstanding, interest rate swaps are the most widely used over-the-counter derivative worldwide. Some interest rate swaps are liquid, with multiple swaps dealers posting competitive two-way quotes. In addition to interest rate swaps, fixed-income portfolio managers use inflation swaps, total return swaps, and credit swaps to alter their portfolio exposure. Because they trade over the counter, swaps may be tailored to an investor's specific needs.

Fixed-income exchange-traded funds (ETFs) and pooled investment vehicles (such as mutual funds) have emerged as another alternative to transacting in individual bonds. ETF shares tend to be more liquid than the underlying individual securities and have thus provided new opportunities for investors seeking liquid fixed-income investments. ETFs may allow certain qualified financial institutions (authorized participants) to transact through in-kind deposits and redemptions (delivering and receiving a portfolio of securities, such as a portfolio of bonds). In the more illiquid bond market sectors, such as high-yield corporate bonds, fixed-income portfolio managers may purchase ETF shares and then redeem those shares for the actual underlying portfolio of bonds. In this redemption process, an ETF authorized participant generally acts as the intermediary between the portfolio managers redeeming their ETF shares and the ETF sponsor supplying the portfolio of bonds.

A MODEL FOR FIXED-INCOME RETURNS

5

Investors often have views on future changes in the yield curve and (re)structure their portfolios accordingly. Investment strategies should be evaluated in terms of expected returns rather than just yields. A bond position's yield provides an incomplete measure of its expected return. Instead, expected fixed-income returns consist of a number of different components in addition to yield. Examining these components leads to a better understanding of the driving forces behind expected returns. The focus is on *expected* as opposed to *realized* returns, but realized returns can be decomposed in a similar manner.

5.1 Decomposing Expected Returns[4]

Decomposing expected fixed-income returns allows an investor to differentiate among several important return components. At the most general level, expected returns (denoted as E(R) below) can be decomposed (approximately) in the following manner:

$$\begin{aligned} E(R) \approx\ & \text{Yield income} \\ &+ \text{Rolldown return} \\ &+ E(\text{Change in price based on investor's views of yields and yield spreads}) \\ &- E(\text{Credit losses}) \\ &+ E(\text{Currency gains or losses}) \end{aligned}$$

where E(…) represents effects on expected returns based on expectations of the bracketed item. The decomposition holds only approximately and can be a better or worse approximation of reality depending on the type of bond. It has very general applicability for all types of fixed-income securities, however, ranging from high-credit-quality, home currency sovereign government bonds to lower-credit-quality (high-yield) corporate bonds denominated in a currency other than an investor's home currency. The decomposition should help investors better understand their own investment positions and any assumptions reflected in those positions. The following discussion assumes the model is being applied to an annual period, but the same model can be generalized to other periods. In addition, for simplification, the model does not reflect taxes.

Yield income is the income that an investor receives from coupon payments relative to the bond's price as well as interest on reinvestment income. Assuming there is no reinvestment income, yield income equals a bond's annual current yield.

Yield income (or Current yield) = Annual coupon payment/Current bond price

The rolldown return results from the bond "rolling down" the yield curve as the time to maturity decreases, assuming zero interest rate volatility. Bond prices change as time passes even if the market discount rate remains the same. As time passes, a bond's price typically moves closer to par. This price movement is illustrated by the constant-yield price trajectory, which shows the "pull to par" effect on the price of a bond trading at a premium or a discount to par value. If the issuer does not default, the price of a bond approaches par value as its time to maturity approaches zero.

4 Some of this material has been adapted from Hanke and Seals (2010). A more detailed analysis of expected returns of US government bonds can be found in Ilmanen (1995a, 1995b, and 2011).

The rolldown return equals the bond's percentage price change assuming an unchanged yield curve over the strategy horizon. Bonds trading at a premium to their par value will experience capital losses during their remaining life, and bonds trading at a discount relative to their par value will experience capital gains during their remaining life.

To compute the rolldown return, the bond has to be revalued at the end of the strategy horizon assuming an unchanged yield curve. Then the annualized rolldown return is as follows:

$$\text{Rolldown Return} = \frac{\left(\text{Bond price}_{\text{End-of-horizon period}} - \text{Bond price}_{\text{Beginning-of-horizon period}}\right)}{\text{Bond price}_{\text{Beginning-of-horizon period}}}$$

The sum of the yield income and the rolldown return may be referred to as the bond's rolling yield.

The expected change in price based on investor's views of yields and yield spreads reflects an investor's expectation of changes in yields and yield spreads over the investment horizon. This expected change is zero if the investor expects yield curves and yield spreads to remain unchanged. Assuming the investor does expect a change in the yield curve, this expected return component is computed as follows:

$$E(\text{Change in price based on investor's views of yields and yield spreads}) = [-\text{MD} \times \Delta\text{Yield}] + [\tfrac{1}{2} \times \text{Convexity} \times (\Delta\text{Yield})^2]$$

where MD is the modified duration of a bond, ΔYield is the expected change in yield based on expected changes to both the yield curve and yield spread, and convexity estimates the effect of the non-linearity of the yield curve.[5] It should be noted that for bonds with embedded options, the duration and convexity measures used in the expected return decomposition need to be effective duration and effective convexity. Also, in contrast to fixed-coupon bonds, floating-rate notes have modified duration near zero.

Expected credit losses represent the expected percentage of par value lost to default for a bond. The expected credit loss equals the bond's probability of default (also called expected default rate) multiplied by its expected loss severity (also known as loss given default). Expected credit losses may be low based on past experience of default rates and resulting credit losses. For example, US investment-grade bonds experienced an average annual default rate of around 0.1% from 1980 to 2015.[6]

If an investor holds bonds denominated in a currency other than her home currency, she also needs to factor in any expected fluctuations in the currency exchange rate or expected currency gains or losses over the investment horizon. This quantity could simply be a reflection of her own views, or it could be based on survey information or some kind of quantitative model. It could also be based on the exchange rate that can be locked in over the investment horizon using currency forwards.

The following discussion shows an application of the fixed-income model described here. Expected return and its components are on an annualized basis, and any potential coupons are assumed to be paid annually.

5 Leibowitz, Krasker, and Nozari (1990) offer a detailed analysis of spread duration.

6 As reported by Vazza and Kraemer (2016), for the period 1981 to 2015, the average one-year cumulative global corporate default rates were 0.10% for investment-grade issues, 3.80% for speculative-grade (high-yield) issues, and 1.49% for all rated issues. Yearly default rates vary, however, and during the period 1981 to 2015, one-year cumulative global corporate default rates ranged between 0.14% (1981) and 4.18% (2009) for all rated issues.

EXAMPLE 5

Decomposing Expected Returns

Ann Smith works for a US investment firm in its London office. She manages the firm's British pound–denominated corporate bond portfolio. Her department head in New York has asked Smith to make a presentation on the next year's total expected return of her portfolio in US dollars and the components of this return. Exhibit 7 shows information on the portfolio and Smith's expectations for the next year. Calculate the total expected return of Smith's bond portfolio, assuming no reinvestment income.

Exhibit 7 Portfolio Characteristics and Expectations

Notional principal of portfolio (in millions)	£100
Average bond coupon payment (per £100)	£2.75
Coupon frequency	Annual
Investment horizon	1 year
Current average bond price	£97.11
Expected average bond price in one year (assuming an unchanged yield curve)	£97.27
Average bond convexity	0.18
Average bond modified duration	3.70
Expected average yield and yield spread change	0.26%
Expected credit losses	0.10%
Expected currency losses (£ depreciation versus US$)	0.50%

Solution:

The portfolio's yield income is 2.83%. The portfolio has an average coupon of £2.75 on a £100 notional principal and currently trades at £97.11. The yield income over a one-year horizon is 2.83% = £2.75/£97.11.

In one year's time, assuming an unchanged yield curve and zero interest rate volatility, the rolldown return is 0.16% = (£97.27 – £97.11)/£97.11.

The rolling yield, which is the sum of the yield income and the rolldown return, is 2.99% = 2.83% + 0.16%.

The expected change in price based on Smith's views of yields and yield spreads is –0.96%. The bond portfolio has a modified duration of 3.70 and a convexity statistic of 0.18. Smith expects an average yield and yield spread change of 0.26%. Smith expects to incur a decrease in prices and a reduction in return based on her yield view. The expected change in price based on Smith's views of yields and yield spreads is thus $-0.0096 = [-3.70 \times 0.0026] + [\frac{1}{2} \times 0.18 \times (0.0026)^2]$. So the expected reduction in return based on Smith's yield view is 0.96%.

Smith expects 0.1% of credit losses in her well-diversified investment-grade bond portfolio.

Smith expects the British pound, the foreign currency in which her bond position is denominated, to depreciate by an annualized 50 bps (or 0.5%) over the investment horizon against the US dollar, the home country currency. The expected currency loss to the portfolio is thus 0.50%.

After combining the foregoing return components, the total expected return on Smith's bond position is 1.43%. For ease of reference, Exhibit 8 summarizes the calculations.

Exhibit 8 Return Component Calculations

Return Component	Formula	Calculation
Yield income	Annual coupon payment/Current bond price	£2.75/£97.11 = 2.83%
+ Rolldown return	$\frac{\left(\text{Bond price}_{\text{End-of-horizon period}} - \text{Bond price}_{\text{Beginning-of-horizon period}}\right)}{\text{Bond price}_{\text{Beginning-of-horizon period}}}$	(£97.27 – £97.11)/£97.11 = 0.16%
= Rolling yield	Yield income + Rolldown return	2.83% + 0.16% = 2.99%
+ E(Change in price based on Smith's yield and yield spread view)	[–MD × ΔYield] + [½ × Convexity × $(\Delta\text{Yield})^2$]	[–3.70 × 0.0026] + [½ × 0.18 × $(0.0026)^2$] = –0.96%
– E(Credit losses)	given	–0.10%
+ E(Currency gains or losses)	given	–0.50%
= Total expected return		**1.43%**

5.2 Estimation of the Inputs

In the model for fixed-income returns discussed earlier, some of the individual expected return components can be more easily estimated than others. The easiest component to estimate is the yield income. The rolldown return, although still relatively straightforward to estimate, depends on the curve-fitting technique used.

The return model's most uncertain individual components are the investor's views of changes in yields and yield spreads, expected credit losses, and expected currency movements. These components are normally based on purely qualitative (subjective) criteria, on survey information, or on a quantitative model. Although a quantitative approach may seem more objective, the choice of quantitative model is largely subjective given the multitude of such models available.

5.3 Limitations of the Expected Return Decomposition

The return decomposition described in Section 5.1 is an approximation; only duration and convexity are used to summarize the price–yield relationship. In addition, the model implicitly assumes that all intermediate cash flows of the bond are reinvested at the yield to maturity, which results in different coupon reinvestment rates for different bonds.

The model also ignores other factors, such as local richness/cheapness effects as well as potential financing advantages. Local richness/cheapness effects are deviations of individual maturity segments from the fitted yield curve, which was obtained using a curve estimation technique. Yield curve estimation techniques produce relatively smooth curves, and there are likely slight deviations from the curve in practice. There may be financing advantages to certain maturity segments in the repo market. The repo market provides a form of short-term borrowing for dealers in government securities who sell government bonds to other market participants overnight and buy them

back, typically on the following day. In most cases, local richness/cheapness effects and financing advantages tend to be relatively small and are thus not included in the expected return decomposition model.

EXAMPLE 6

Components of Expected Return

Kevin Tucker manages a global bond portfolio. At a recent investment committee meeting, Tucker discussed his portfolio's domestic (very high credit quality) government bond allocation with another committee member. The other committee member argued that if the yield curve is expected to remain unchanged, the only determinants of a domestic government bond's expected return are its coupon payment and its price.

Explain why the other committee member is incorrect, including a description of the additional expected return components that need to be included.

Solution:

A bond's coupon payment and its price allow only its yield income to be computed. Yield income is an incomplete measure of a bond's expected return. For domestic government bonds, in addition to yield income, the rolldown return needs to be considered. The rolldown return results from the fact that bonds are pulled to par as the time to maturity decreases, even if the yield curve is expected to remain unchanged over the investment horizon. Currency gains and losses would also need to be considered in a global portfolio. Because the portfolio consists of government bonds with very high credit quality, the view on credit spreads and expected credit losses are less relevant for Tucker's analysis. For government and corporate bonds with lower credit quality, however, credit spreads and credit losses would also need to be considered as additional return components.

LEVERAGE

6

Leverage is the use of borrowed capital to increase the magnitude of portfolio positions, and it is an important tool for fixed-income portfolio managers. By using leverage, fixed-income portfolio managers may be able to increase portfolio returns relative to what they can achieve in unleveraged portfolios.

Managers often have mandates that place limits on the types of securities they may hold. Simultaneously, managers may have return objectives that are difficult to achieve, especially during low interest rate environments. Through the use of leverage, a manager can increase his investment exposure and may be able to increase the returns to fixed-income asset classes that typically have low returns. The increased return potential, however, comes at the cost of increased risk: If losses occur, these would be higher than in unleveraged positions.

6.1 Using Leverage

Leverage increases portfolio returns if the securities in the portfolio have higher returns than the cost of borrowing. In an unleveraged portfolio, the return on the portfolio (r_p) equals the return on invested funds (r_I). When the manager uses leverage, however, the invested funds exceed the portfolio's equity by the amount that is borrowed.

The leveraged portfolio return, r_p, can be expressed as the total investment gains per unit of invested capital:

$$r_P = \frac{\text{Portfolio return}}{\text{Portfolio equity}} = \frac{\left[r_I \times (V_E + V_B) - (V_B \times r_B)\right]}{V_E}$$

where

V_E = value of the portfolio's equity
V_B = borrowed funds
r_B = borrowing rate (cost of borrowing)
r_I = return on the invested funds (investment returns)
r_p = return on the levered portfolio

The numerator represents the total return on the portfolio assets, $r_I \times (V_E + V_B)$, minus the cost of borrowing, $V_B \times r_B$, divided by the portfolio's equity.

The leveraged portfolio return can be decomposed further to better identify the effect of leverage on returns:

$$\begin{aligned} r_P &= \frac{\left[r_I \times (V_E + V_B) - (V_B \times r_B)\right]}{V_E} \\ &= \frac{(r_I \times V_E) + \left[V_B \times (r_I - r_B)\right]}{V_E} \\ &= r_I + \frac{V_B}{V_E}(r_I - r_B) \end{aligned}$$

This expression decomposes the leveraged portfolio return into the return on invested funds and a portion that accounts for the effect of leverage. If $r_I > r_B$, then the second term is positive because the rate of return on invested funds exceeds the borrowing rate—in this case, leverage increases the portfolio's return. If $r_I < r_B$, then the second term is negative because the rate of return on invested funds is less than the borrowing rate—in this case, the use of leverage decreases the portfolio's return. The degree to which the leverage increases or decreases portfolio returns is proportional to the use of leverage (amount borrowed), V_B/V_E, and the amount by which investment return differs from the cost of borrowing, $(r_I - r_B)$.

6.2 Methods for Leveraging Fixed-Income Portfolios

Fixed-income portfolio managers have a variety of tools available to create leveraged portfolio exposures, notably the use of financial derivatives as well as borrowing via collateralized money markets. Derivatives or borrowing are explicit forms of leverage. Other forms of leverage, such as the use of structured financial instruments, are more implicit.

6.2.1 *Futures Contracts*

Futures contracts embed significant leverage because they permit the counterparties to gain exposure to a large quantity of the underlying asset without having to actually transact in the underlying. Futures contracts can be obtained for a modest investment that comes in the form of a margin deposit. A futures contract's notional value equals the current value of the underlying asset multiplied by the multiplier, or the quantity of the underlying asset controlled by the contract.

The futures leverage is the ratio of the futures exposure (in excess of the margin deposit) normalized by the amount of margin required to control the notional amount. We can calculate the futures leverage using the following equation:

$$\text{Leverage}_{\text{Futures}} = \frac{\text{Notional value} - \text{Margin}}{\text{Margin}}$$

6.2.2 *Swap Agreements*

Interest rate swaps can be viewed as a portfolio of bonds. In an interest rate swap, the fixed-rate payer is effectively short a fixed-rate bond and long a floating-rate bond. When interest rates increase, the value of the swap to the fixed-rate payer increases because the present value of the fixed-rate liability decreases and the floating-rate payments received increase. The fixed-rate receiver in the interest rate swap agreement effectively has a long position in a fixed-rate bond and a short position in a floating-rate bond. If interest rates decline, the value of the swap to the fixed-rate receiver increases because the present value of the fixed-rate asset increases and the floating-rate payments made decrease.

Because interest rate swaps are economically equivalent to a long–short bond portfolio, they provide leveraged exposure to bonds; the only capital required to enter into swap agreements is collateral required by the counterparties. Collateral for interest rate swap agreements has historically occurred between the two (or more) counterparties in the transaction. Increasingly, collateral for interest rate and other swaps occurs through central clearinghouses. The most significant driver of this shift has been regulation enacted after the 2008–2009 global financial crisis. Clearing of interest rate swaps through central clearinghouses has increased standardization and has reduced counterparty risk.

6.2.3 *Structured Financial Instruments*

Structured financial instruments (or structured products) are designed to repackage and redistribute risks. Many structured financial instruments have embedded leverage. An example of such a structured financial instrument is an inverse floating-rate note, also known as an inverse floater. An inverse floater's defining feature is that its coupon has an inverse relationship to a market interest rate such as Libor. As an example, the coupon rate for an inverse floater may be as follows:

$$\text{Coupon rate} = 15\% - (1.5 \times \text{Libor}_{\text{3-month}})$$

The inverse floater exacerbates the magnitude of the inverse relationship between bond prices and interest rates. The coupon rate in the example above can range from 0% to 15%. If three-month Libor increases to at least 10%, the coupon rate is 0%. At the other extreme, if three-month Libor decreases to 0%, the coupon rate is 15%. It should be noted that the inverse floater's structure would specify that the coupon rate cannot be less than 0%. A long position in an inverse floater is ideal for a fixed-income manager looking to express a strong view that interest rates will remain low or possibly decline over the life of the bond. However, the embedded leverage adds an additional source of price volatility to a fixed-income investor's portfolio.

6.2.4 *Repurchase Agreements*

Repurchase agreements (repos) are an important source of short-term financing for fixed-income securities dealers and other financial institutions, as evidenced by the trillions of dollars of repo transactions that take place annually. In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount while simultaneously agreeing to repurchase the security at a specified future date (typically

one day later) and price. Repos are thus effectively collateralized loans. When referring to a repo, the transaction normally refers to the borrower's standpoint; from the standpoint of the lender, these agreements are referred to as **reverse repos**.

The interest rate on a repurchase agreement, called the **repo rate**, is the difference between the security's selling price and its repurchase price. For example, consider a dealer wishing to finance a $15 million bond position with a repurchase agreement. The dealer enters into an overnight repo at a repo rate of 5%. We can compute the price at which she agrees to repurchase this bond after one day as the $15 million value today plus one day of interest. The interest amount is computed as follows:

Dollar interest = Principal amount × Repo rate × (Term of repo in days/360)

Continuing with the example, the dollar interest = $2,083.33 = $15 million × 5% × (1/360). Thus, the dealer will repurchase the bond the next day for $15,002,083.33.

The term, or length, of a repurchase agreement is measured in days. Overnight repos are common, although they are often rolled over to create longer-term funding. A repo agreement may be cash driven or security driven. Cash-driven transactions feature one party that owns bonds and wants to borrow cash, as in the foregoing example. Cash-driven transactions usually feature "general collateral," which are securities commonly accepted by investors and dealers, such as Treasury bonds. In a security-driven transaction, the lender typically seeks a particular security. The motives may be for hedging, arbitrage, or speculation.

Credit risk is a concern in a repo agreement, in particular for the counterparty that lends capital. Protection against a default by the borrower is provided by the underlying collateral bonds. Additional credit protection comes from the "haircut," the amount by which the collateral's value exceeds the repo principal amount. For example, haircuts for high-quality government bonds typically range from 1% to 3% and are higher for other types of bonds. The size of the haircut serves to not only protect the lender against a potential default by the borrower but also to limit the borrower's net leverage capacity. Generally, the size of the haircut increases as the price volatility of the underlying collateral increases.

Repos are categorized as bilateral repos or tri-party repos based on the way they are settled. Bilateral repos are conducted directly between two institutions, and settlement is typically conducted as "delivery versus payment," meaning that the exchanges of cash and collateral occur simultaneously through a central custodian (for example, the Depository Trust Company in the United States). Bilateral repos are usually used for security-driven transactions. Tri-party repo transactions involve a third party that provides settlement and collateral management services. Most cash-motivated repo transactions against general collateral are conducted as tri-party repo transactions.

6.2.5 *Securities Lending*

Securities lending is another form of collateralized lending, and is closely linked to the repo market. The primary motive of securities lending transactions is to facilitate short sales, which involve the sale of securities the seller does not own. A short seller must borrow the securities he has sold short in order to deliver them upon trade settlement. Another motive for securities lending transactions is financing, or collateralized borrowing. In a financing-motivated security loan, a bond owner lends the bond to another investor in exchange for cash.

Security lending transactions are collateralized by cash or high-credit-quality bonds. In the United States, most transactions feature cash collateral, although in many other countries, highly rated bonds are used as collateral. Typically, security lenders require collateral valued in excess of the value of the borrowed securities when bonds are used as collateral. For example, if high-quality government bonds are used as collateral, the lender may require bonds valued at 102% of the value of

the borrowed securities. The extra 2% functions in the same way as the haircut in the repo market, providing extra protection against borrower default. The collateral required will increase if lower-quality bonds are used as collateral.

In security lending transactions with cash collateral, the security borrower typically pays the security lender a fee equal to a percentage of the value of the securities loaned. For securities that are readily available for lending, that fee is small. The security lender earns an additional return by reinvesting the cash collateral. In cases where the securities loan is initiated for financing purposes, the lending fee is typically negative, indicating that the security lender pays the security borrower a fee in exchange for its use of the cash.

When bonds are posted as collateral, the income earned on the collateral usually exceeds the security lending rate; the security lender (who is in possession of the bonds as collateral) usually repays the security borrower a portion of the interest earned on the bond collateral. The term **rebate rate** refers to the portion of the collateral earnings rate that is repaid to the security borrower by the security lender. This relationship can be expressed as follows:

Rebate rate = Collateral earnings rate – Security lending rate

When securities are difficult to borrow, the rebate rate may be negative, which means the fee for borrowing the securities is greater than the return earned on the collateral. In this case, the security borrower pays a fee to the security lender in addition to forgoing the interest earned on the collateral.

There are important differences between repurchase agreements and securities lending transactions. Unlike repurchase agreements, security lending transactions are typically open-ended. The securities lender may recall the securities at any time, forcing the borrower to deliver the bonds by buying them back or borrowing from another lender. Similarly, the borrower may deliver the borrowed securities back to the lender at any time, forcing the lender, or its agent, to return the collateral (cash or bonds) and search for another borrower.

6.3 Risks of Leverage

Leverage alters the risk–return properties of an investment portfolio. A heavily leveraged portfolio may incur significant losses even when portfolio assets suffer only moderate valuation declines.

Leverage can lead to forced liquidations. If the value of the portfolio decreases, the portfolio's equity relative to borrowing levels is reduced and the portfolio's leverage increases. Portfolio assets may be sold in order to pay off borrowing and reduce leverage. If portfolio assets are not liquidated, then the overall leverage increases, corresponding to higher levels of risk. Decreases in portfolio value can lead to forced liquidations even if market conditions are unfavorable for selling—for example, during crisis periods. The term "fire sale" refers to forced liquidations at prices that are below fair value as a result of the seller's need for immediate liquidation. Reducing leverage, declining asset values, and forced sales have the potential to create spiraling effects that can result in severe declines in values and reduction in market liquidity.

Additionally, reassessments of counterparty risk typically occur during extreme market conditions, such as occurred in the 2008–2009 financial crisis. During periods of financial crisis, counterparties to short-term financing arrangements, such as credit lines, repurchase agreements, and securities lending agreements, may withdraw their financing. These withdrawals undermine the ability of leveraged market participants to maintain their investment exposures. Thus, the leveraged investor may be forced to reduce their investment exposure at exactly the worst time—that is, when prices are depressed.

7 FIXED-INCOME PORTFOLIO TAXATION

A tax-exempt investor's objective is to achieve the highest possible risk-adjusted returns net of fees and transaction costs. A taxable investor needs to also consider the effects of taxes on both expected and realized net investment returns. Taxes typically complicate investment decisions.

The investment management industry has traditionally made investment decisions based on pretax returns as though investors are tax exempt (such as pension funds in many countries).[7] The majority of the world's investable assets, however, is owned by taxable investors, who are concerned with after-tax rather than pretax returns.

Taxes may differ across investor types, among countries, and based on income source, such as interest or capital gains. In many countries, pension funds are exempt from taxes but corporations generally have to pay tax on their investments. Many countries make some allowance for tax-sheltered investments that individuals can use (up to certain limits). These types of tax shelters generally offer either an exemption from tax on investment income or a deferral of taxes until an investor draws money from the shelter (usually after retirement). Such shelters allow returns to accrue on a pretax basis until retirement, which can provide substantial benefits. In a fixed-income context for taxable investors, coupon payments (interest income) are typically taxed at the investor's normal income tax rate. Capital gains, however, may be taxed at a lower effective rate than an investor's normal income tax rate. In some countries, income from special types of fixed-income securities, such as bonds issued by the sovereign government, a non-sovereign government, or various government agencies, may be taxed at a lower effective rate or even not taxed.

It is beyond the scope of this reading to discuss specific tax rules because these vary across countries. Any discussion of the effect of taxes on investor returns—and therefore on how portfolios should optimally be managed for taxable investors—is especially challenging if it needs to apply on a global level. Although accounting standards have become more harmonized globally, any kind of tax harmonization among countries is not likely to occur anytime soon. An investor should consider how taxes affect investment income in the country where the income is earned and how the investment income is treated when it is repatriated to the investor's home country. Treaties between countries may affect tax treatment of investment income. Taxes are complicated and can make investment decisions difficult. Portfolio managers who manage assets for taxable individual investors, as opposed to tax-exempt investors, need to consider a number of issues.

7.1 Principles of Fixed-Income Taxation

Although tax codes differ across countries, there are certain principles that most tax codes have in common with regard to taxation of fixed-income investments:

- The two primary sources of investment income that affect taxes for fixed-income securities are coupon payments (interest income) and capital gains or losses.
- In general, tax is payable only on capital gains and interest income that have actually been received. In some countries, an exception to this rule applies to zero-coupon bonds. Imputed interest may be calculated that is taxed

7 See, for example, Rogers (2006).

throughout a zero-coupon bond's life. This method of taxation ensures that tax is paid over the bond's life and that the return on a zero-coupon bond is not taxed entirely as a capital gain.

- Capital gains are frequently taxed at a lower effective tax rate than interest income.
- Capital losses generally cannot be used to reduce sources of income other than capital gains. Capital losses reduce capital gains in the tax year in which they occur. If capital losses exceed capital gains in the year, they can often be "carried forward" and applied to gains in future years; in some countries, losses may also be "carried back" to reduce capital gains taxes paid in prior years. Limits typically exist on the number of years that capital losses can be carried forward or back.
- In some countries, short-term capital gains are taxed at a different (usually higher) rate than long-term capital gains.

An investor or portfolio manager generally has no control over the timing of when coupon income is received and the related income tax must be paid. However, he or she can generally decide the timing of sale of investments and therefore has some control over the timing of realized capital gains and losses. This control can be valuable for a taxable investor because it may be optimal to delay realizing gains and related tax payments and to realize losses as early as possible. This type of tax-driven strategic behavior is referred to as tax-loss harvesting.

Key points for managing taxable fixed-income portfolios include the following:

- Selectively offset capital gains and losses for tax purposes.
- If short-term capital gains tax rates are higher than long-term capital gains tax rates, then be judicious when realizing short term gains.
- Realize losses taking into account tax consequences. They may be used to offset current or future capital gains for tax purposes.
- Control turnover in the fund. In general, the lower the turnover, the longer capital gains tax payments can be deferred.
- Consider the trade-off between capital gains and income for tax purposes.

7.2 Investment Vehicles and Taxes

The choice of investment vehicle often affects how investments are taxed at the final investor level. In a pooled investment vehicle (sometimes referred to as a collective investment scheme) such as a mutual fund, interest income is generally taxed at the final investor level when it occurs—regardless of whether the fund reinvests interest income or pays it out to investors. In other words, for tax purposes the fund is considered to have distributed interest income for tax purposes in the year it is received even if it does not actually pay it out to investors. Taxation of capital gains arising from the individual investments within a fund is often treated differently in different countries.

Some countries, such as the United States, use what is known as *pass-through treatment* of capital gains in mutual funds. Realized net capital gains in the underlying securities of a fund are treated as if distributed to investors in the year that they arise, and investors need to include the gains on their tax returns. Other countries, such as the United Kingdom, do not use pass-through treatment. Realized capital gains arising within a fund increase the net asset value of the fund shares that investors hold. Investors pay taxes on the net capital gain when they sell their fund shares. This tax treatment leads to a deferral in capital gains tax payments. The UK portfolio manager's decisions on when to realize capital gains or losses do not affect the timing of tax payments on capital gains by investors.

In a separately managed account, an investor typically pays tax on realized gains in the underlying securities at the time they occur. The investor holds the securities directly rather than through shares in a fund. For separately managed accounts, the portfolio manager needs to consider tax consequences for the investor when making investment decisions.

Tax-loss harvesting, which we defined earlier as deferring the realization of gains and realizing capital losses early, allows investors to accumulate gains on a pretax basis. The deferral of taxes increases the present value of investments to the investor.

EXAMPLE 7

Managing Taxable and Tax-Exempt Portfolios

A bond portfolio manager needs to raise €10,000,000 in cash to cover outflows in the portfolio she manages. To satisfy her cash demands, she considers one of two corporate bond positions for potential liquidation: Position A and Position B. For tax purposes, capital gains receive pass-through treatment; realized net capital gains in the underlying securities of a fund are treated as if distributed to investors in the year that they arise. Assume that the capital gains tax rate is 28% and the income tax rate for interest is 45%. Exhibit 9 provides relevant data for the two bond positions.

Exhibit 9 Selected Data for Two Bonds

	Position A	Position B
Current market value	€10,000,000	€10,000,000
Capital gain/loss	€1,000,000	–€1,000,000
Coupon rate	5.00%	5.00%
Remaining maturity	10 years	10 years
Income tax rate	45%	
Capital gains tax rate	28%	

The portfolio manager considers Position A to be slightly overvalued and Position B to be slightly undervalued. Assume that the two bond positions are identical with regard to all other relevant characteristics. How should the portfolio manager optimally liquidate bond positions if she manages a portfolio for:

1. tax-exempt investors?
2. taxable investors?

Solution to 1:

The taxation of capital gains and capital losses has minimal consequences to tax-exempt investors. Consistent with the portfolio manager's investment views, the portfolio manager would likely liquidate Position A, which she considers slightly overvalued rather than liquidating Position B, which she considers slightly undervalued.

Solution to 2:

All else equal, portfolio managers for taxable investors should have an incentive to defer capital gains taxes and realize capital losses early (tax-loss harvesting) so that losses can be used to offset current or future capital gains. Despite the

slight undervaluation of the position, the portfolio manager might want to liquidate Position B because of its embedded capital loss, which will result in a lower realized net capital gain being distributed to investors. This decision is based on the assumption that there are no other capital losses in the portfolio that can be used to offset other capital gains. Despite the slight overvaluation of Position A, its liquidation would be less desirable for a taxable investor because of the required capital gains tax.

SUMMARY

This reading describes the roles of fixed-income securities in an investment portfolio and introduces fixed-income portfolio management. Key points of the reading include the following:

- Fixed-income investments provide diversification benefits in a portfolio context. These benefits arise from the generally low correlations of fixed-income investments with other major asset classes such as equities.
- Fixed-income investments have regular cash flows, which is beneficial for the purposes of funding future liabilities.
- Floating-rate and inflation-linked bonds can be used to hedge inflation risk.
- Liability-based fixed-income mandates are managed to match or cover expected liability payments with future projected cash inflows.
- For liability-based fixed-income mandates, portfolio construction follows two main approaches—cash flow matching and duration matching—to match fixed-income assets with future liabilities.
- Cash flow matching is an immunization approach based on matching bond cash flows with liability payments.
- Duration matching is an immunization approach based on matching the duration of assets and liabilities.
- Hybrid forms of duration and cash flow matching include contingent immunization and horizon matching.
- Total return mandates are generally structured to either track or outperform a benchmark.
- Total return mandates can be classified into different approaches based on their target active return and active risk levels. Approaches range from pure indexing to enhanced indexing to active management.
- Liquidity is an important consideration in fixed-income portfolio management. Bonds are generally less liquid than equities, and liquidity varies greatly across sectors.
- Liquidity affects pricing in fixed-income markets because many bonds either do not trade or trade infrequently.
- Liquidity affects portfolio construction because there is a trade-off between liquidity and yield. Less liquid bonds have higher yields, all else being equal, and may be more desirable for buy-and-hold investors. Investors anticipating liquidity needs may forgo higher yields for more-liquid bonds.

- Fixed-income derivatives, as well as fixed-income exchange-traded funds and pooled investment vehicles, are often more liquid than their underlying bonds and provide investment managers with an alternative to trading in illiquid underlying bonds.
- When evaluating fixed-income investment strategies, it is important to consider expected returns and to understand the different components of expected returns.
- Decomposing expected fixed-income returns allows investors to understand the different sources of returns given expected changes in bond market conditions.
- A model for expected fixed-income returns can decompose them into the following components: yield income, rolldown return, expected change in price based on investor's views of yields and yield spreads, expected credit losses, and expected currency gains or losses.
- Leverage is the use of borrowed capital to increase the magnitude of portfolio positions. By using leverage, fixed-income portfolio managers may be able to increase portfolio returns relative to what they can achieve in unleveraged portfolios. The potential for increased returns, however, comes with increased risk.
- Methods for leveraging fixed-income portfolios include the use of futures contracts, swap agreements, structured financial instruments, repurchase agreements, and securities lending.
- Taxes can complicate investment decisions in fixed-income portfolio management. Complications result from the difference in taxation across investor types, countries, and income sources (interest income or capital gains).

REFERENCES

Chen, Y., W. Ferson, and H. Peters. 2010. "Measuring the Timing Ability and Performance of Bond Mutual Funds." *Journal of Financial Economics*, vol. 98, no. 1: 72–89.

Davidson, R.B. 1999. "Bond Management for Taxable Investors." Association for Investment Management and Research Conference Proceedings no. 2 (August): 59–68.

Fabozzi, F.J. 2005. *The Handbook of Fixed Income Securities*, 7th Edition. New York: McGraw-Hill.

Fong, H.G., and O.A. Vasicek. 1984. "A Risk Minimizing Strategy for Portfolio Immunization." *Journal of Finance*, vol. 39, no. 5 (December): 1541–1546.

Gorton, G., and A. Metrick. 2012. "Securitized Banking and the Run on Repo." *Journal of Financial Economics*, vol. 104, no. 3 (June): 425–451.

Hanke, B., and G. Seals. 2010. "Fixed-Income Analysis: Yield Curve Construction, Trading Strategies, and Risk Analysis." CFA Institute online course.

Ilmanen, A. 1995a. "Convexity Bias and the Yield Curve." *Understanding the Yield Curve: Part 5*. New York: Salomon Brothers.

Ilmanen, A. 1995b. "A Framework for Analyzing Yield Curve Trades." *Understanding the Yield Curve: Part 6*. New York: Salomon Brothers.

Ilmanen, A. 2011. *Expected Returns: An Investor's Guide to Harvesting Market Rewards*. Hoboken, NJ: John Wiley & Sons.

Kothari, S.P., and J. Shanken. 2004. "Asset Allocation with Inflation-Protected Bonds." *Financial Analysts Journal*, vol. 60, no. 1 (January–February): 54–70.

Leibowitz, M.L. 1986a. "The Dedicated Bond Portfolio in Pension Funds – Part I: Motivations and Basics." *Financial Analysts Journal*, vol. 42, no. 1 (January–February): 68–75.

Leibowitz, M. L. 1986b. "The Dedicated Bond Portfolio in Pension Funds – Part II: Immunization, Horizon Matching and Contingent Procedures." *Financial Analysts Journal*, vol. 42, no. 2 (March–April): 47–57.

Leibowitz, M., W. Krasker, and A. Nozari. 1990. "Spread Duration: A New Tool for Bond Management." *Journal of Portfolio Management*, vol. 16, no. 3 (Spring): 46–53.

Lin, H., J. Wang, and C. Wu. 2011. "Liquidity Risk and Expected Corporate Bond Returns." *Journal of Financial Economics*, vol. 99, no. 3: 628–650.

Redington, F.M. 1952. "Review of the Principles of Life Insurance Valuations." *Journal of the Institute of Actuaries*, vol. 78: 286–340.

Rogers, D. 2006. *Tax-Aware Investment Management: The Essential Guide*. New York: Bloomberg Press.

Roll, R. 2004. "Empirical TIPS." *Financial Analysts Journal*, vol. 60, no. 1 (January–February): 31–53.

Vazza, D., and N. Kraemer. 2016. "2015 Annual Global Corporate Default Study and Rating Transitions." *Standard & Poor's Ratings Services*, 2 May.

Wilcox, J., J. Horvitz, and D. diBartolomeo. 2006. *Investment Management for Taxable Private Investors*. Charlottesville, VA: Research Foundation of CFA Institute.

PRACTICE PROBLEMS

The following information relates to Questions 1–6

Cécile Perreaux is a junior analyst for an international wealth management firm. Her supervisor, Margit Daasvand, asks Perreaux to evaluate three fixed-income funds as part of the firm's global fixed-income offerings. Selected financial data for the funds Aschel, Permot, and Rosaiso are presented in Exhibit 1. In Perreaux's initial review, she assumes that there is no reinvestment income and that the yield curve remains unchanged.

Exhibit 1 Selected Data on Fixed-Income Funds

	Aschel	Permot	Rosaiso
Current average bond price	$117.00	$91.50	$94.60
Expected average bond price in one year (end of Year 1)	$114.00	$96.00	$97.00
Average modified duration	7.07	7.38	6.99
Average annual coupon payment	$3.63	$6.07	$6.36
Present value of portfolio's assets (millions)	$136.33	$68.50	$74.38
Bond type*			
Fixed-coupon bonds	95%	38%	62%
Floating-coupon bonds	2%	34%	17%
Inflation-linked bonds	3%	28%	21%
Quality*			
AAA	65%	15%	20%
BBB	35%	65%	50%
B	0%	20%	20%
Not rated	0%	0%	10%
Value of portfolio's equity (millions)	$94.33		
Value of borrowed funds (millions)	$42.00		
Borrowing rate	2.80%		
Return on invested funds	6.20%		

* Bond type and Quality are shown as a percentage of total for each fund.

After further review of the composition of each of the funds, Perreaux notes the following.

Note 1 Aschel is the only fund of the three that uses leverage.

Note 2 Rosaiso is the only fund of the three that holds a significant number of bonds with embedded options.

© 2017 CFA Institute. All rights reserved.

Daasvand asks Perreaux to analyze immunization approaches to liability-based mandates for a meeting with Villash Foundation. Villash Foundation is a tax-exempt client. Prior to the meeting, Perreaux identifies what she considers to be two key features of a cash flow–matching approach.

Feature 1	It requires no yield curve assumptions.
Feature 2	Cash flows come from coupons and liquidating bond portfolio positions.

Two years later, Daasvand learns that Villash Foundation needs $5,000,000 in cash to meet liabilities. She asks Perreaux to analyze two bonds for possible liquidation. Selected data on the two bonds are presented in Exhibit 2.

Exhibit 2 Selected Data for Bonds 1 and 2

	Bond 1	Bond 2
Current market value	$5,000,000	$5,000,000
Capital gain/loss	400,000	–400,000
Coupon rate	2.05%	2.05%
Remaining maturity	8 years	8 years
Investment view	Overvalued	Undervalued
Income tax rate	39%	
Capital gains tax rate	30%	

1 Based on Exhibit 1, which fund provides the highest level of protection against inflation for coupon payments?

A Aschel

B Permot

C Rosaiso

2 Based on Exhibit 1, the rolling yield of Aschel over a one-year investment horizon is *closest* to:

A –2.56%.

B 0.54%.

C 5.66%.

3 The levered portfolio return for Aschel is *closest* to:

A 7.25%.

B 7.71%.

C 8.96%.

4 Based on Note 2, Rosaiso is the only fund for which the expected change in price based on the investor's views of yields and yield spreads should be calculated using:

A convexity.

B modified duration.

C effective duration

5 Is Perreaux correct with respect to key features of cash flow matching?

A Yes.

B No, only Feature 1 is correct.

C No, only Feature 2 is correct.

6 Based on Exhibit 2, the optimal strategy to meet Villash Foundation's cash needs is the sale of:

A 100% of Bond 1.

B 100% of Bond 2.

C 50% of Bond 1 and 50% of Bond 2.

The following information relates to Questions 7–12

Celia Deveraux is chief investment officer for the Topanga Investors Fund, which invests in equities and fixed income. The clients in the fund are all taxable investors. The fixed-income allocation includes a domestic (US) bond portfolio and an externally managed global bond portfolio.

The domestic bond portfolio has a total return mandate, which specifies a long-term return objective of 25 basis points (bps) over the benchmark index. Relative to the benchmark, small deviations in sector weightings are permitted, such risk factors as duration must closely match, and tracking error is expected to be less than 50 bps per year.

The objectives for the domestic bond portfolio include the ability to fund future liabilities, protect interest income from short-term inflation, and minimize the correlation with the fund's equity portfolio. The correlation between the fund's domestic bond portfolio and equity portfolio is currently 0.14. Deveraux plans to reduce the fund's equity allocation and increase the allocation to the domestic bond portfolio. She reviews two possible investment strategies.

Strategy 1 Purchase AAA rated fixed-coupon corporate bonds with a modified duration of two years and a correlation coefficient with the equity portfolio of –0.15.

Strategy 2 Purchase US government agency floating-coupon bonds with a modified duration of one month and a correlation coefficient with the equity portfolio of –0.10.

Deveraux realizes that the fund's return may decrease if the equity allocation of the fund is reduced. Deveraux decides to liquidate $20 million of US Treasuries that are currently owned and to invest the proceeds in the US corporate bond sector. To fulfill this strategy, Deveraux asks Dan Foster, a newly hired analyst for the fund, to recommend Treasuries to sell and corporate bonds to purchase.

Foster recommends Treasuries from the existing portfolio that he believes are overvalued and will generate capital gains. Deveraux asks Foster why he chose only overvalued bonds with capital gains and did not include any bonds with capital losses. Foster responds with two statements.

Statement 1 Taxable investors should prioritize selling overvalued bonds and always sell them before selling bonds that are viewed as fairly valued or undervalued.

Statement 2 Taxable investors should never intentionally realize capital losses.

Regarding the purchase of corporate bonds, Foster collects relevant data, which are presented in Exhibit 1.

Exhibit 1 Selected Data on Three US Corporate Bonds

Bond Characteristics	Bond 1	Bond 2	Bond 3
Credit quality	AA	AA	A
Issue size ($ millions)	100	75	75
Maturity (years)	5	7	7
Total issuance outstanding ($ millions)	1,000	1,500	1,000
Months since issuance	New issue	3	6

Deveraux and Foster review the total expected 12-month return (assuming no reinvestment income) for the global bond portfolio. Selected financial data are presented in Exhibit 2.

Exhibit 2 Selected Data on Global Bond Portfolio

Notional principal of portfolio (in millions)	€200
Average bond coupon payment (per €100 par value)	€2.25
Coupon frequency	Annual
Current average bond price	€98.45
Expected average bond price in one year (assuming an unchanged yield curve)	€98.62
Average bond convexity	0.22
Average bond modified duration	5.19
Expected average yield and yield spread change	0.15%
Expected credit losses	0.13%
Expected currency gains (€ appreciation vs. $)	0.65%

Deveraux contemplates adding a new manager to the global bond portfolio. She reviews three proposals and determines that each manager uses the same index as its benchmark but pursues a different total return approach, as presented in Exhibit 3.

Exhibit 3 New Manager Proposals Fixed-Income Portfolio Characteristics

Sector Weights (%)	Manager A	Manager B	Manager C	Index
Government	53.5	52.5	47.8	54.1
Agency/quasi-agency	16.2	16.4	13.4	16.0

(continued)

Exhibit 3 (Continued)

Sector Weights (%)	Manager A	Manager B	Manager C	Index
Corporate	20.0	22.2	25.1	19.8
MBS	10.3	8.9	13.7	10.1

Risk and Return Characteristics	Manager A	Manager B	Manager C	Index
Average maturity (years)	7.63	7.84	8.55	7.56
Modified duration (years)	5.23	5.25	6.16	5.22
Average yield (%)	1.98	2.08	2.12	1.99
Turnover (%)	207	220	290	205

7 Which approach to its total return mandate is the fund's domestic bond portfolio *most likely* to use?

A Pure indexing

B Enhanced indexing

C Active management

8 Strategy 2 is *most likely* preferred to Strategy 1 for meeting the objective of:

A protecting inflation.

B funding future liabilities.

C minimizing the correlation of the fund's domestic bond portfolio and equity portfolio.

9 Are Foster's statements to Deveraux supporting Foster's choice of bonds to sell correct?

A Only Statement 1 is correct.

B Only Statement 2 is correct.

C Neither Statement 1 nor Statement 2 is correct.

10 Based on Exhibit 1, which bond *most likely* has the highest liquidity premium?

A Bond 1

B Bond 2

C Bond 3

11 Based on Exhibit 2, the total expected return of the fund's global bond portfolio is *closest* to:

A 0.90%.

B 2.20%.

C 3.76%.

12 Based on Exhibit 3, which manager is *most likely* to have an active management total return mandate?

A Manager A

B Manager B

C Manager C

SOLUTIONS

1 B is correct. Permot has the highest percentage of floating-coupon bonds and inflation-linked bonds. Bonds with floating coupons protect interest income from inflation because the reference rate should adjust for inflation. Inflation-linked bonds protect against inflation by paying a return that is directly linked to an index of consumer prices and adjusting the principal for inflation. Inflation-linked bonds protect both coupon and principal payments against inflation.

The level of inflation protection for coupons = % portfolio in floating-coupon bonds + % portfolio in inflation-linked bonds:

Aschel = 2% + 3% = 5%

Permot = 34% + 28% = 62%

Rosaiso = 17% + 21% = 38%

Thus, Permot has the highest level of inflation protection with 62% of its portfolio in floating-coupon and inflation-linked bonds.

2 B is correct. The rolling yield is the sum of the yield income and the rolldown return. Yield income is the sum of the bond's annual current yield and interest on reinvestment income. Perreaux assumes that there is no reinvestment income for any of the three funds, and the yield income for Aschel will be calculated as follows:

Yield income = Annual average coupon payment/Current bond price
= \$3.63/\$117.00
= 0.0310, or 3.10%.

The rolldown return is equal to the bond's percentage price change assuming an unchanged yield curve over the horizon period. The rolldown return will be calculated as follows:

$$\text{Rolldown return} = \frac{\left(\text{Bond price}_{\text{End-of-horizon period}} - \text{Bond price}_{\text{Beginning-of-horizon period}}\right)}{\text{Bond price}_{\text{Beginning-of-horizon period}}}$$
$$= \frac{(\$114.00 - \$117.00)}{\$117.00}$$
$$= -0.0256, \text{ or } -2.56\%$$

Rolling yield = Yield income + Rolldown return = 3.10% – 2.56% = 0.54%

3 B is correct. The return for Aschel is 7.71%, calculated as follows.

$$r_p = \frac{\left(r_l \times (V_E + V_B) - V_B \times r_B\right)}{V_E}$$
$$= r_l + \frac{V_B}{V_E}(r_l - r_B)$$
$$= 6.20\% + \frac{\$42.00 \text{ million}}{\$94.33 \text{ million}}(6.20\% - 2.80\%)$$
$$= 7.71\%$$

4 C is correct. Rosaiso is the only fund that holds bonds with embedded options. Effective duration should be used for bonds with embedded options. For bonds with embedded options, the duration and convexity measures used to calculate the expected change in price based on the investors's views of yields and yield spreads are effective duration and effective convexity. For bonds without embedded options, convexity and modified duration are used in this calculation.

5 B is correct. Cash flow matching has no yield curve or interest rate assumptions. With this immunization approach, cash flows come from coupon and principal repayments that are expected to match and offset liability cash flows. Because bond cash inflows are scheduled to coincide with liability cash payouts, there is no need for reinvestment of cash flows. Thus, cash flow matching is not affected by interest rate movements. Cash flows coming from coupons and liquidating bond portfolio positions is a key feature of a duration-matching approach.

6 A is correct. The optimal strategy for Villash is the sale of 100% of Bond 1, which Perreaux considers to be overvalued. Because Villash is a tax-exempt foundation, tax considerations are not relevant and Perreaux's investment views drive her trading recommendations.

7 B is correct. The domestic bond portfolio's return objective is to modestly outperform the benchmark. Its risk factors, such as duration, are to closely match the benchmark. Small deviations in sector weights are allowed, and tracking error should be less than 50 bps year. These features are typical of enhanced indexing.

8 A is correct. Floating-coupon bonds provide inflation protection for the interest income because the reference rate should adjust for inflation. The purchase of fixed-coupon bonds as outlined in Strategy 1 provides no protection against inflation for either interest or principal. Strategy 1 would instead be superior to Strategy 2 in funding future liabilities (better predictability as to the amount of cash flows) and reducing the correlation between the fund's domestic bond portfolio and equity portfolio (better diversification).

9 C is correct. Since the fund's clients are taxable investors, there is value in harvesting tax losses. These losses can be used to offset capital gains within the fund that will otherwise be distributed to the clients and cause them higher tax payments, which decreases the total value of the investment to clients. The fund has to consider the overall value of the investment to its clients, including taxes, which may result in the sale of bonds that are not viewed as overvalued. Tax-exempt investors' decisions are driven by their investment views without regard to offsetting gains and losses for tax purposes.

10 C is correct. Bond 3 is most likely to be the least liquid of the three bonds presented in Exhibit 2 and will thus most likely require the highest liquidity premium. Low credit ratings, longer time since issuance, smaller issuance size, smaller issuance outstanding, and longer time to maturity typically are associated with a lower liquidity (and thus a higher liquidity premium). Bond 3 has the lowest credit quality and the longest time since issuance of the three bonds. Bond 3 also has a smaller issue size and longer time to maturity than Bond 1. The total issuance outstanding for Bond 3 is smaller than that of Bond 2 and equal to that of Bond 1.

11 B is correct. The total expected return is calculated as:

Total expected return = Rolling yield + E(Change in price based on investor's yield and yield spread view) – E(Credit losses) + E(Currency gains or losses)

Rolling yield = Yield income + Rolldown return

Return Component	Formula	Calculation
Yield income	Annual coupon payment/Current bond price	€2.25/€98.45 = 2.29%
+ Rolldown return	$\frac{(\text{Bond price}_{\text{End-of-horizon period}} - \text{Bond price}_{\text{Beginning-of-horizon period}})}{\text{Bond price}_{\text{Beginning-of-horizon period}}}$	(€98.62 – €98.45)/ €98.45 = 0.17%
= Rolling yield	Yield income + Rolldown return	2.29% + 0.17% = 2.46%
+ E(Change in price based on investor's yield and yield spread view)	[–MD × ΔYield] + [½ × Convexity × (Yield)^2]	[–5.19 × 0.0015] + [½ × 0.22 × (0.0015)^2] = –0.78%
– E(Credit losses)	Given	–0.13%
+ E(Currency gains or losses)	Given	0.65%
= Total expected return		**2.20%**

12 C is correct. The sector weights, risk and return characteristics, and turnover for Manager C differ significantly from those of the index, which is typical of an active management mandate. In particular, Manager C's modified duration of 6.16 represents a much larger deviation from the benchmark index modified duration of 5.22 than that of the other managers, which is a characteristic unique to an active management mandate.

CUSTOMER SERVICE

68

READING

22

Liability-Driven and Index-Based Strategies

by James F. Adams, PhD, CFA, and Donald J. Smith, PhD

James F. Adams, PhD, CFA, is at J.P. Morgan (USA). Donald J. Smith, PhD, is at Boston University Questrom School of Business (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe liability-driven investing;
☐	**b.** evaluate strategies for managing a single liability;
☐	**c.** compare strategies for a single liability and for multiple liabilities, including alternative means of implementation;
☐	**d.** evaluate liability-based strategies under various interest rate scenarios and select a strategy to achieve a portfolio's objectives;
☐	**e.** explain risks associated with managing a portfolio against a liability structure;
☐	**f.** discuss bond indexes and the challenges of managing a fixed-income portfolio to mimic the characteristics of a bond index;
☐	**g.** compare alternative methods for establishing bond market exposure passively;
☐	**h.** discuss criteria for selecting a benchmark and justify the selection of a benchmark;
☐	**i.** describe construction, benefits, limitations, and risk–return characteristics of a laddered bond portfolio.

INTRODUCTION

1

Fixed-income instruments make up nearly three-quarters of all global financial assets available to investors, so it is not surprising that bonds are a critical component of most investment portfolios. This reading focuses on structured and passive total return fixed-income investment strategies. "Passive" does not necessarily mean "buy

James F. Adams is a contributing author and his contributions solely represent his views and can in no way be taken to reflect the views of JPMorgan Chase & Co.

© 2017 CFA Institute. All rights reserved.

and hold" because the primary strategies discussed—immunization and indexation—can entail frequent rebalancing of the bond portfolio. "Passive" stands in contrast to "active" fixed-income strategies that are based on the asset manager's particular view on interest rate and credit market conditions.

Sections 2 through 6 address how to best structure a fixed-income portfolio when considering both the asset and liability sides of the investor's balance sheet. It is first important to have a thorough understanding of both the timing and relative certainty of future financial obligations. Because it is rare to find a bond investment whose characteristics perfectly match one's obligations, we introduce the idea of structuring a bond portfolio to match the future cash flows of one or more liabilities that have bond-like characteristics. Asset–liability management (ALM) strategies are based on the concept that investors incorporate both rate-sensitive assets and liabilities into the portfolio decision-making process. When the liabilities are given and assets are managed, liability-driven investing (LDI) may be used to ensure adequate funding for an insurance portfolio, a pension plan, or an individual's budget after retirement.[1] The techniques and risks associated with LDI are introduced using a single liability, and then expanded to cover both cash flow and duration matching techniques and multiple liabilities. This strategy, known as immunization, may be viewed simply as a special case of interest rate hedging. It is important to note that when funds exceed a predetermined threshold, investors can also use interest rate derivatives as a tool to manage their liabilities in addition to choosing a specific asset portfolio to achieve the management of their liabilities. This contingent form of immunization involves active management above a pre-specified funding threshold while retaining a more passive approach at lower funding levels. Section 5 reviews these concepts in detail using the example of a defined benefit pension plan. Section 6 reviews risks associated with these strategies, such as model risk and measurement risk.

Investors often use an index-based investment strategy to gain a broader exposure to fixed-income markets rather than tailoring investments to match a specific liability profile. Sections 7 through 9 cover this approach. Advantages of index-based investing include greater diversification and lower cost when compared with active management. That said, the depth and breadth of bond markets make both creating and tracking an index more challenging than in the equity markets. Fixed-income managers face a variety of alternatives in matching a bond index, from full replication to enhanced indexing using primary risk factors. We describe how portfolio managers and investors in general can gain fixed-income exposure through mutual funds or exchange-traded funds, as well as via synthetic means. Given the wide variety of fixed-income instruments available, it is critical to select a benchmark that is most relevant to a specific investor based on factors such as the targeted duration profile and risk appetite. In the area of private wealth management, establishing a laddered portfolio of bonds is often an effective strategy to match an individual investor's duration and risk preferences. The final section discusses this approach.

2 LIABILITY-DRIVEN INVESTING

Let us start with the example of a 45-year-old investor who plans to retire at age 65 and would like to secure a stable stream of income thereafter. It is quite probable that he currently has a diversified portfolio that includes bonds, equities, and possibly other asset classes. Our focus here is on the fixed-income portion of his overall portfolio. We will assume that the investor builds the bond portfolio and adds to it year by year.

1 In this reading, we use the terms "liability driven" and "liability based" interchangeably.

Upon retirement, he plans to sell the bonds and buy an annuity that will pay a fixed benefit for his remaining lifetime. This investor's initial 20-year time horizon is critical to identifying and measuring the impact on retirement income arising from future interest rate volatility, and it forms the initial frame of reference for understanding and dealing with interest rate risk.

More generally, the frame of reference is in the form of a balance sheet of rate-sensitive assets and liabilities. In the example of the 45-year-old investor, the asset is the growing bond portfolio and the liability is the present value of the annuity that the investor requires to satisfy the fixed lifetime benefit. Asset–liability management strategies consider both assets and liabilities in the portfolio decision-making process. ALM strategies became popular in the 1970s following the surge in oil prices and inflation. As rising inflation led to US interest rate volatility, bank managers began to implement ALM strategies in order to better balance the interest rate exposure of assets and liabilities. Before ALM, bank managers often made loans and deposit rate decisions independently, leading to unexpected gaps between the maturity profiles of loan assets and deposit liabilities. Managers realized that coordinated rate decisions and measurement of gaps between asset and liability maturities would reduce interest rate risk. These institutions set up asset–liability committees (ALCOs) to monitor and manage the maturity gaps and set rates in a coordinated manner. For example, if the bank acquired long-term fixed-rate assets, it would raise rates on long-term deposits so as to make such deposits attractive to savers, allowing the bank to maintain a balance in the maturities. The use of derivatives such as interest rate swaps to manage these maturity gaps through synthetic ALM strategies became widespread in the 1980s.

Liability-driven investing (LDI) and asset-driven liabilities (ADL) are special cases of ALM. The key difference is that with ADL, the assets are given and the liabilities are structured to manage interest rate risk; whereas with LDI, the liabilities are given and the assets are managed. As an example of LDI, a life insurance company acquires a liability portfolio based on the insurance policies underwritten by its sales force. Another example involves the future employee benefits promised by a defined benefit pension plan, which create a portfolio of rate-sensitive liabilities. In each circumstance, the liabilities are defined and result from routine business and financial management decisions. The present value of those liabilities depends on current interest rates. A life insurance or pension manager will use the estimated interest rate sensitivity of plan liabilities as a starting point when making investment portfolio decisions. This process often requires building a model for the liabilities, as discussed in Section 5 of this reading.

With ADL, the asset side of the balance sheet results from a company's underlying businesses, and the debt manager seeks a liability structure to reduce interest rate risk. One example might be a leasing company with short-term contracts that chooses to finance itself with short-term debt. The company is aiming to match the maturities of its assets and liabilities to minimize risk. Alternatively, a manufacturing company might identify that its operating revenues are highly correlated with the business cycle. Monetary policy is typically managed so there is positive correlation between interest rates and the business cycle. Central banks lower policy rates when the economy is weak and raise them when it is strong. Therefore, this company has a natural preference for variable-rate liabilities so that operating revenue and interest expense rise and fall together.[2]

An LDI strategy starts with analyzing the size and timing of the entity's liabilities. Exhibit 1 shows a classification scheme for this analysis.[3]

2 See Adams and Smith (2013) for further examples and the use of interest rate swaps to transform fixed-rate debt into a synthetic-floating rate liability.

3 This classification scheme is taken from Fabozzi (2013).

Exhibit 1 Classification of Liabilities

Liability Type	Amount of Cash Outlay	Timing of Cash Outlay
I	Known	Known
II	Known	Uncertain
III	Uncertain	Known
IV	Uncertain	Uncertain

The same scheme also applies to financial assets, but our focus here is on liabilities and on LDI, which is much more common than ADL. Type I liabilities arise from financial contracts that specify certain amounts due on scheduled future dates. An example is a traditional fixed-income bond having no embedded options. How much one pays (or receives) in coupon interest and principal redemption, as well as the timing of the payments, are known in advance. The next two sections assume Type I liabilities, first for only a single payment and then for multiple bonds. An advantage to knowing the size and timing of cash flows is that yield duration statistics—that is, Macaulay duration, modified duration, money duration, and the present value of a basis point (PVBP)—can be used to measure the interest rate sensitivity of the liabilities.

Type II liabilities have known amounts, but the timing of those payments is uncertain. Examples of this type of liability are callable and putable bonds. The call price payable upon exercise of the option is known in advance, but when or if the bond will be called is uncertain. Similarly, the issuer of a putable bond does not know when or if the investor will exercise the option. Another example is a term life insurance policy. Although the timing of the insured's death is unknown, a life insurance company holding a large portfolio of policies can benefit from the "law of large numbers." This means that the insurance company can use actuarial science to predict, on average, the amount of total liabilities due for each year and so can gain a very good sense of the amount of cash flow it will have to pay out in a given year.

Type III liabilities have known payment dates but an uncertain amount. A floating-rate note is an obvious example because the interest payments depend on future money market rates. Moreover, some structured notes have principal redemption amounts tied to a commodity price or interest rate index. Inflation-indexed bonds issued by many governments are another example. In the United States, the US Treasury issues Treasury inflation-protected securities (TIPS). The principal redemption amount is adjusted for the changes in the Consumer Price Index realized over the security's lifetime, making interest and principal payment amounts uncertain.

Type IV liabilities present the most difficult setting for an LDI strategy because both the amount and timing of the future obligations are uncertain. A property and casualty insurance company offers a good example. Although the amount and timing of some claims might follow a known pattern (for instance, automobile insurance), others such as damages from catastrophic weather events (e.g., tornados, cyclones, and floods) are inherently difficult to predict.

With Types II, III, and IV liabilities, a curve duration statistic known as effective duration is needed to estimate interest rate sensitivity.[4] This statistic is calculated using a model for the uncertain amount and/or timing of the cash flows and an initial assumption about the yield curve. Then the yield curve is shifted up and down to obtain

4 In this reading, we discuss only the use of yield and curve duration statistics for a fixed-income bond. In academic literature, duration is often calculated by discounting each cash flow with the spot (or zero-coupon) rate corresponding with the date. The resulting duration statistic is known as Fisher–Weil duration. Although theoretically correct, it is difficult to calculate in practice because of the lack of observable spot rates for risky bonds.

new estimates for the present value of the liabilities. We demonstrate this process in Section 5 for the sponsor of a defined benefit pension plan, which is another example of an entity with Type IV liabilities.

EXAMPLE 1

Modern Mortgage, a savings bank, decides to establish an ALCO to improve risk management and coordination of its loan and deposit rate-setting processes. Modern's primary assets are long-term, fixed-rate, monthly payment, fully amortizing residential mortgage loans. The mortgage loans are prime quality and have loan-to-value ratios that average 80%. The loans are pre-payable at par value by the homeowners at no fee. Modern also holds a portfolio of non-callable, fixed-income government bonds (considered free of default risk) of varying maturities to manage its liquidity needs. The primary liabilities are demand and time deposits that are fully guaranteed by a government deposit insurance fund. The demand deposits are redeemable by check or debit card. The time deposits have fixed rates and maturities ranging from 90 days to three years and are redeemable before maturity at a small fee. The banking-sector regulator in the country in which Modern operates has introduced a new capital requirement for savings banks. In accordance with the requirement, contingent convertible long-term bonds are issued by the savings bank and sold to institutional investors. The key feature is that if defaults on the mortgage loans reach a certain level or the savings bank's capital ratio drops below a certain level, as determined by the regulator, the bonds convert to equity at a specified price per share.

As a first step, the ALCO needs to identify the types of assets and liabilities that comprise its balance sheet using the classification scheme in Exhibit 1. Type I has certain amounts and dates for its cash flows; Type II has known amounts but uncertain dates; Type III has specified dates but unknown amounts; and Type IV has uncertain amounts and dates.

Specify and explain the classification scheme for the following:

1. Residential mortgage loans
2. Government bonds
3. Demand and time deposits
4. Contingent convertible bonds

Solution to 1:

Residential mortgage loans are Type IV assets to the savings bank. The timing of interest and principal cash flows is uncertain because of the prepayment option held by the homeowner. This type of call option is complex. Homeowners might elect to prepay for many reasons, including sale of the property as well as the opportunity to refinance if interest rates come down. Therefore, a prepayment model is needed to project the timing of future cash flows. Default risk also affects the projected amount of the cash flow for each date. Even if the *average* loan-to-value ratio is 80%, indicating high-quality mortgages, some loans could have higher ratios and be more subject to default, especially if home prices decline.

Solution to 2:

Fixed-rate government bonds are Type I assets because the coupon and principal payment dates and amounts are determined at issuance.

Solution to 3:

Demand and time deposits are Type II liabilities from the savings bank's perspective. The deposit amounts are known, but the depositor can redeem the deposits prior to maturity, creating uncertainty about timing.

Solution to 4:

The contingent convertible bonds are Type IV liabilities. The presence of the conversion option makes both the amount and timing of cash flows uncertain.

3 INTEREST RATE IMMUNIZATION—MANAGING THE INTEREST RATE RISK OF A SINGLE LIABILITY

Liability-driven investing in most circumstances is used to manage the interest rate risk on multiple liabilities. In this section, we focus on only a single liability to demonstrate the techniques and risks of the classic investment strategy known as interest rate **immunization**.[5] Immunization is the process of structuring and managing a fixed-income bond portfolio to minimize the variance in the realized rate of return over a known time horizon.[6] This variance arises from the volatility of future interest rates. Default risk is neglected at this point because the portfolio bonds are assumed to have default probabilities that approach zero.

The most obvious way to immunize the interest rate risk on a single liability is to buy a zero-coupon bond that matures on the obligation's due date. The bond's face value matches the liability amount. There is no cash flow reinvestment risk because there are no coupon payments to reinvest, and there is no price risk because the bond is held to maturity. Any interest rate volatility over the bond's lifetime is irrelevant in terms of the asset's ability to pay off the liability. The problem is that in many financial markets, zero-coupon bonds are not available. Nevertheless, the perfect immunization provided by a zero-coupon bond sets a standard to measure the performance of immunizing strategies using coupon-bearing bonds.

Exhibit 2 illustrates the connection between immunization and the duration of a traditional coupon-bearing fixed-income bond.

5 This section is based on Smith (2014, ch. 9–10).

6 The British actuary F.M. Redington coined the term "immunization" in his article, "Review of the Principles of Life-Office Valuations," *Journal of the Institute of Actuaries*, 1952.

Exhibit 2 Interest Rate Immunization with a Single Fixed-Income Bond

Assume that the bond is currently priced at par value. Then, an instantaneous, one-time, upward shift occurs in the yield curve. The bond's value falls, as shown in the upper panel. That drop in value is estimated by the money duration of the bond. The money duration is the bond's modified duration statistic multiplied by the price. Subsequently, the bond price will be "pulled to par" as the maturity date nears (assuming no default, of course). But there is another factor at work. Assuming that interest rates remain higher, the future value of reinvested coupon payments goes up. It is a rising line as more and more payments are received and reinvested at the higher interest rates.

The key detail to note in Exhibit 2 is that at some point in time, the two effects—the price effect and the coupon reinvestment effect—cancel each other. The lower panel shows the same cancellation for an immediate downward shift in interest rates. The remarkable result is that this point in time turns out to be the bond's Macaulay duration (for a zero-coupon bond, its Macaulay duration is its maturity). Therefore, an investor having an investment horizon equal to the bond's Macaulay duration is effectively protected, or immunized, from interest rate risk in that price, and coupon reinvestment effects offset for either higher or lower rates.

A numerical example is useful to show that the strategy of matching the Macaulay duration to the investment horizon works for a bond portfolio as well as for an individual security. Suppose that some entity has a single liability of EUR 250 million due 15 February 2023. The current date is 15 February 2017, so the investment horizon is six years. The asset manager for the entity seeks to build a three-bond portfolio to earn a rate of return sufficient to pay off the obligation.

Exhibit 3 reports the prices, yields, risk statistics (Macaulay duration and convexity), and par values for the chosen portfolio. The portfolio's current market value is EUR 200,052,250 (= EUR 47,117,500 + EUR 97,056,750 + EUR 55,878,000). The semi-annual coupon payments on the bonds occur on 15 February and 15 August of each year. The price is per 100 of par value, and the yield to maturity is on a street-convention semi-annual bond basis (meaning an annual percentage rate having a periodicity of

two). Both the Macaulay duration and the convexity are annualized. (Note that in practice, some bond data vendors [such as Bloomberg] report the convexity statistic divided by 100.)

Exhibit 3 The Bond Portfolio to Immunize the Single Liability

	2.5-Year Bond	7-Year Bond	10-Year Bond
Coupon rate	1.50%	3.25%	5.00%
Maturity date	15 August 2019	15 February 2024	15 February 2027
Price	100.25	99.75	100.50
Yield to maturity	1.3979%	3.2903%	4.9360%
Par value	47,000,000	97,300,000	55,600,000
Market value	47,117,500	97,056,750	55,878,000
Macaulay duration	2.463	6.316	7.995
Convexity	7.253	44.257	73.747
Allocation	23.55%	48.52%	27.93%

Exhibit 4 shows the cash flows and calculations used to obtain the relevant portfolio statistics. The third column aggregates the coupon and principal payments received for each date from the three bonds.

Exhibit 4 Portfolio Statistics

Time	Date	Cash Flow	PV of Cash Flow	Weight	Time × Weight	Dispersion	Convexity
0	15-Feb-17	–200,052,250					
1	15-Aug-17	3,323,625	3,262,282	0.0163	0.0163	1.9735	0.0326
2	15-Feb-18	3,323,625	3,202,071	0.0160	0.0320	1.6009	0.0960
3	15-Aug-18	3,323,625	3,142,971	0.0157	0.0471	1.2728	0.1885
4	15-Feb-19	3,323,625	3,084,962	0.0154	0.0617	0.9871	0.3084
5	15-Aug-19	50,323,625	45,847,871	0.2292	1.1459	11.2324	6.8754
6	15-Feb-20	2,971,125	2,656,915	0.0133	0.0797	0.4782	0.5578
7	15-Aug-20	2,971,125	2,607,877	0.0130	0.0913	0.3260	0.7300
8	15-Feb-21	2,971,125	2,559,744	0.0128	0.1024	0.2048	0.9213
9	15-Aug-21	2,971,125	2,512,500	0.0126	0.1130	0.1131	1.1303
10	15-Feb-22	2,971,125	2,466,127	0.0123	0.1233	0.0493	1.3560
11	15-Aug-22	2,971,125	2,420,610	0.0121	0.1331	0.0121	1.5972
12	15-Feb-23	2,971,125	2,375,934	0.0119	0.1425	0.0000	1.8527
13	15-Aug-23	2,971,125	2,332,082	0.0117	0.1515	0.0116	2.1216
14	15-Feb-24	100,271,125	77,251,729	0.3862	5.4062	1.5434	81.0931
15	15-Aug-24	1,390,000	1,051,130	0.0053	0.0788	0.0473	1.2610
16	15-Feb-25	1,390,000	1,031,730	0.0052	0.0825	0.0825	1.4028
17	15-Aug-25	1,390,000	1,012,688	0.0051	0.0861	0.1265	1.5490
18	15-Feb-26	1,390,000	993,997	0.0050	0.0894	0.1788	1.6993
19	15-Aug-26	1,390,000	975,651	0.0049	0.0927	0.2389	1.8533
20	15-Feb-27	56,990,000	39,263,380	0.1963	3.9253	12.5585	82.4316
			200,052,250	1.0000	12.0008	33.0378	189.0580

For instance, EUR 3,323,625 is the sum of the coupon payments for the first four dates:

(1.50% × 0.5 × EUR 47,000,000) + (3.25% × 0.5 × EUR 97,300,000) + (5.00% × 0.5 × EUR 55,600,000) = EUR 352,500 + EUR 1,581,125 + EUR 1,390,000 = EUR 3,323,625

On 15 August 2019, the principal of EUR 47,000,000 is redeemed so that the total cash flow is EUR 50,323,625. The next eight cash flows represent the coupon payments on the second and third bonds, and so forth.

The internal rate of return on the cash flows in column 3 for the 20 semi-annual periods, including the portfolio's initial market value on 15 February 2017, is 1.8804%. Annualized on a semi-annual bond basis, the portfolio's cash flow yield is 3.7608% (= 2 × 1.8804%). This yield is significantly higher than the market value weighted average of the individual bond yields presented in Exhibit 3, which equals 3.3043%.

(1.3979% × 0.2355) + (3.2903% × 0.4852) + (4.9360% × 0.2793) = 3.3043%

This difference arises because of the steepness in the yield curve. The key point is that the goal of the immunization strategy is to achieve a rate of return close to 3.76%, not 3.30%.

The fourth column in Exhibit 4 shows the present values for each of the aggregate cash flows, calculated using the internal rate of return per period (1.8804%) as the discount rate. For example, the combined payment of EUR 100,271,125 due on 15 February 2024 has a present value of EUR 77,251,729. [*Note: Calculations in this reading are carried out on a spreadsheet that preserves precision. For readability and to avoid clutter, the exhibits and text report rounded results. For example, the following calculation gives 77,251,498 with the numbers shown on the left hand-side, but it gives 77,251,729, the amount shown on the right hand-side, when the precise semi-annual cash flow yield, 1.0188037819%, is used.*]

$$\frac{100{,}271{,}125}{(1.018804)^{14}} = 77{,}251{,}729$$

The sum of the present values in column 4 is EUR 200,052,250, the current market value for the bond portfolio.

The sixth column is used to obtain the portfolio's Macaulay duration. This duration statistic is the weighted average of the times to the receipt of cash flow, whereby the share of total market value for each date is the weight. Column 5 shows the weights, which are the PV of each cash flow divided by the total PV of EUR 200,052,250. The times to receipt of cash flow (the times from column 1) are multiplied by the weights and then summed. For example, the contribution to total portfolio duration for the second cash flow on 15 February 2018 is 0.0320 (= 2 × 0.0160). The sum of column 6 is 12.0008. That is the Macaulay duration for the portfolio in terms of semi-annual periods. Annualized, it is 6.0004 (= 12.0008/2). It is now clear why the asset manager for the entity chose this portfolio: The portfolio Macaulay duration matches the investment horizon of six years.

In practice, it is common to estimate the portfolio duration using the market value weighted average of the individual durations for each bond.[7] Exhibit 3 shows those individual durations and the allocation percentages for each bond. The average Macaulay duration is (2.463 × 0.2355) + (6.316 × 0.4852) + (7.995 × 0.2793) = 5.8776.

7 Another, and more theoretically correct, way to obtain the portfolio duration would be to discount the cash flows using spot (or zero-coupon) rates. As mentioned in Footnote 4, this duration calculation is difficult to implement in practice.

The difference, as with the cash flow yield and the market value weighted average yield, arises because the yield curve is not flat. When the yield curve is upwardly sloped, average duration (5.8776) is less than the portfolio duration (6.0004). This difference in duration statistics is important because using the average duration in building the immunizing portfolio instead of the portfolio duration would introduce model risk to the strategy. Section 6 of this reading discusses model risk.

The sum of the seventh column in Exhibit 4 is the portfolio **dispersion** statistic. Whereas Macaulay duration is the weighted *average* of the times to receipt of cash flow, dispersion is the weighted *variance*. It measures the extent to which the payments are spread out around the duration. For example, the contribution to total portfolio dispersion for the fifth cash flow on 15 August 2019 is 11.2324: $(5 - 12.0008)^2 \times 0.2292 = 11.2324$.

This portfolio's dispersion is 33.0378 in terms of semi-annual periods. Annualized, it is 8.2594 (= 33.0378/4). The Macaulay duration statistic is annualized by dividing by the periodicity of the bonds (two payments per year); dispersion (and convexity, which follows) is annualized by dividing by the periodicity squared.

The portfolio convexity is calculated with the eighth column. It is the sum of the times to the receipt of cash flow, multiplied by those times plus one, multiplied by the shares of market value for each date (weight), and all divided by one plus the cash flow yield squared. For example, the contribution to the sum for the 14th payment on 15 February 2024 is 81.0931 (= 14 × 15 × 0.3862). The sum of the column is 189.0580. The convexity in semi-annual periods is 182.1437:

$$\frac{189.0580}{(1.018804)^2} = 182.1437$$

The annualized convexity for the portfolio is 45.5359 (= 182.1437/4). This result is slightly higher than the market value weighted average of the individual convexity statistics reported in Exhibit 3:

$$(7.253 \times 0.2355) + (44.257 \times 0.4852) + (73.747 \times 0.2793) = 43.7786$$

As with the average yield and duration, this difference results from the slope of the yield curve. The convexity statistic can be used to improve the estimate for the change in portfolio market value following a change in interest rates than is provided by duration alone. That is, convexity is the second-order effect, whereas duration is the first-order effect.

There is an interesting connection among the portfolio convexity, Macaulay duration, dispersion, and cash flow yield.[8]

$$\text{Convexity} = \frac{\text{Macaulay duration}^2 + \text{Macaulay duration} + \text{Dispersion}}{(1 + \text{Cash flow yield})^2} \quad (1)$$

In terms of semi-annual periods, the Macaulay duration for this portfolio is 12.0008, the dispersion is 33.0378, and the cash flow yield is 1.8804%.

$$\text{Convexity} = \frac{12.0008^2 + 12.0008 + 33.0378}{(1.018804)^2} = 182.1437$$

The portfolio dispersion and convexity statistics are used to assess the structural risk to the interest rate immunization strategy. Structural risk arises from the potential for shifts and twists to the yield curve. This risk is discussed later in this section.

Exhibit 5 demonstrates how matching the Macaulay duration for the portfolio to the investment horizon leads to interest rate immunization.

8 The derivation of Equation 1, as well as additional examples of calculating dispersion and convexity for fixed-income bonds, are included in Smith (2014).

Exhibit 5 Interest Rate Immunization

Time	Date	Cash Flow	Total Return at 3.7608%	Total Return at 2.7608%	Total Return at 4.7608%
0	15-Feb-17	–200,052,250			
1	15-Aug-17	3,323,625	4,079,520	3,864,613	4,305,237
2	15-Feb-18	3,323,625	4,004,225	3,811,992	4,205,138
3	15-Aug-18	3,323,625	3,930,319	3,760,088	4,107,366
4	15-Feb-19	3,323,625	3,857,777	3,708,891	4,011,868
5	15-Aug-19	50,323,625	57,333,230	55,392,367	59,332,093
6	15-Feb-20	2,971,125	3,322,498	3,225,856	3,421,542
7	15-Aug-20	2,971,125	3,261,175	3,181,932	3,341,989
8	15-Feb-21	2,971,125	3,200,984	3,138,607	3,264,286
9	15-Aug-21	2,971,125	3,141,904	3,095,871	3,188,390
10	15-Feb-22	2,971,125	3,083,914	3,053,718	3,114,258
11	15-Aug-22	2,971,125	3,026,994	3,012,138	3,041,850
12	15-Feb-23	2,971,125	2,971,125	2,971,125	2,971,125
13	15-Aug-23	2,971,125	2,916,287	2,930,670	2,902,045
14	15-Feb-24	100,271,125	96,603,888	97,559,123	95,662,614
15	15-Aug-24	1,390,000	1,314,446	1,333,991	1,295,282
16	15-Feb-25	1,390,000	1,290,186	1,315,827	1,265,166
17	15-Aug-25	1,390,000	1,266,373	1,297,911	1,235,750
18	15-Feb-26	1,390,000	1,242,999	1,280,238	1,207,018
19	15-Aug-26	1,390,000	1,220,058	1,262,806	1,178,955
20	15-Feb-27	56,990,000	49,099,099	51,070,094	47,213,270
			250,167,000	250,267,858	250,265,241

The fourth column shows the values of the cash flows as of the horizon date of 15 February 2023, assuming that the cash flow yield remains unchanged at 3.7608%. For instance, the future value of the EUR 3,323,625 in coupon payments received on 15 August 2017 is EUR 4,079,520.

$$3{,}323{,}625 \times \left(1 + \frac{0.037608}{2}\right)^{11} = 4{,}079{,}520$$

The value of the last cash flow for EUR 56,990,000 on 15 February 2027 is EUR 49,099,099 as of the horizon date of 15 February 2023.

$$\frac{56{,}990{,}000}{\left(1 + \frac{0.037608}{2}\right)^{8}} = 49{,}099{,}099$$

All of the payments received before the horizon date are reinvested at the cash flow yield. All of the payments received after the horizon date are sold at their discounted values. The sum of the fourth column is EUR 250,167,000, which is more than enough

to pay off the EUR 250 million liability. The six-year holding period rate of return (ROR), also called the horizon yield, is 3.7608%. It is based on the original market value and the total return and is the solution for ROR:

$$200{,}052{,}250 = \frac{250{,}167{,}000}{\left(1 + \frac{\text{ROR}}{2}\right)^{12}}, \text{ ROR} = 0.037608$$

The holding period rate of return equals the cash flow yield for the portfolio. This equivalence is the multi-bond version of the well-known result for a single bond: The realized rate of return matches the yield to maturity only if coupon payments are reinvested at that same yield and if the bond is held to maturity or sold at a point on the constant-yield price trajectory.

The fifth column in Exhibit 5 repeats the calculations for the assumption of an instantaneous, one-time, 100 bp drop in the cash flow yield on 15 February 2017. The future values of all cash flows received are now lower because they are reinvested at 2.7608% instead of 3.7608%. For example, the payment of EUR 50,323,625 on 15 August 2019, which contains the principal redemption on the 2.5-year bond, grows to only EUR 55,392,367.

$$50{,}323{,}625 \times \left(1 + \frac{0.027608}{2}\right)^{7} = 55{,}392{,}367$$

The value of the last cash flow is now higher because it is discounted at the lower cash flow yield.

$$\frac{56{,}990{,}000}{\left(1 + \frac{0.027608}{2}\right)^{8}} = 51{,}070{,}094$$

The important result is that the total return as of the horizon date is EUR 250,267,858, demonstrating that the cash flow reinvestment effect is balanced by the price effect, as illustrated for a single bond in Exhibit 2. The holding-period rate of return is 3.7676%.

$$200{,}052{,}250 = \frac{250{,}267{,}858}{\left(1 + \frac{\text{ROR}}{2}\right)^{12}}, \text{ ROR} = 0.037676$$

To complete the example, the sixth column reports the results for an instantaneous, one-time, 100 bp jump in the cash flow yield, up to 4.7608% from 3.7608%. In this case, the future values of the reinvested cash flows are higher and the discounted values of cash flows due after the horizon date are lower. Nevertheless, the total return of EUR 250,265,241 for the six-year investment horizon is enough to pay off the liability. The horizon yield is 3.7674%.

$$200{,}052{,}250 = \frac{250{,}265{,}241}{\left(1 + \frac{\text{ROR}}{2}\right)^{12}}, \text{ ROR} = 0.037674$$

This numerical exercise demonstrates interest rate immunization using a portfolio of fixed-income bonds. The total returns and holding period rates of return are virtually the same—in fact, slightly higher because of convexity—whether the cash flow yield goes up or down. Exhibit 4 is somewhat misleading, however, because it suggests that immunization is a buy-and-hold passive investment strategy. It suggests that the entity will (a) hold on the horizon date of 15 February 2023 the same positions in what then will be one-year, 3.25% and four-year, 5% bonds and (b) sell the bonds on that date. This suggestion is misleading because the portfolio must be frequently rebalanced to stay on its target duration. As time passes, the portfolio's Macaulay

duration changes but not in line with the change in the remainder of the investment horizon. For example, after five years, the investment horizon as of 15 February 2022 is just one remaining year. The portfolio Macaulay duration at that time needs to be 1.000. The asset manager will have had to execute some trades by then, substantially reducing the holdings in what is then the five-year, 5% bond.

Exhibit 6 offers another way to illustrate interest rate immunization. An immunization strategy is essentially "zero replication." We know that the perfect bond to lock in the six-year holding period rate of return is a six-year zero-coupon bond having a face value that matches the EUR 250 million liability. The idea is to originally structure and then manage over time a portfolio of coupon-bearing bonds that replicates the period-to-period performance of the zero-coupon bond. Therefore, immunization is essentially just an interest rate hedging strategy. As the yield on the zero-coupon bond rises and falls, there will be unrealized losses and gains. In Exhibit 6, this is illustrated by the zero-coupon bond's value moving below and above the constant-yield price trajectory. Two paths for the zero-coupon yield are presented: Path A for generally lower rates (and higher values) and Path B for higher rates (and lower values). Regardless, the market value of the zero-coupon bond will be "pulled to par" as maturity nears.

Exhibit 6 Interest Rate Immunization as Zero Replication

Immunizing with coupon-bearing bonds entails continuously matching the portfolio Macaulay duration with the Macaulay duration of the zero-coupon bond over time and as the yield curve shifts, even though the zero-coupon bond could be hypothetical and not exist in reality. Also, the bond portfolio's initial market value has to match or exceed the present value of the zero-coupon bond. The Macaulay duration of that, perhaps hypothetical, zero-coupon bond always matches the investment horizon. Immunization will be achieved if any ensuing change in the cash flow yield on the bond portfolio is equal to the change in the yield to maturity on the zero-coupon bond. That equivalence will ensure that the change in the bond portfolio's market value is close to the change in the market value of the zero-coupon bond. Therefore, at the end of the six-year investment horizon, the bond portfolio's market value should meet or exceed the face value of the zero-coupon bond, regardless of the path for interest rates over the six years.

The key assumption to achieve immunization is the statement that "any ensuing change in the cash flow yield on the bond portfolio is equal to the change in the yield to maturity on the zero-coupon bond." A *sufficient*, but not *necessary*, condition for that statement is a parallel (or shape-preserving) shift to the yield curve whereby all yields change by the same amount. *Sufficient* means that if the yield curve shift is

parallel, the change in the bond portfolio's cash flow yield will equal the change in yield to maturity of the zero-coupon bond, which is enough to ensure immunization. To achieve immunization, however, it is not *necessary* that the yield curve shifts in a parallel manner. That is, in some cases, the immunization property can prevail even with non-parallel yield curve movements such as an upward and steepening shift (sometimes called a "bear steepener"), an upward and flattening shift (a "bear flattener"), a downward and steepening shift (a "bull steepener"), or a downward and flattening shift (a "bull flattener").

Exhibit 7 demonstrates this observation. Panel A of Exhibit 7 presents three different upward yield curve shifts. The first is a parallel shift of 102.08 bps for each of the three bond yields. The second is a steepening shift of 72.19 bps for the 2.5-year bond, 94.96 bps for the 7-year bond, and 120.82 bps for the 10-year bond. The third is a flattening shift whereby the yields on the three bonds increase by 145.81 bps, 109.48 bps, and 79.59 bps, respectively. The key point is that each of these yield curve shifts results in the same 100 bp increase in the cash flow yield from 3.7608% to 4.7608%. Moreover, each shift in the yield curve produces virtually the same reduction in the portfolio's market value.

Panel B of Exhibit 7 shows the results for three downward shifts in the yield curve. The first is a parallel shift of 102.06 bps. The second and third are downward and steepening (–129.00 bps, –104.52 bps, and –92.00 bps for the 2.5-year, 7-year, and 10-year bonds) and downward and flattening (–55.76 bps, –86.32 bps, and –134.08 bps). Each shift results in the same 100 bp decrease in the cash flow yield from 3.7608% to 2.7608% and virtually the same increase in the market value of the portfolio.

Exhibit 7 Some Yield Curve Shifts That Achieve Interest Rate Immunization

Panel A Yield Curve Shift

	Change in 2.5-Year Yield	Change in 7-Year Yield	Change in 10-Year Yield	Change in Cash Flow Yield	Change in Market Value
Upward and parallel	+102.08 bps	+102.08 bps	+102.08 bps	+100 bps	–11,340,537
Upward and steepening	+72.19 bps	+94.96 bps	+120.82 bps	+100 bps	–11,340,195
Upward and flattening	+145.81 bps	+109.48 bps	+79.59 bps	+100 bps	–11,340,183

Panel B Yield Curve Shift

	Change in 2.5-Year Yield	Change in 7-Year Yield	Change in 10-Year Yield	Change in Cash Flow Yield	Change in Market Value
Downward and parallel	–102.06 bps	–102.06 bps	–102.06 bps	–100 bps	12,251,212
Downward and steepening	–129.00 bps	–104.52 bps	–92.00 bps	–100 bps	12,251,333
Downward and flattening	–55.76 bps	–86.32 bps	–134.08 bps	–100 bps	12,251,484

Notice that the interest rate immunization property shown in Exhibit 5 rests only on the change in the cash flow yield going up or down by 100 bps. It is not necessary to assume that the change in the value of the immunizing portfolio arises only from

a parallel shift in the yield curve. In the same manner, the immunization property illustrated in Exhibit 6 requires only that the change in the value of the immunizing portfolio, one that has a Macaulay duration matching the investment horizon, is close to the change in the value of the zero-coupon bond that provides perfect immunization. Exhibit 7 demonstrates that non-parallel as well as parallel shifts can satisfy those conditions. Of course, there are many other non-parallel shifts for which those conditions are not met.

In general, the interest rate risk to an immunization strategy is that the change in the cash flow yield on the portfolio is not the same as on the ideal zero-coupon bond. This difference can occur with twists to the shape of the yield curve, in addition to some non-parallel shifts.[9] Exhibit 8 portrays two such twists. To exaggerate the risk, assume that the immunizing portfolio has a "barbell" structure in that it is composed of half short-term bonds and half long-term bonds. The portfolio Macaulay duration for the barbell is six years. The zero-coupon bond that provides perfect immunization has a maturity (and Macaulay duration) also of six years.

Exhibit 8 Immunization Risk and Twists to the Yield Curve

A. Steepening Twist

B. Positive Butterfly Twist

9 In this reading, we distinguish "non-parallel shift" and "twist" to the yield curve. With a non-parallel shift, all yields rise or fall to varying degrees. With a twist to the yield curve, some yields rise while others fall.

The upper panel of Exhibit 8 shows a steepening twist to the yield curve. The twist is assumed to occur at the six-year point to indicate that the value of the zero-coupon bond does not change. Short-term yields go down and long-term yields go up by approximately the same amount. The value of the barbell portfolio goes down because the losses on the long-term positions exceed the gains on the short-term holdings as a result of the difference in duration between the holdings and the equivalence in the assumed changes in yield. Therefore, this portfolio does not track the value of the zero-coupon bond.

The lower panel of Exhibit 8 illustrates a dramatic twist in the shape of the yield curve. Short-term and long-term yields go up while the six-year yields go down. This type of twist is named a "positive butterfly." (In a "negative butterfly" twist, short-term and long-term yields go down and intermediate-term yields go up.) The immunizing portfolio decreases in value as its yields go up and the zero-coupon bond goes up in value. Again, the portfolio does not track the change in the value of the bond that provides perfect immunization. Fortunately for those entities that pursue interest rate immunization, these types of twists are rare. Most yield curve shifts are generally parallel, with some steepening and flattening, especially for maturities beyond a few years.

Exhibit 8 also illustrates how to reduce **structural risk** to an immunizing strategy. Structural risk arises from portfolio design, particularly the choice of the portfolio allocations. The risk is that yield curve twists and non-parallel shifts lead to changes in the cash flow yield that do not match the yield to maturity of the zero-coupon bond that provides for perfect immunization. Structural risk is reduced by minimizing the dispersion of the bond positions, going from a barbell design to more of a bullet portfolio that concentrates the component bonds' durations around the investment horizon. At the limit, a zero-coupon bond that matches the date of the single obligation has, by design, no structural risk.

Equation 1 indicates that minimizing portfolio dispersion is the same as minimizing the portfolio convexity for a given Macaulay duration and cash flow yield. An advantage to using convexity to measure the extent of structural risk is that the portfolio statistic can be approximated by the market value weighted average of the individual bonds' convexities. A problem with estimating portfolio dispersion using the dispersion statistics for individual bonds is that it can be misleading. Consider a portfolio of all zero-coupon bonds of varying maturities. Each individual bond has zero dispersion (because it has only one payment), so the market value weighted average is also zero. Clearly, the portfolio overall can have significant (non-zero) dispersion.

In summary, the characteristics of a bond portfolio structured to immunize a single liability are that it (1) has an initial market value that equals or exceeds the present value of the liability; (2) has a portfolio Macaulay duration that matches the liability's due date; and (3) minimizes the portfolio convexity statistic. This portfolio must be regularly rebalanced over the horizon to maintain the target duration, because the portfolio Macaulay duration changes as time passes and as yields change. The portfolio manager needs to weigh the trade-off between incurring transactions costs from rebalancing and allowing some duration gap. This and other risks to immunization—for instance, those arising from the use of interest rate derivatives to match the duration of assets to the investment horizon—are covered in Section 6.

EXAMPLE 2

An institutional client asks a fixed-income investment adviser to recommend a portfolio to immunize a single 10-year liability. It is understood that the chosen portfolio will need to be rebalanced over time to maintain its target duration. The adviser proposes two portfolios of coupon-bearing government bonds because zero-coupon bonds are not available. The portfolios have the same market value.

The institutional client's objective is to minimize the variance in the realized rate of return over the 10-year horizon. The two portfolios have the following risk and return statistics:

	Portfolio A	Portfolio B
Cash flow yield	7.64%	7.65%
Macaulay duration	9.98	10.01
Convexity	107.88	129.43

These statistics are based on aggregating the interest and principal cash flows for the bonds that constitute the portfolios; they are not market value weighted averages of the yields, durations, and convexities of the individual bonds. The cash flow yield is stated on a semi-annual bond basis, meaning an annual percentage rate having a periodicity of two; the Macaulay durations and convexities are annualized.

Indicate the portfolio that the investment adviser should recommend, and explain the reasoning.

Solution:

The adviser should recommend Portfolio A. First, notice that the cash flow yields of both portfolios are virtually the same and that both portfolios have Macaulay durations very close to 10, the horizon for the liability. It would be wrong and misleading to recommend Portfolio B because it has a "higher yield" and a "duration closer to the investment horizon of 10 years." In practical terms, a difference of 1 bp in yield is not likely to be significant, nor is the difference of 0.03 in annual duration.

Given the fact that the portfolio yields and durations are essentially the same, the choice depends on the difference in convexity. The difference between 129.43 and 107.88, however, is meaningful. In general, convexity is a desirable property of fixed-income bonds. All else being equal (meaning the same yield and duration), a more convex bond gains more if the yield goes down and loses less if the yield goes up than a less convex bond.

The client's objective, however, is to minimize the variance in the realized rate of return over the 10-year horizon. That objective indicates a conservative immunization strategy achieved by building the duration matching portfolio and minimizing the portfolio convexity. Such an approach minimizes the dispersion of cash flows around the Macaulay duration and makes the portfolio closer to the zero-coupon bond that would provide perfect immunization; see Equation 1.

The structural risk to the immunization strategy is the potential for non-parallel shifts and twists to the yield curve, which lead to changes in the cash flow yield that do not track the change in the yield on the zero-coupon bond. This risk is minimized by selecting the portfolio with the lower convexity (and dispersion of cash flows).

Note that default risk is neglected in this discussion because the portfolio consists of government bonds that presumably have default probabilities approaching zero.

4 INTEREST RATE IMMUNIZATION—MANAGING THE INTEREST RATE RISK OF MULTIPLE LIABILITIES

The principle of interest rate immunization applies to multiple liabilities in addition to a single liability. For now, we continue to assume that these are Type I cash flows in that the scheduled amounts and payment dates are known to the asset manager. In particular, we assume that the same three bonds from Exhibits 3 and 4, which were assets in the single-liability immunization, are now themselves liabilities to be immunized. This assumption allows us to use the same portfolio statistics as in the previous section. The entity in the examples that follow seeks to immunize the cash flows in column 3 (the cash flow column) of Exhibit 4 from Dates 1 through 20, and so needs to build a portfolio of assets that will allow it to pay those cash flows. The present value of the (now) corporate debt liabilities is EUR 200,052,250. As in Section 3, the cash flow yield is 3.76%; the Macaulay duration is 6.00; and the convexity is 45.54. We use the portfolio statistics rather than the market value weighted averages because they better summarize Type I liabilities.

In this section, we discuss several approaches to manage these liabilities:

- *Cash flow matching*, which entails building a dedicated portfolio of zero-coupon or fixed-income bonds to ensure that there are sufficient cash inflows to pay the scheduled cash outflows;
- *Duration matching*, which extends the ideas of the previous section to a portfolio of debt liabilities;
- *Derivatives overlay*, in particular using futures contracts on government bonds in the immunization strategy; and
- *Contingent immunization*, which allows for active bond portfolio management until a minimum threshold is reached and that threshold is identified by the interest rate immunization strategy.

4.1 Cash Flow Matching

A classic strategy to eliminate the interest rate risk arising from multiple liabilities is to build a dedicated asset portfolio of high-quality fixed-income bonds that, as closely as possible, matches the amount and timing of the scheduled cash outflows. "Dedicated" means that the bonds are placed in a held-to-maturity portfolio. A natural question is, if the entity has enough cash to build the dedicated bond portfolio, why not just use that cash to buy back and retire the liabilities? The answer is that the buyback strategy is difficult and costly to implement if the bonds are widely held by buy-and-hold institutional and retail investors. Most corporate bonds are rather illiquid, so buying them back on the open market is likely to drive up the purchase price. Cash flow matching can be a better use of the available cash assets.

A corporate finance motivation for cash flow matching is to improve the company's credit rating. The entity has sufficient cash assets to retire the debt liabilities, and dedicating the bonds effectively accomplishes that objective. Under some circumstances, a corporation might even be able to remove both the dedicated asset portfolio and the debt liabilities from its balance sheet through the process of **accounting defeasance**.

Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities, such as US Treasury notes, to repay the liability.[10]

Panel A in Exhibit 9 illustrates the dedicated cash flow matching asset portfolio. These assets could be zero-coupon bonds or traditional fixed-income securities. Panel B represents the amount and timing of the debt liabilities. The amounts come from the third column in Exhibit 4 and are the sum of the coupon and principal payments on the three debt securities.

Exhibit 9 Cash Flow Matching

A concern when implementing this strategy is the *cash-in-advance constraint*. That means securities are not sold to meet obligations; instead sufficient funds must be available on or before each liability payment date to meet the obligation. The design of traditional bonds—a fixed coupon rate and principal redemption at maturity—is a problem if the liability stream, unlike in Exhibit 9, is a level payment annuity. That

10 Note that the mention of defeasance is intended to motivate the passive fixed income strategies and not to teach the accounting for such transactions.

scenario could lead to large cash holdings between payment dates and, therefore, cash flow reinvestment risk, especially if yields on high-quality, short-term investments are low (or worse, negative).

EXAMPLE 3

Alfred Simonsson is assistant treasurer at a Swedish lumber company. The company has sold a large tract of land and now has sufficient cash holdings to retire some of its debt liabilities. The company's accounting department assures Mr. Simonsson that its external auditors will approve of a defeasement strategy if Swedish government bonds are purchased to match the interest and principal payments on the liabilities. Following is the schedule of payments due on the debt as of June 2017 that the company plans to defease:

June 2018	SEK 3,710,000
June 2019	SEK 6,620,000
June 2020	SEK 4,410,000
June 2021	SEK 5,250,000

The following Swedish government bonds are available. Interest on the bonds is paid annually in May of each year.

Coupon Rate	Maturity Date
2.75%	May 2018
3.50%	May 2019
4.75%	May 2020
5.50%	May 2021

How much in par value for each government bond will Mr. Simonsson need to buy to defease the debt liabilities, assuming that the minimum denomination in each security is SEK 10,000?

Solution:

The cash flow matching portfolio is built by starting with the last liability of SEK 5,250,000 in June 2021. If there were no minimum denomination, that liability could be funded with the 5.50% bonds due May 2021 having a par value of SEK 4,976,303 (= SEK 5,250,000/1.0550). To deal with the constraint, however, Mr. Simonsson buys SEK 4,980,000 in par value. That bond pays SEK 5,253,900 (= SEK 4,980,000 × 1.0550) at maturity. This holding also pays SEK 273,900 (= SEK 4,980,000 × 0.0550) in coupon interest in May 2018, 2019, and 2020.

Then move to the June 2020 obligation, which is SEK 4,136,100 after subtracting the SEK 273,900 received on the 5.50% bond: SEK 4,410,000 – SEK 273,900 = SEK 4,136,100. Mr. Simonsson buys SEK 3,950,000 in par value of the 4.75% bond due May 2020. That bond pays SEK 4,137,625 (= SEK 3,950,000 × 1.0475) at maturity and SEK 187,625 in interest in May 2018 and 2019.

The net obligation in June 2019 is SEK 6,158,475 (= SEK 6,620,000 – SEK 273,900 – SEK 187,625) after subtracting the interest received on the longer-maturity bonds. The company can buy SEK 5,950,000 in par value of the 3.50% bond due May 2019. At maturity, this bond pays SEK 6,158,250 (= SEK 5,950,000 × 1.0350). The small shortfall of SEK 225 (= SEK 6,158,475 – SEK 6,158,250) can be made up because the funds received in May are reinvested until June. This bond also pays SEK 208,250 in interest in May 2018.

Finally, Mr. Simonsson needs to buy SEK 2,960,000 in par value of the 2.75% bond due May 2018. This bond pays SEK 3,041,400 (= SEK 2,960,000 × 1.0275) in May 2018. The final coupon and principal, plus the interest on the 5.50%, 4.75%, and 3.50% bonds, total SEK 3,711,175 (= SEK 3,041,400 + SEK 273,900 + SEK 187,625 + SEK 208,250). That amount is used to pay off the June 2018 obligation of SEK 3,710,000. Note that the excess could be kept in a bank account to cover the 2019 shortfall.

In sum, Mr. Simonsson buys the following portfolio:

Bond	Par Value
2.75% due May 2018	SEK 2,960,000
3.50% due May 2019	SEK 5,950,000
4.75% due May 2020	SEK 3,950,000
5.50% due May 2021	SEK 4,980,000

The following chart illustrates the cash flow matching bond portfolio: Each bar represents the par amount of a bond maturing in that year plus coupon payments from bonds maturing in later years. For example, the 2018 bar has SEK 2.96 million of the 2.75% bond maturing that year, plus coupon payments from the 2019 3.5% bond, 2020 4.75% bond, and 2021 5.5% bond.

4.2 Duration Matching

Duration matching to immunize multiple liabilities is based on similar principles to those covered in the previous section for a single liability. A portfolio of fixed-income bonds is structured and managed to track the performance of the zero-coupon bonds that would perfectly lock in the rates of return needed to pay off the corporate debt liabilities identified in Exhibit 4. In the case of a single liability, the immunization strategy is to match the portfolio Macaulay duration with the investment horizon. Also, the initial investment needs to match (or exceed) the present value of the liability. These two conditions can be combined to prescribe that the money duration of the immunizing portfolio matches the money duration of the debt liabilities. Money duration, often called "dollar duration" in North America, is the portfolio modified duration multiplied by the market value. The modified duration is the portfolio Macaulay duration divided by one plus the cash flow yield per period. With multiple liabilities, matching money durations is useful because the market values and cash flow yields of the assets and liabilities are not necessarily equal.

The money duration for the debt liabilities is EUR 1,178,237,935:

$$\left[\frac{6.0004}{\left(1+\frac{0.037608}{2}\right)}\right] \times 200{,}052{,}250 = 1{,}178{,}237{,}935$$

The term in brackets is the annualized modified duration for the bond portfolio. To keep the numbers manageable, we use the basis point value (BPV) measure for money duration. This measure is the money duration multiplied by 1 bp. The BPV is EUR 117,824 (= EUR 1,178,237,935 × 0.0001). For each 1 bp change in the cash flow yield, the market value changes by approximately EUR 117,824. It is an approximation because convexity is not included. A closely related risk measure is the present value of a basis point (PVBP), also called the PV01 (present value of an "01", meaning 1 bp) and, in North America, the DV01 (dollar value of an "01").

Exhibit 10 shows the three bonds purchased by the asset manager on 15 February 2017. The total cash outlay on that date is EUR 202,224, 094 (= EUR 41,772,719 + EUR 99,750,000 + EUR 60,701,375 = the market values of the three bonds). Exhibit 11 presents the table used to calculate the cash flow yield and the risk statistics. The annualized cash flow yield is 3.5822%. It is the internal rate of return on the cash flows in the second column of Exhibit 11, multiplied by two. The annualized Macaulay duration for the portfolio is 5.9308 (= 11.8615/2) and the modified duration is 5.8264 (= 5.9308/[1 + 0.035822/2]). The annualized dispersion and convexity statistics are 12.3048 (= 49.2194/4) and 48.6846 (= $\{201.7767/[1 + 0.035822/2]^2\}/4$), respectively. Notice that the first few cash flows for the assets in Exhibit 11 are less than the liability payments in Exhibit 4. That disparity indicates that some of the bonds held in the asset portfolio will need to be sold to meet the obligations.

Exhibit 10 The Bond Portfolio to Immunize the Multiple Liabilities

	1.5-Year Bond	6-Year Bond	11.5-Year Bond
Coupon rate	1.00%	2.875%	4.50%
Maturity date	15 August 2018	15 February 2023	15 August 2028
Price	99.875	99.75	100.25
Yield to maturity	1.0842%	2.9207%	4.4720%
Par value	41,825,000	100,000,000	60,550,000
Market value	41,772,719	99,750,000	60,701,375
Macaulay duration	1.493	5.553	9.105
Convexity	2.950	34.149	96.056
Allocation	20.657%	49.326%	30.017%

Exhibit 11 Portfolio Statistics

Time	Date	Cash Flow	PV of Cash Flow	Weight	Time × Weight	Dispersion	Convexity
0	15-Feb-17	–202,224,094					
1	15-Aug-17	3,009,000	2,956,054	0.0146	0.0146	1.7245	0.0292
2	15-Feb-18	3,009,000	2,904,040	0.0144	0.0287	1.3966	0.0862

Exhibit 11 (Continued)

Time	Date	Cash Flow	PV of Cash Flow	Weight	Time × Weight	Dispersion	Convexity
3	15-Aug-18	44,834,000	42,508,728	0.2102	0.6306	16.5068	2.5225
4	15-Feb-19	2,799,875	2,607,951	0.0129	0.0516	0.7970	0.2579
5	15-Aug-19	2,799,875	2,562,062	0.0127	0.0633	0.5965	0.3801
6	15-Feb-20	2,799,875	2,516,981	0.0124	0.0747	0.4276	0.5228
7	15-Aug-20	2,799,875	2,472,692	0.0122	0.0856	0.2890	0.6847
8	15-Feb-21	2,799,875	2,429,183	0.0120	0.0961	0.1791	0.8649
9	15-Aug-21	2,799,875	2,386,440	0.0118	0.1062	0.0966	1.0621
10	15-Feb-22	2,799,875	2,344,449	0.0116	0.1159	0.0402	1.2753
11	15-Aug-22	2,799,875	2,303,196	0.0114	0.1253	0.0085	1.5034
12	15-Feb-23	102,799,875	83,075,901	0.4108	4.9297	0.0079	64.0865
13	15-Aug-23	1,362,375	1,081,607	0.0053	0.0695	0.0069	0.9734
14	15-Feb-24	1,362,375	1,062,575	0.0053	0.0736	0.0240	1.1034
15	15-Aug-24	1,362,375	1,043,878	0.0052	0.0774	0.0508	1.2389
16	15-Feb-25	1,362,375	1,025,510	0.0051	0.0811	0.0869	1.3794
17	15-Aug-25	1,362,375	1,007,465	0.0050	0.0847	0.1315	1.5245
18	15-Feb-26	1,362,375	989,738	0.0049	0.0881	0.1844	1.6738
19	15-Aug-26	1,362,375	972,323	0.0048	0.0914	0.2450	1.8271
20	15-Feb-27	1,362,375	955,214	0.0047	0.0945	0.3129	1.9839
21	15-Aug-27	1,362,375	938,406	0.0046	0.0974	0.3875	2.1439
22	15-Feb-28	1,362,375	921,894	0.0046	0.1003	0.4686	2.3067
23	15-Aug-28	61,912,375	41,157,805	0.2035	4.6811	25.2505	112.3462
			202,224,094	1.0000	11.8615	49.2194	201.7767

The market value of the immunizing fixed-income bonds is EUR 202,224,094. That amount is higher than the value of the liabilities, which is EUR 200,052,250. The reason for the difference in market values as of 15 February 2017 is the difference in the cash flow yields. The high-quality assets needed to immunize the corporate liabilities have a cash flow yield of 3.5822%, which is lower than the cash flow yield of 3.7608% on the debt obligations. The assets grow at a lower rate and, therefore, need to start at a higher level. If we discount the debt liabilities scheduled in the third column of Exhibit 4 at 3.5822%, the present value is EUR 202,170,671, indicating that initially, the immunizing portfolio is slightly overfunded. Importantly, the asset portfolio BPV is EUR 117,824 (= 202,224,094 × 5.8264 × 0.0001), matching the BPV for the debt liabilities.

There is another meaningful difference in the structure of the asset and liability portfolios. Although the money durations are the same, the dispersion and convexity statistics for the assets are greater than for the liabilities—12.30 compared with 8.26 for dispersion, and 48.68 compared with 45.54 for convexity. This difference is required to achieve immunization for multiple liabilities. (Mathematically, in the optimization problem to minimize the difference in the change in the values of assets and liabilities, the first derivative leads to matching money duration [or BPV] and the second derivative to having a higher dispersion.) Intuitively, this condition follows from the general result that, for equal durations, a more convex portfolio generally outperforms a less convex portfolio (higher gains if yields fall, lower losses if yields

rise). But, as in the case of immunizing a single liability, the dispersion of the assets should be as low as possible subject to being greater than or equal to the dispersion of the liabilities to mitigate the effect of non-parallel shifts in the yield curve. Note that from Equation 1, higher dispersion implies higher convexity when the Macaulay durations and cash flow yields are equal.

Some numerical examples are useful to illustrate that immunization of multiple liabilities is essentially an interest rate risk hedging strategy. The idea is that changes in the market value of the asset portfolio closely match changes in the debt liabilities whether interest rates rise or fall. Exhibit 12 demonstrates this dynamic.

Exhibit 12 Immunizing Multiple Liabilities

Upward Parallel Shift	Immunizing Assets	Debt Liabilities	Difference
ΔMarket value	–2,842,408	–2,858,681	16,273
ΔCash flow yield	0.2437%	0.2449%	–0.0012%
ΔPortfolio BPV	–2,370	–2,207	–163

Downward Parallel Shift	Immunizing Assets	Debt Liabilities	Difference
ΔMarket value	2,900,910	2,913,414	–12,504
ΔCash flow yield	–0.2437%	–0.2449%	0.0012%
ΔPortfolio BPV	2,429	2,256	173

Steepening Twist	Immunizing Assets	Debt Liabilities	Difference
ΔMarket value	–1,178,071	–835,156	–342,915
ΔCash flow yield	0.1004%	0.0711%	0.0293%
ΔPortfolio BPV	–984	–645	–339

Flattening Twist	Immunizing Assets	Debt Liabilities	Difference
ΔMarket value	1,215,285	850,957	364,328
ΔCash flow yield	–0.1027%	–0.0720%	–0.0307%
ΔPortfolio BPV	1,016	658	358

First, we allow the yield curve to shift upward in a parallel manner. The yields on the bonds in Exhibit 10 go up instantaneously by 25 bps on 15 February 2017, immediately after the asset portfolio is purchased. That increase results in a drop in market value of EUR 2,842,408. The yields on the debt liabilities in Exhibit 4 also go up by 25 bps, dropping the market value by EUR 2,858,681. The difference is EUR 16,273, a small amount given that the size of portfolios exceeds EUR 200 million. This scenario implicitly assumes no change in the corporate entity's credit risk. Next, we shift the yield curve downward by 25 bps. Both the asset and liability portfolios gain market value by almost the same amount. The difference is only EUR 12,504.

The driving factor behind the success of the strategy given these upward and downward shifts is that the portfolio durations are matched and changes in the cash flow yields are very close: 24.37 bps for the assets and 24.49 bps for the liabilities.[11] As explained in the previous section, a parallel shift is a sufficient but not necessary condition for immunization. Although not shown in Exhibit 12, an upward non-parallel shift of 15.9 bps in the 1.5-year bond, 23.6 bps in the 6-year bond, and 27.5 bps in the 11.5-year bond leads to virtually the same change in market value (EUR 2,842,308) as the 25 bp parallel shift. Those particular changes are chosen because they result in the same change in the cash flow yield of 24.37 bps.

The structural risk to the immunization strategy is apparent in the third scenario in Exhibit 12. This scenario is the steepening twist in which short-term yields on high-quality bonds go down while long-term yields go up. The 1.5-year yield is assumed to drop by 25 bps. The 6-year yield remains the same, and the 11.5-year yield goes up by 25 bps. These changes lead to a loss of EUR 1,178,071 in the asset portfolio as the cash flow yield increases by 10.04 bps. The maturities of the debt liabilities differ from those of the assets. For simplicity, we assume that those yields change in proportion to the differences in maturity around the six-year pivot point for the twist. The 2.5-year yield drops by 19.44 bps (= 25 bps × 3.5/4.5), the 7-year yield goes up by 4.55 bps (= 25 bps × 1/5.5), and the 10-year by 18.18 bps (= 25 bps × 4/5.5). The market value of the liabilities drops by only EUR 835,156 because the cash flow yield increases by only 7.11 bps. The value of the assets goes down by more than the liabilities—the difference is EUR 342,915. The steepening twist to the shape of the yield curve is the source of the loss.

The results of the fourth scenario show that a flattening twist can lead to a comparable gain if long-term high-quality yields fall while short-term yields rise. We make the same assumptions about proportionate changes in the yields. In this case, the cash flow yield of the assets goes down more and the market value rises higher than the debt liabilities. Clearly, an entity that pursues immunization of multiple liabilities hopes that steepening twists are balanced out by flattening twists and that most yield curve shifts are more or less parallel.

Exhibit 12 also reports the changes in the portfolio BPVs for the assets and liabilities. Before the yield curve shifts and twists, the BPVs are matched at EUR 117,824. Afterward, there is a small money duration mismatch. In theory, the asset manager needs to rebalance the portfolio immediately. In practice, the manager likely waits until the mismatch is large enough to justify the transactions costs in selling some bonds and buying others. Another method to rebalance the portfolio is to use interest rate derivatives.

EXAMPLE 4

A Japanese corporation recently sold one of its lines of business and would like to use the cash to retire the debt liabilities that financed those assets. Summary statistics for the multiple debt liabilities, which range in maturity from three to seven years, are market value, JPY 110.4 billion; portfolio modified duration, 5.84; portfolio convexity, 46.08; and BPV, JPY 64.47 million.

11 The astute reader might have noticed in Exhibit 12 that the asset portfolio rises slightly less than the liabilities when the yield curve shifts down in a parallel manner by 25 bps. Hence, the loss is EUR 12,504 despite the greater convexity of the assets. That disparity is explained by the slightly higher decrease in the cash flow yield on the liabilities.

An investment bank working with the corporation offers three alternatives to accomplish the objective:

1 **Bond tender offer.** The corporation would buy back the debt liabilities on the open market, paying a premium above the market price. The corporation currently has a single-A rating and hopes for an upgrade once its balance sheet is improved by retiring the debt. The investment bank anticipates that the tender offer would have to be at a price commensurate with a triple-A rating to entice the bondholders to sell. The bonds are widely held by domestic and international institutional investors.

2 **Cash flow matching.** The corporation buys a portfolio of government bonds that matches, as closely as possible, the coupon interest and principal redemptions on the debt liabilities. The investment bank is highly confident that the corporation's external auditors will agree to accounting defeasement because the purchased bonds are government securities. That agreement will allow the corporation to remove both the defeasing asset portfolio and the liabilities from the balance sheet.

3 **Duration matching.** The corporation buys a portfolio of high-quality corporate bonds that matches the duration of the debt liabilities. Interest rate derivative contracts will be used to keep the duration on its target as time passes and yields change. The investment bank thinks it is very unlikely that the external auditors will allow this strategy to qualify for accounting defeasement. The corporation can explain to investors and the rating agencies in the management section of its annual report, however, that it is aiming to "effectively defease" the debt. To carry out this strategy, the investment bank suggests three different portfolios of investment-grade corporate bonds that range in maturity from 2 years to 10 years. Each portfolio has a market value of about JPY 115 billion, which is considered sufficient to pay off the liabilities.

	Portfolio A	Portfolio B	Portfolio C
Modified duration	5.60	5.61	5.85
Convexity	42.89	50.11	46.09
BPV (in millions)	JPY 64.50	JPY 64.51	JPY 67.28

After some deliberation and discussion with the investment bankers and external auditors, the corporation's CFO chooses Strategy 3, duration matching.

1 Indicate the likely trade-offs that led the corporate CFO to choose the duration matching strategy over the tender offer and cash flow matching.

2 Indicate the portfolio that the corporation should choose to carry out the duration matching strategy.

Solution to 1:

The likely trade-offs are between removing the debt liabilities from the balance sheet, either by directly buying the bonds from investors or by accounting defeasement via cash flow matching, and the cost of the strategy. The tender offer entails buying the bonds at a triple-A price, which would be considerably higher than at a single-A price. Cash flow matching entails buying even more expensive government bonds. The duration matching strategy can be implemented at a lower cost because the asset portfolio consists of less expensive investment-grade bonds. The CFO has chosen the lowest-cost strategy, even though the debt liabilities will remain on the balance sheet.

Solution to 2:

The corporation should recommend Portfolio B. Portfolio C closely matches the modified duration (as well as the convexity) of the liabilities. Duration matching when the market values of the assets and liabilities differ, however, entails matching the money durations, in particular the BPVs. The choice then comes down to Portfolios A and B. Although both have BPVs close to the liabilities, it is incorrect to choose A based on its BPV being "closer."

The important difference between Portfolios A and B lies in the convexities. To immunize multiple liabilities, the convexity (and dispersion of cash flows) of the assets needs to be greater than the liabilities. Therefore, Portfolio A does not meet that condition.

Recall that in Example 2, the correct immunizing portfolio is the one with the lower convexity, which minimizes the structural risk to the strategy. But, that bond portfolio still has a convexity greater than the zero-coupon bond that would provide perfect immunization. This greater convexity of the immunizing portfolio is because the dispersion of the zero-coupon bond is zero and the durations are the same. As seen in Equation 1, that dispersion implies a lower convexity statistic.

4.3 Derivatives Overlay

Interest rate derivatives can be a cost-effective method to rebalance the immunizing portfolio to keep it on its target duration as the yield curve shifts and twists and as time passes. Suppose that in the duration matching example in Section 4.2, there is a much larger instantaneous upward shift in the yield curve on 15 February 2017. In particular, all yields shift up by 100 bps. Because yields and duration are inversely related, the portfolio duration statistics go down, as does the market value. The BPV of the immunizing asset portfolio decreases from EUR 117,824 to EUR 108,679, a drop of EUR 9,145. The BPV for the debt liabilities goes down to EUR 109,278, a drop of EUR 8,546. There is now a duration gap of –EUR 599 (= EUR 108,679 – EUR 109,278). The asset manager could sell some of the 1%, 1.5-year bonds and buy some more of the 4.50%, 11-year bonds to close the money duration gap. A more efficient and lower-cost rebalancing strategy, however, is likely to buy, or go long, a few interest rate futures contracts to rebalance the portfolio.

To address the question of the required number of contracts to close, or reduce, a duration gap, we change the example from euros to US dollars. Doing so allows us to illustrate the calculations for the required number of futures contracts using the actively traded 10-year US Treasury note futures contract offered at the CME Group. The present value of corporate debt liabilities shown in Exhibits 3 and 4 now is assumed to be USD 200,052,250. Risk and return statistics are invariant to currency denomination, so the portfolio Macaulay duration is still 6.0004 and the BPV is USD 117,824.

Unlike the previous example for duration matching of multiple liabilities, however, we assume that the asset manager buys a portfolio of high-quality, short-term bonds. This portfolio has a market value of USD 222,750,000, Macaulay duration of 0.8532, and cash flow yield of 1.9804%. Discounting the debt liabilities in the third column of Exhibit 4 at 1.9804% gives a present value of USD 222,552,788. This value indicates that the immunizing portfolio is overfunded on 15 February 2017. The BPV for the asset portfolio is USD 18,819:

$$\left[\frac{0.8532}{\left(1+\frac{0.019804}{2}\right)}\right] \times 222{,}750{,}000 \times 0.0001 = 18{,}819$$

There are a number of reasons why the asset manager might elect to hold a portfolio of short-term bonds rather than intermediate-term and long-term securities. Perhaps there is much greater liquidity and the perception of finer pricing in the short-term market. Another possibility is that the entity faces liquidity constraints and needs to hold these short-term bonds to meet regulatory requirements. A derivatives overlay strategy is then used to close the duration gap while keeping the underlying portfolio unchanged. In general, a derivatives overlay transforms some aspect of the underlying portfolio—the currency could be changed with foreign exchange derivatives or the credit risk profile with credit default swap contracts. Here, interest rate derivatives are used to change the interest rate risk profile, increasing the portfolio BPV from USD 18,819 to USD 117,824.

Although the details of interest rate futures contracts are covered in other readings, some specific features of the 10-year US Treasury note contract traded at the CME Group are important for this example. Each contract is for USD 100,000 in par value and has delivery dates in March, June, September, and December. The T-notes qualifying for delivery range from 6.5 to 10 years in maturity. (In January 2016, the CME Group introduced the Ultra 10-year contract for which the qualifying T-notes have maturities from 9 years and 5 months to 10 years.) Conversion factors that are used to make the qualifying T-notes roughly equivalent for delivery by the contract seller, or short position, are based on an arbitrary yield to maturity of 6.00%. If the eligible T-note has a coupon rate below (above) 6.00%, the conversion factor is less (more) than 1.0000. The invoice price paid by the buyer of the contract, the long position, at the expiration of the contract is the futures price multiplied by the conversion factor, plus accrued interest. The logic of this design is that if the contract seller chooses to deliver a qualifying T-note having a lower (higher) coupon rate than 6.00%, the buyer pays a lower (higher) price.

The key point is that, although the eligible T-notes are roughly equivalent, one will be identified as the cheapest-to-deliver (CTD) security. Importantly, the duration of the 10-year T-note futures contract is assumed to be the duration of the CTD T-note. A factor in determining the CTD T-note is that the conversion factors for each qualifying security are based on the arbitrary assumption of a 6.00% yield to maturity. In practice, when yields are below 6.00%, as they have been in recent years, the CTD security typically is the qualifying T-note having the lowest duration. Therefore, the 10-year T-note futures contract essentially has been acting as a 6.5-year contract. (That explains the motivation for introducing the Ultra 10-year contract—to provide a hedging instrument more closely tied to the 10-year T-note traded in the cash market).

To illustrate the importance of using the risk statistics for the CTD T-note, Exhibit 13 reports two hypothetical qualifying securities for the March 2017 10-year futures contract. One is designated the 6.5-year T-note. It has a coupon rate of 2.75% and matures on 15 November 2023. As of 15 February 2017, it is assumed to be priced to yield 3.8088%. Its BPV per USD 100,000 in par value is USD 56.8727, and its conversion factor is 0.8226. The other is the on-the-run 10-year T-note. Its coupon rate is 4.00%, and it matures on 15 February 2027. Its BPV is USD 81.6607, and its conversion factor is 0.8516.

Exhibit 13 Two Qualifying T-Notes for the March 2017 10-Year T-Note Futures Contract as of 15 February 2017

	6.5-Year T-Note	10-Year T-Note
Coupon rate	2.75%	4.00%
Maturity date	15 November 2023	15 February 2027
Full price per 100,000 in par value	USD 94,449	USD 99,900

Exhibit 13 (Continued)

	6.5-Year T-Note	10-Year T-Note
Yield to maturity	3.8088%	4.0122%
Modified duration	6.0215	8.1742
BPV per 100,00 in par value	56.8727	81.6607
Conversion factor	0.8226	0.8516

The calculation of the required number of futures contract, denoted N_f, comes from this relationship:

$$\text{Asset portfolio BPV} + (N_f \times \text{Futures BPV}) = \text{Liability portfolio BPV} \quad (2)$$

Inherent in this expression is the important idea that, although futures contracts have a market value of zero as a result of daily mark-to-market valuation and settlement, they can add to or subtract from the asset portfolio BPV. This equation can be rearranged to isolate N_f:

$$N_f = \frac{\text{Liability portfolio BPV} - \text{Asset portfolio BPV}}{\text{Futures BPV}} \quad (3)$$

If N_f is a positive number, the asset manager buys, or goes long, the required number of futures contracts. Doing so raises the money duration of the assets to match that of the liabilities. If N_f is a negative number, the asset manager sells, or goes short, futures contracts to reduce the money duration. In our problem, the asset portfolio BPV is USD 18,819 and the liability portfolio BPV is USD 117,824. Therefore, N_f is a large positive number and depends on the BPV for the futures contract. The exact formulation for the Futures BPV is complicated, however, and goes beyond the scope of this reading. It involves details such as the number of days until the expiration of the contract, the interest rate for that period, and the accrued interest on the deliverable bond. To simplify, we use an approximation formula that is common in practice:

$$\text{Futures BPV} \approx \frac{\text{BPV}_{\text{CTD}}}{\text{CF}_{\text{CTD}}} \quad (4)$$

where CF_{CTD} is the conversion factor for the CTD security. (In interest futures markets that do not have a CTD security, the Futures BPV is simply the BPV of the deliverable bond.)

If the CTD security is the 6.5-year T-note shown in Exhibit 13, the Futures BPV is estimated to be USD 69.1377 (= 56.8727/0.8226). Then the required number of contracts is approximately 1,432:

$$\frac{117{,}824 - 18{,}819}{69.1377} = 1{,}432$$

But, if the CTD security is the 10-year T-note, the Futures BPV is USD 95.8909 (= 81.6607/0.8516). To close the money duration gap, the required number of contracts is only 1,032.

$$\frac{117{,}824 - 18{,}819}{95.8909} = 1{,}032$$

Clearly, the asset manager must know the CTD T-note to use in the derivatives overlay strategy. The difference of 400 futures contracts is significant.

The asset manager has established a synthetic "barbell" strategy having positions in the short-term and longer-term segments of the yield curve. The term "synthetic" means "created with derivatives." The underlying asset portfolio is concentrated in

the short-term market. The derivatives portfolio is either at the 6.5-year or 10-year segment of the yield curve. There also are actively traded two-year and five-year Treasury futures contracts at CME Group. Therefore, the asset manager could choose to spread out the futures contracts across other segments of the yield curve. That diversification reduces the structural risk to the immunization strategy arising from non-parallel shifts and twists to the curve.

EXAMPLE 5

A Frankfurt-based asset manager uses the Long Bund contract traded at the Intercontinental Exchange (ICE) futures exchange to manage the gaps that arise from "duration drift" in a portfolio of German government bonds that are used to immunize a portfolio of corporate debt liabilities. This futures contract has a notional principal of EUR 100,000 and a 6% coupon rate. The German government bonds that are eligible for delivery have maturities between 8.5 years and 10.5 years.

Currently, the corporate debt liabilities have a market value of EUR 330,224,185, a modified duration of 7.23, and a BPV of EUR 238,752. The asset portfolio has a market value of EUR 332,216,004, a modified duration of 7.42, and a BPV of EUR 246,504. The duration drift has arisen because of a widening spread between corporate and government bond yields as interest rates in general have come down. The lower yields on government bonds have increased the modified durations relative to corporates.

Based on the deliverable bond, the asset manager estimates that the BPV for each futures contract is EUR 65.11.

1. Does the asset manager go long (buy) or go short (sell) the futures contract?
2. How many contracts does the manager buy or sell to close the duration gap?

Solution to 1:

The money duration of the assets, as measured by the BPV, is greater than the money duration of debt liabilities. This relationship is true of the modified duration statistics as well, but the money duration is a better measure of the gap because the market values differ. The asset manager needs to go short (or sell) Long Bund futures contracts.

Solution to 2:

Use Equation 3 to get the requisite number of futures contracts to sell.

$$N_f = \frac{\text{Liability portfolio BPV} - \text{Asset portfolio BPV}}{\text{Futures BPV}}$$

where Liability portfolio BPV = 238,752, Asset portfolio BPV = 246,504, and Futures BPV = 65.11.

$$N_f = \frac{238{,}752 - 246{,}504}{65.11} = -119.06$$

The minus sign indicates the need to go short (or sell) 119 contracts to close the duration gap.

4.4 Contingent Immunization

The last two examples illustrate that the initial market value for the immunizing asset portfolio can vary according to the strategy chosen by the asset manager. In the duration matching example, the initial market value of the asset portfolio is EUR 202,224,094, while the liabilities are EUR 200,052,250. The derivatives overlay example is to hold a portfolio of short-term bonds having a market value of USD 222,750,000 and 1,432 10-year futures contracts (assuming that the CTD eligible security is the 6.5-year T-note) to immunize the liability of USD 200,052,250.

The difference between the market values of the assets and liabilities is the **surplus**. The initial surplus in the duration matching example is EUR 2,171,844 (= EUR 202,224,094 – EUR 200,052,250); the surplus in the derivatives overlay example is USD 22,697,750 (= EUR 222,750,000 –EUR 200,052,250). The presence of a significant surplus allows the asset manager to consider a hybrid passive–active strategy known as **contingent immunization**. The idea behind contingent immunization is that the asset manager can pursue active investment strategies, as if operating under a total return mandate, as long as the surplus is above a designated threshold. If the actively managed assets perform poorly, however, and the surplus evaporates, the mandate reverts to the purely passive strategy of building a duration matching portfolio and then managing it to remain on duration target.

In principle, the available surplus can be deployed into any asset category, including equity, fixed income, and alternative investments. The surplus could be used to buy out-of-the-money commodity option contracts or credit default swaps. The objective is to attain gains on the actively managed funds in order to reduce the cost of retiring the debt obligations. Obviously, liquidity is an important criterion in selecting the investments because the positions would need to be unwound if losses cause the surplus to near the threshold.

A natural setting for contingent immunization is in the fixed-income derivatives overlay strategy. Instead of buying, or going long, 1,432 10-year T-note futures contracts, the asset manager could intentionally over-hedge or under-hedge, depending on the held view on rate volatility at the 6.5-year segment of the Treasury yield curve. That segment matters because the 10-year T-note futures contract price responds to changes in the yield of the CTD security. The asset manager could buy more (less) than 1,432 contracts if she expects the 6.5-year Treasury yield to go down (up) and the futures price to go up (down).

Suppose that on 15 February 2017, the price of the March 10-year T-note futures contract is quoted to be 121-03. The price is 121 and 3/32 percent of USD 100,000, which is the contract size. Therefore, the delivery price in March would be USD 121,093.75 multiplied by the conversion factor, plus the accrued interest. What matters to the asset manager is the change in the settlement futures price from day to day. For each futures contract, the gain or loss is USD 31.25 for each 1/32nd change in the futures price, calculated as 1/32 percent of USD 100,000.

Now suppose that the asset manager anticipates an upward shift in the yield curve. Such a shift would cause bond prices to drop in both the Treasury cash and futures markets. Suppose that the quoted March futures price drops from 121-03 to 119-22. That is a 45/32nd change in the price and causes a loss of USD 1,406.25 (= 45 × USD 31.25) per contract. If the asset manager holds 1,432 long contracts, the loss that day is USD 2,013,750 (= USD 1,406.25 × 1,432). But if the asset manager is allowed to under-hedge, he could have dramatically reduced the number of long futures contracts and maybe even gone short in anticipation of the upward shift. The presence of the surplus allows the manager the opportunity to take a view on interest rates and save some of the cost of the strategy to retire the debt liabilities. The objective is to be over-hedged when yields are expected to fall and under-hedged when they are expected to rise.

EXAMPLE 6

An asset manager is asked to build and manage a portfolio of fixed-income bonds to retire multiple corporate debt liabilities. The debt liabilities have a market value of GBP 50,652,108, a modified duration of 7.15, and a BPV of GBP 36,216.

The asset manager buys a portfolio of British government bonds having a market value of GBP 64,271,055, a modified duration of 3.75, and a BPV of GBP 24,102. The initial surplus of GBP 13,618,947 and the negative duration gap of GBP 12,114 are intentional. The surplus allows the manager to pursue a contingent immunization strategy to retire the debt at, hopefully, a lower cost than a more conservative duration matching approach. The duration gap requires the manager to buy, or go long, interest rate futures contracts to close the gap. The manager can choose to over-hedge or under-hedge, however, depending on market circumstances.

The futures contract that the manager buys is based on 10-year gilts having a par value of GBP 100,000. It is estimated to have a BPV of GBP 98.2533 per contract. Currently, the asset manager has purchased, or gone long, 160 contracts.

Which statement *best* describes the asset manager's hedging strategy and the held view on future 10-year gilt interest rates? The asset manager is:

A over-hedging because the rate view is that 10-year yields will be rising.

B over-hedging because the rate view is that 10-year yields will be falling.

C under-hedging because the rate view is that 10-year yields will be rising.

D under-hedging because the rate view is that 10-year yields will be falling.

Solution:

B is correct. The asset manager is over-hedging because the rate view is that 10-year yields will be falling. First calculate the number of contracts (N_f) needed to fully hedge (or immunize) the debt liabilities. The general relationship is Equation 2: Asset portfolio BPV + ($N_f \times$ Futures BPV) = Liability portfolio BPV.

Asset portfolio BPV is GBP 24,102; Futures BPV is 98.2533; and Liability portfolio BPV is 36,216.

$$24{,}102 + (N_f \times 98.2533) = 36{,}216$$
$$N_f = 123.3$$

The asset manager is over-hedging because a position in 160 long futures contracts is more than what is needed to close the duration gap. Long, or purchased, positions in interest rate futures contracts gain when futures prices rise and rates go down. The anticipated gains from the strategic decision to over-hedge in this case further increase the surplus and reduce the cost of retiring the debt liabilities.

5 LIABILITY-DRIVEN INVESTING—AN EXAMPLE OF A DEFINED BENEFIT PENSION PLAN

In Section 2, we introduced four types of liabilities: Types I, II, III, and IV. In Sections 3 and 4, we looked at Type I liabilities for which the amount and timing of cash flows are known to the asset manager. That knowledge allows the manager to consider immunization strategies using yield duration statistics such as Macaulay, modified, and money duration. An example of a Type II liability is a callable bond. The corporate

issuer knows that the bond can be repurchased at the preset call prices on the call dates and, if it is not called, that it will be redeemed at par value at maturity. A floating-rate note is an example of a Type III liability. The issuer knows the interest payment dates but not the amounts, which are linked to future rates. Models are needed to project the amounts and dates of the cash flows and to calculate the effective durations of the callable and floating-rate securities. Because there are no well-defined yields to maturity as a result of the uncertain amounts and timing of cash flows, yield duration statistics such as Macaulay and modified duration do not apply.

Defined benefit pension plan obligations are a good example of Type IV liabilities for which both the amounts and dates are uncertain.[12] An LDI strategy for this entity starts with a model for these liabilities. We reveal some of the assumptions that go into this complex financial modeling problem by assuming the work history and retirement profile for a representative employee covered by the pension plan. We assume that this employee has worked for G years, a sufficient length of time to ensure that the retirement benefits are vested. The employee is expected to work for another T years and then to retire and live for Z years. Exhibit 14 illustrates this time line.

Exhibit 14 Time Line Assumptions for the Representative Employee

Although there are many types of pension plans worldwide, here we model a final-pay US defined benefit plan. In principle, the same type of model can be built to illustrate retirement obligations in other countries. In this example, the retired employee receives a fixed lifetime annuity based on her wage at the time of retirement, denoted W_T. Some pension plans index the annual retirement benefit to inflation. Our example assumes an annuity fixed in nominal terms, calculated as the final wage, W_T, multiplied by a multiplier, m, multiplied by the total number of years worked, $G + T$.

There are two general measures of the retirement obligations as of Time 0—the accumulated benefit obligation (ABO) and the projected benefit obligation (PBO). The ABO calculates the liability based on the G years worked and the current annual wage, denoted W_0, even though the annuity paid in retirement is based on W_T and $G + T$ years. The use of the current annual wage and the number of years worked is because the ABO represents the *legal liability* today of the plan sponsor if the plan were to be closed or converted to another type of plan, such as a defined contribution plan. The ABO is the present value of the annuity, discounted at an annual rate r on high-quality corporate bonds,[13] which for simplicity we assume applies for all periods (a flat yield curve).

$$\text{ABO} = \frac{1}{(1+r)^T} \times \left[\frac{m \times G \times W_0}{1+r} + \frac{m \times G \times W_0}{(1+r)^2} + \cdots + \frac{m \times G \times W_0}{(1+r)^Z} \right]$$

The term in brackets is the value of the Z-year annuity as of year T, and that sum is discounted back over T years to Time 0.

12 This section is based on Adams and Smith (2009).

13 In the United States, government regulators and the accounting authorities allow high-quality corporate bonds to be used to discount the future liabilities.

The PBO liability measure uses the projected wage for year T instead of the current wage in the Z-year annuity.

$$\text{PBO} = \frac{1}{(1+r)^T} \times \left[\frac{m \times G \times W_T}{1+r} + \frac{m \times G \times W_T}{(1+r)^2} + \cdots + \frac{m \times G \times W_T}{(1+r)^Z} \right]$$

Although the ABO is the legal obligation to the plan sponsor, the PBO is the liability reported in financial statements and used to assess the plan's funding status. The plan is over-funded (under-funded) if the current fair value of assets is more (less) than the present value of the promised retirement benefits.

The next step is to consider how wages evolve between dates 0 and T. We denote w to be the average annual wage growth rate for the employee's remaining work life of T years. Therefore, the relationship between W_0 and W_T is $W_T = W_0 \times (1 + w)^T$.

After some algebraic manipulation and substitution, the two liability measures can be written more compactly as follows:

$$\text{ABO} = \frac{m \times G \times W_0}{(1+r)^T} \times \left[\frac{1}{r} - \frac{1}{r \times (1+r)^Z} \right]$$

$$\text{PBO} = \frac{m \times G \times W_0 \times (1+w)^T}{(1+r)^T} \times \left[\frac{1}{r} - \frac{1}{r \times (1+r)^Z} \right]$$

Note that the PBO always will be larger than the ABO by the factor of $(1 + w)^T$, assuming positive wage growth in nominal terms.[14]

We see in this simple model several of the important assumptions that go into using an LDI strategy to manage these Type IV liabilities. The assumed post-retirement lifetime (Z years) is critical. A higher value for Z increases both the ABO and PBO measures of liability. The pension plan faces *longevity risk*, which is the risk that employees live longer in their retirement years than assumed in the models. In recent years, some plans have become under-funded and have had to increase assets because regulators required that they recognize longer life expectancies. Another important assumption is the time until retirement (T years). In the ABO measure, increases in T reduce the liability. That result also holds for the PBO as long as w is less than r. Assuming w is less than r is reasonable if it can be assumed that employees over time generally are compensated for price inflation and some part of real economic growth, as well as for seniority and productivity improvements, but overall the labor income growth rate does not quite keep pace with the nominal return on high-quality financial assets.

We now use a numerical example to show how the effective durations of ABO and PBO liability measures are calculated. Assume that $m = 0.02$, $G = 25$, $T = 10$, $Z = 17$, W_0 = USD 50,000 and $r = 0.05$. We also assume that the wage growth rate w is an arbitrarily chosen constant fraction of the yield on high-quality corporate bonds r—in particular, that $w = 0.9 \times r$ so that $w = 0.045$ (= 0.9 × 0.05). Based on these assumptions, the ABO and PBO for the representative employee are USD 173,032 and USD 268,714, respectively.

$$\text{ABO} = \frac{0.02 \times 25 \times 50{,}000}{(1.05)^{10}} \times \left[\frac{1}{0.05} - \frac{1}{0.05 \times (1.05)^{17}} \right] = 173{,}032$$

14 The second term to the right of the equal sign in the foregoing expressions may be familiar to readers as the present value factor for an annuity.

$$\text{PBO} = \frac{0.02 \times 25 \times 50{,}000 \times (1.045)^{10}}{(1.05)^{10}} \times \left[\frac{1}{0.05} - \frac{1}{0.05 \times (1.05)^{17}}\right] = 268{,}714$$

If the plan covers 10,000 similar employees, the total liability is approximately USD 1.730 billion ABO and USD 2.687 billion PBO. Assuming that the pension plan has assets with a market value of USD 2.700 billion, the plan currently is overfunded by both measures of liability.

In general, the effective durations for assets or liabilities are obtained by raising and lowering the assumed yield curve in the valuation model and recalculating the present values.

$$\text{Effective duration} = \frac{(\text{PV}_-) - (\text{PV}_+)}{2 \times \Delta\text{Curve} \times (\text{PV}_0)} \tag{5}$$

PV_0 is the initial value, PV_ is the new value after the yield curve is lowered by ΔCurve, and PV_+ is the value after the yield curve is raised. In this simple model with a flat yield curve, we raise *r* from 0.05 to 0.06 (and *w* from 0.045 to 0.054) and lower *r* from 0.05 to 0.04 (and *w* from 0.045 to 0.036). Therefore, ΔCurve = 0.01. A more realistic model would have shape to the yield curve and include the interaction of a yield change on other variables. For example, an increase in yields on high-quality financial assets could be modeled to shorten the time to retirement.

Given our assumptions, ABO_0 is USD 173,032. Redoing the calculations for the higher and lower values for *r* and *w* gives USD 146,261 for ABO_+ and USD 205,467 for ABO_. The ABO effective duration is 17.1.

$$\text{ABO duration} = \frac{205{,}467 - 146{,}261}{2 \times 0.01 \times 173{,}032} = 17.1$$

Repeating the calculations for the PBO liability measure gives USD 247,477 for PBO_+ and USD 292,644 for PBO_. Given that PBO_0 is 268,714, the PBO duration is 8.4.

$$\text{PBO} = \frac{292{,}644 - 247{,}477}{2 \times 0.01 \times 268{,}714} = 8.4$$

These calculations indicate the challenge facing the fund manager. There is a significant difference between having liabilities of USD 1.730 billion and an effective duration of 17.1, as measured by the ABO, and liabilities of USD 2.687 billion and an effective duration of 8.4, as measured by the PBO. The ABO BPV is USD 2,958,300 (= USD 1.730 billion × 17.1 × 0.0001), and the PBO BPV is USD 2,257,080 (= USD 2.687 billion × 8.4 × 0.0001). The plan sponsor must decide which liability measure to use for risk management and asset allocation. For example, if the corporation anticipates that it might be a target for an acquisition and that the acquirer likely would want to convert the retirement plan from defined benefit to defined contribution, the ABO measure matters more than the PBO.

We assume that the corporate sponsor sees itself as an ongoing independent institution that preserves the pension plan's current design. Therefore, PBO is the appropriate measure for pension plan liabilities. The plan is fully funded in that the market value of assets, assumed to be USD 2.700 billion, exceeds the PBO of USD 2.687 billion. Currently, the surplus is only USD 13 million (= 2.700 billion – 2.687 billion). That surplus disappears quickly if yields on high-quality corporate bonds that are used to discount the projected benefits drop by about 5 bps to 6 bps. Note that the surplus divided by the PBO BPV is 5.76 (= 13,000,000/2,257,080). Interest rate risk is a major concern to the plan sponsor because changes in the funding status flow through the income statement, thereby affecting reported earnings per share.

Lower yields also raise the market value of assets depending on how those assets are allocated. We assume that the current asset allocation is 50% equity, 40% fixed income, and 10% alternatives. The fixed-income portfolio is managed to track an index

of well-diversified corporate bonds—such indexes are covered in a later section of this reading. Relevant at this point is that the chosen bond index reports a modified duration of 5.5.

The problem is to assign a duration for the equity and alternative investments. To be conservative, we assume that there is no stable and predictable relationship between valuations on those asset classes and market interest rates. Therefore, equity duration and alternatives duration are assumed to be zero. Assuming zero duration does not imply that equity and alternatives have no interest rate risk. Effective duration estimates the percentage change in value arising from a change in nominal interest rates. The effect on equity and alternatives depends on *why* the nominal rate changes, especially if that rate change is not widely anticipated in the market. Higher or lower interest rates can arise from a change in expected inflation, a change in monetary policy, or a change in macroeconomic conditions. Only fixed-income securities have a well-defined connection between market values and the yield curve. Nevertheless, assumptions are a source of model risk, as discussed in the next section.

Given these assumptions, we conclude that the asset BPV is USD 594,000 = USD 2.700 billion × [(0.50 × 0) + (0.40 × 5.5) + (0.10 × 0)] × 0.0001. The term in brackets is the estimated effective duration for the asset portfolio, calculated using the shares of market value as the weights. Clearly, the pension plan is running a significant duration gap—the asset BPV of USD 594,000 is much lower than the liability BPV of USD 2,257,080, using the PBO measure. If all yields go down by 10 bps, the market value of assets goes up by approximately USD 5.940 million and the present value of liabilities goes up by USD 22.571 million. The pension plan would have a deficit and be deemed under-funded.

The pension fund manager can choose to reduce, or even eliminate, the duration gap using a derivatives overlay. For example, suppose the Ultra 10-year Treasury futures contract at the Chicago Mercantile Exchange (CME) has a BPV of USD 95.8909 because the on-the-run T-note is the CTD security, as discussed in Section 4.3. Using Equation 3, the pension plan would need to buy, or go long, 17,343 contracts to fully hedge the interest rate risk created by the duration gap:

$$\frac{2{,}257{,}080 - 594{,}000}{95.8909} = 17{,}343$$

We discuss the risks to derivatives overlay strategies associated with LDI in the next section. One concern with hedging with futures is the need for daily oversight of the positions. That need arises because futures contracts are marked to market and settled at the end of each trading day into the margin account. Suppose that the fund did buy 17,343 futures contracts and 10-year Treasury yields go up by 5 bps. Given that the Futures BPV is USD 95.8909 per contract, the *realized* loss that day is more than USD 8.315 million: USD 95.8909 × 5 × 17,343 = 8,315,179. That amount is offset by the *unrealized* reduction in the present value of liabilities. Such a large position in futures contracts would lead to significant daily cash inflows and outflows. For that reason, hedging problems such as the one facing the pension fund often are addressed with over-the-counter interest rate swaps rather than exchange-traded futures contracts.

Suppose that the pension fund manager can enter a 30-year, receive-fixed, interest rate swap against three-month Libor. The fixed rate on the swap is 4.16%. Its effective duration is +16.73, and its BPV is +0.1673 per USD 100 of notional principal. Exhibit 15 illustrates this swap.

Exhibit 15 Interest Rate Swap

The risk statistics for an interest rate swap can be obtained from interpreting the contract as a combination of bonds. From the pension fund's perspective, the swap is viewed as buying a 30-year, 4.16% fixed-rate bond from the swap dealer and financing that purchase by issuing a 30-year floating-rate note (FRN) that pays three-month Libor.[15] The swap's duration is taken to be the (high) duration of the fixed-rate bond minus the (low) duration of the FRN. That explains why a receive-fixed swap has positive duration. From the swap dealer's perspective, the contract is viewed as purchasing a (low duration) FRN that is financed by issuing a (high duration) fixed-rate bond. Hence, the swap has negative duration to the dealer.

The notional principal (NP) on the interest rate swap needed to close the duration gap to zero can be calculated with this expression:

$$\text{Asset BPV} + \left[\text{NP} \times \frac{\text{Swap BPV}}{100}\right] = \text{Liability BPV} \tag{6}$$

This is similar to Equation 2 for futures contracts. Given that the Asset BPV is USD 594,000 and the Liability BPV is USD 2,257,080 using the PBO measure, the required notional principal for the receive-fixed swap having a BPV of 0.1673 is about USD 994 million.

$$594{,}000 + \left[\text{NP} \times \frac{0.1673}{100}\right] = 2{,}257{,}080,\ \text{NP} = 994{,}070{,}532$$

We use the term "hedging ratio" to indicate the extent of interest rate risk management. A hedging ratio of 0% indicates no hedging at all. The pension plan retains the significant negative duration gap and the risk of lower corporate bond yields if it does not hedge. A hedging ratio of 100% indicates an attempt to fully balance, or to immunize, the assets and liabilities. In this case, the plan manager enters the receive-fixed swap for a notional principal of USD 994 million. In practice, partial hedges are common—the manager's task is to select the hedging ratio between 0% and 100%. The initial use of derivatives entails moving up a substantial learning curve. It is important that all stakeholders to the retirement plan understand the hedging strategy. These stakeholders include the plan sponsor, the regulatory authorities, the auditors, the employees covered by the plan, and perhaps even the employees' union representatives. Interest rate swaps typically have a value of zero at initiation. If swap rates rise, the value of the receive-fixed swap becomes negative and stakeholders will need an explanation of those losses. If the contract is collateralized, the pension fund will have to post cash or marketable securities with the swap dealer. We discuss collateralization further in the next section. The key point is that in all likelihood, the prudent course of action for the plan manager is to use a partial hedge rather than attempt to reduce the duration gap to zero.

15 Swaps are typically quoted as a fixed rate against Libor flat, meaning no spread. The spread over Libor is put into the fixed rate. For instance, a swap of 4.00% against Libor flat is the same as a swap of 4.25% against Libor + 0.25%.

One possibility is that the plan sponsor allows the manager some flexibility in selecting the hedging ratio. This flexibility in selecting the hedging ratio can be called strategic hedging. For example, the mandate could be to stay within a range of 25% to 75%. When the manager anticipates lower market rates and gains on receive-fixed interest rate swaps, the manager prefers to be at the top of an allowable range. On the other hand, if market (swap) rates are expected to go up, the manager could reduce the hedging ratio to the lower end of the range. The performance of the strategic hedging decisions can be measured against a strategy of maintaining a preset hedging ratio, for instance, 50%. That strategy means entering the receive-fixed swap for a notional principal of USD 497 million, which is about half of the notional principal needed to attempt to immunize the plan from interest rate risk (we assume that if the plan manager chooses to enter the receive-fixed swap, its notional principal would be USD 497 million, a 50% hedging ratio).

Another consideration for the plan manager is whether to use an option-based derivatives overlay strategy. Instead of entering a 30-year, receive-fixed interest rate swap against three-month Libor, the pension fund could purchase an option to enter a similar receive-fixed swap. This contract is called a receiver swaption. Suppose that the strike rate on the swaption is 3.50%. Given that the current 30-year swap fixed rate is assumed to be 4.16%, this receiver swaption is out of the money. The swap rate would have to fall by 66 bps (= 4.16% – 3.50%) for the swap contract to have intrinsic value. Suppose that the swaption premium is 100 bps, an amount based on the assumed level of interest rate volatility and the time to expiration (the next date that liabilities are measured and reported). Given a notional principal of USD 497 million, the pension plan pays USD 4.97 million (= USD 497 million × 0.0100) up front to buy the swaption. (This example neglects that the 3.50% swap has a somewhat higher effective duration and BPV than the 4.16% swap.)

When the expiration date arrives, the plan exercises the swaption if 30-year swap rates are below 3.50%. The plan could "take delivery" of the swap and receive what has become an above-market fixed rate for payment of three-month Libor. Or, the plan could close out the swap with the counterparty to capture the present value of the annuity based on the difference between the contractual fixed rate of 3.50% and the fixed rate in the swap market, multiplied by the notional principal. This gain partially offsets the loss incurred on the higher value for the pension plan liabilities. If 30-year swap rates are equal to or above 3.50% at expiration, the plan lets the swaption expire.

Another derivatives overlay is a swaption collar. The plan buys the same receiver swaption, but instead of paying the premium of USD 4.97 million in cash, the plan writes a payer swaption. Suppose that a strike rate of 5.00% on the payer swaption generates an upfront premium of 100 bps. Therefore, the combination is a "zero-cost" collar, at least in terms of the initial expense. If 30-year swap rates are below 3.50% at expiration, the purchased receiver swaption is in the money and the option is exercised. If the swap rate is between 3.50% and 5.00%, both swaptions are out of the money. But if the swap rate exceeds 5.00%, the payer swaption is in the money to the counterparty. As the writer of the contract, the pension plan is obligated to receive a fixed rate of only 5.00% when the going market rate is higher. The plan could continue with the swap but more likely seek to close it out by making a payment to the counterparty for the fair value of the contract.

Hedging decisions involve a number of factors, including accounting and tax treatment for the derivatives used in the overlay strategy. An important consideration is the various stakeholders' sensitivity to losses on the derivatives. Obviously, the plan manager is a "hero" if yields suddenly go down and if any of the three strategies—enter the receive-fixed swap, buy the receiver swaption, or enter the swaption collar—are undertaken. Note that swap rates do not need to go below 3.50% for the receiver swaption to generate an immediate gain. Its market value would go up if market rates fall (an increase in the value of the option) and it could be sold for more than the

purchase price. The problem for the manager, however, occurs if yields suddenly and unexpectedly go up, leading to a significant loss on the hedge. Will being hedged be deemed a managerial mistake by some of the stakeholders? An advantage to buying the receiver swaption is that, like an insurance contract, its cost is a known amount paid upfront. Potential losses on the receive-fixed swap and swaption collar are *time-deferred* and *rate-contingent* and therefore are uncertain.

A factor in the choice of derivatives overlay is the plan manager's view on future interest rates, particularly on high-quality corporate bond yields at the time of the next reporting for liabilities. An irony to interest rate risk management is that the view on rates is part of decision-making even when uncertainty about future rates is the motive for hedging. Exhibit 16 illustrates the payoffs on the three derivatives and the breakeven rates that facilitate the choice of contract.

Exhibit 16 Payoffs on Received-Fixed Swap, Receiver Swaption, and Swaption Collar

Consider first the downward-sloping payoff line for the received-fixed swap, which we assume has a notional principal of USD 497 million (a 50% hedging ratio). There are gains (losses) if rates on otherwise comparable 30-year swaps are below (above) 4.16%. In reality, the payoff line is not linear as shown in the exhibit. Suppose the swap rate moves down to 4.10%. The gain is the present value of the 30-year annuity of USD 149,100 (= [0.0416 – 0.0410] × 0.5 × USD 497,000,000) per period, assuming semi-annual payments. Assuming that 4.10% is the correct rate for discounting, the gain is about USD 5.12 million:

$$\frac{149{,}100}{\left(1+\frac{0.0410}{2}\right)^{1}}+\frac{149{,}100}{\left(1+\frac{0.0410}{2}\right)^{2}}+\cdots+\frac{149{,}100}{\left(1+\frac{0.0410}{2}\right)^{60}}=5{,}120{,}670$$

If the swap rate moves up to 4.22%, the annuity is still USD 149,100. But the loss is about USD 5.05 million using 4.22% to discount the cash flows.

$$\frac{149{,}100}{\left(1+\frac{0.0422}{2}\right)^{1}}+\frac{149{,}100}{\left(1+\frac{0.0422}{2}\right)^{2}}+\cdots+\frac{149{,}100}{\left(1+\frac{0.0422}{2}\right)^{60}}=5{,}047{,}526$$

The payoffs for the purchased 3.50% receiver swaption are shown as the dotted line in Exhibit 16. The payoff line includes the cost to buy the swaption. The premium paid at purchase is USD 4.97 million, assuming that the quoted price is 100 bps and

the notional principal is USD 497 million. The thick line shows the payoffs on the swaption collar. It is composed of the long position in the 3.50% receiver swaption and the short position in the 5.00% payer swaption. There is a gain if the swap rate is below 3.50% and a loss if the rate is above 5.00%.

Decision-making is facilitated by breakeven numbers. It is easier to ask "do we expect the rate to be above or below a certain number" than to state a well-articulated probability distribution for the future rate. Exhibit 16 shows two breakeven rates. If the plan manager expects the swap rate to be at or below 4.16%, the receive-fixed swap is preferred. Its gains are higher than the other two derivative overlays. If the manager expects the swap rate to be above 4.16%, however, the swaption collar is attractive because the swap would be incurring a loss. At some point above 5.00%, the purchased receiver swaption is better because it limits the loss. That breakeven rate can be found by trial-and-error search. The task is to find the swap rate that generates a loss that is more than the USD 4.97 million purchase price for the receiver swaption.

Suppose the swap rate goes up to 5.07% on the date that the liabilities are measured and reported. The fair value of the written 5.00% payer swaption starts with the 30-year annuity of USD 173,950 [= (0.0507 – 0.0500) × 0.5 × USD 497,000,000]. The loss of about USD 5.33 million is the present value of that annuity, discounted at 5.07%.

$$\frac{173{,}950}{\left(1+\frac{0.0507}{2}\right)^{1}}+\frac{173{,}950}{\left(1+\frac{0.0507}{2}\right)^{2}}+\cdots+\frac{173{,}950}{\left(1+\frac{0.0507}{2}\right)^{60}}=5{,}333{,}951$$

Therefore, if the plan manager expects the swap rate to be above 5.07%, the purchased receiver swaption is preferred.

In summary, many decisions go into the LDI strategy for defined benefit pension plans. Given the assumptions that lie behind the calculations of the asset BPV and the liability BPV, including the important choice between the ABO and PBO measure of liabilities, the plan manager faces a significant duration gap. The hedging ratio—the percentage of the duration gap to close—is a key decision that might depend on the held view on future interest rates—in particular, on high-quality corporate bond yields that are used to measure the liabilities. Then, given the determined hedging ratio, the choice of derivatives overlay is made. That decision once again depends on many factors, including the view on future rates.

EXAMPLE 7

A corporation is concerned about the defined benefit pension plan that it sponsors for its unionized employees. Because of recent declines in corporate bond yields and weak performance in its equity investments, the plan finds itself to be only about 80% funded. That fact is raising concerns with its employees as well as with the rating agencies. Currently, the present value of the corporation's retirement obligations is estimated by the plan's actuarial advisers to be about USD 1.321 billion using the PBO measure of liabilities. The corporation has no plans to close the defined benefit plan but is concerned about having to report the funding status in its financial statements. The market value of its asset portfolio is USD 1.032 billion—the plan is underfunded by USD 289 million.

The pension fund's asset allocation is rather aggressive: 70% equity, 10% alternative assets, and 20% fixed income. The fund manager hopes that a recovering equity market will reverse the deficit and ultimately return the plan to a fully funded position. Still, the manager is concerned about tightening corporate spreads as the economy improves. That scenario could lead to lower discount rates that are used to calculate the present value of the liabilities and offset any gains in the stock market.

The pension plan has hired a qualified professional asset manager (QPAM) to offer advice on derivatives overlay strategies and to execute the contracts with a commercial bank. The QPAM suggests that the pension plan consider the use of interest rate derivatives to partially close the duration gap between its assets and liabilities. The actuarial advisers to the plan estimate that the effective duration of the liabilities is 9.2, so that the BPV is USD 1.215 million. The corporate sponsor requires that the manager assume an effective duration of zero on equity and alternative assets. The fixed-income portfolio consists mostly of long-term bonds, including significant holdings of zero-coupon government securities. Its effective duration is estimated to be 25.6. Taken together, the asset BPV is USD 528,384. The negative money duration gap is substantial.

The QPAM has negotiated three interest rate derivatives with the commercial bank. The first is a 30-year, 3.80% receive-fixed swap referencing three-month Libor. The swap's effective duration is +17.51 and its BPV is 0.1751 per USD 100 of notional principal. The second is a receiver swaption having a strike rate of 3.60%. The plan pays a premium of 145 bps upfront to buy the right to enter a 30-year swap as the fixed-rate receiver. The expiration date is set to match the date when the pension plan next reports its funding status. The third is a swaption collar, the combination of buying the 3.60% receiver swaption and writing a 4.25% payer swaption. The premiums on the two swaptions offset, so this is a "zero-cost" collar.

After some discussions with the rates desk at the commercial bank and a conversation with the bank's strategy group, the plan manager instructs the QPAM to select the 3.80% receive-fixed interest rate swap. Moreover, the manager chooses a hedging ratio of 75%.

1. Calculate the notional principal on the interest rate swap to achieve the 75% hedging ratio.
2. Indicate the plan manager's likely view on future 30-year swap fixed rates given the decision to choose the swap rather than the purchased receiver swaption or the swaption collar.

Solution to 1:

First calculate the notional principal needed to close the duration gap between assets and liabilities to zero using Equation 6.

$$\text{Asset BPV} + \left(\text{NP} \times \frac{\text{Swap BPV}}{100}\right) = \text{Liability BPV}$$

Asset BPV is USD 528,384; Swap BPV is 0.1751 per 100 of notional principal; and Liability BPV is USD 1.215 million.

$$528{,}384 + \left(\text{NP} \times \frac{0.1751}{100}\right) = 1{,}215{,}000;\ \text{NP} = 392{,}127{,}927$$

A 100% hedging ratio requires a receive-fixed interest rate swap having a notional principal of about USD 392 million. For a hedging ratio of 75%, the notional principal needs to be about USD 294 million (= 392 × 0.75).

Solution to 2:

The plan manager's likely view is that the 30-year swap rate will be less than 3.80%. Then the gain on the swap exceeds that of the purchased receiver swaption having a strike rate of 3.60%, as illustrated in Exhibit 16. If the view is that the swap rate will exceed 3.80%, the swaption collar would be preferred. The purchased receiver swaption will be preferred only if the swap rate is expected to be somewhat above 4.25%, the strike rate on the written payer swaption.

Notice that this rate view is also consistent with the concern about lower corporate bond yields and the relatively high hedging ratio.

6 RISKS IN LIABILITY-DRIVEN INVESTING

We have mentioned in previous sections some of the risks to LDI strategies for single and multiple liabilities. In this section, we review those risks and introduce some new ones. The essential relationship for full interest rate hedging is summarized in this expression:

$$\begin{aligned}&\text{Asset BPV} \times \Delta\text{Asset yields} + \text{Hedge BPV} \times \Delta\text{Hedge yields}\\ &\approx \text{Liability BPV} \times \Delta\text{Liability yields}\end{aligned} \tag{7}$$

ΔAsset yields, ΔHedge yields, and ΔLiability yields are measured in basis points. This equation describes an immunization strategy (a hedging ratio of 100%) whereby the intent is to match the changes in market value on each side of the balance sheet when yields change. Doing so entails matching the money duration of assets and liabilities. We know, however, that entities also choose to partially hedge interest rate risk by selecting a hedging ratio less than 100%. In any case, Equation 7 serves to indicate the source of the risks to LDI. The "approximately equals" sign (≈) in the equation results from ignoring higher-order terms such as convexity.

We encounter model risk in financial modeling whenever assumptions are made about future events and approximations are used to measure key parameters. The risk is that those assumptions turn out to be wrong and the approximations are inaccurate. For example, in the defined benefit pension plan example in Section 5, we assumed that the effective durations for investments in equity and alternative assets are zero. That assumption introduces the risk that Asset BPV is mis-measured if in fact those market values change as the yield curve shifts. The modeling problem is that the effect on those asset classes is not predictable or stable because it depends on the reason for the change in nominal interest rates. Unlike fixed-income bonds, an increase in expected inflation can have a very different effect on equity and alternative asset valuations than an increase in the real rate.

Measurement error for Asset BPV can even arise in the classic immunization strategy for Type I cash flows, which have set amounts and dates. In practice, it is common to approximate the asset portfolio duration using the weighted average of the individual durations for the component bonds. A better approach to achieve immunization, however, uses the cash flow yield to discount the future coupon and principal payments.[16] This error is minimized when the underlying yield curve is flat or when future cash flows are concentrated in the flattest segment of the curve.

A similar problem arises in measuring Hedge BPV. In Section 4.3 on using derivatives overlays to immunize, we used a common approximation for the Futures BPV. Equation 4 estimates it to be the BPV for the CTD qualifying security divided by its conversion factor. A more developed calculation involving short-term rates and accrued interest, however, could change the number of contracts needed to hedge the interest rate risk. Although the error introduced by using an approximation might not be large, it still can be a source of underperformance in the hedging strategy.

Model risk in obtaining a measure of Liability BPV is evident in the defined benefit pension plan example in Section 5. Measuring a defined benefit pension plan's liability is clearly a difficult financial modeling problem. Even the simple models for the two liability measures (the ABO and PBO) necessarily require many assumptions about

16 See also Footnotes 4 and 7.

the future, including the dates when employees retire and their wage levels at those times. The difficulty in projecting life spans of retirees covered by the pension plan leads to longevity risk. The risk is the sponsor has not provided sufficient assets to make the longer-than-expected payout stream. More, and harder-to-make, assumptions are needed to deal with Type IV liabilities and lead to greater uncertainty regarding the models' outputs.

Implicit in Equation 7 is the assumption that all yields change by the same number of basis points—that is, ΔAsset Yields, ΔHedge Yields, and ΔLiability Yields are equal. That is a strong assumption—and a source of risk—if the particular fixed-income assets, the derivatives, and the liabilities are positioned at varying points along the benchmark bond yield curve and at varying spreads to that curve. In Section 3 on immunizing the interest rate risk on a single liability by structuring and managing a portfolio of fixed-income bonds, we point out that a parallel yield curve shift is a sufficient, but not necessary, condition to achieve the desired outcome. Non-parallel shifts as well as twists to the yield curve can result in changes to the cash flow yield on the immunizing portfolio that do not match the change in the yield on the zero-coupon bond that provides perfect immunization. Minimizing dispersion of the cash flows in the asset portfolio mitigates this risk.

Generally, the framework for thinking about interest rate risk rests on changes in the benchmark bond yield curve, which usually is the yield curve for government bonds. In practice, however, ΔAsset Yields and ΔLiability Yields often refer to various classes of corporate bonds. In the example in Section 5, the pension fund holds a portfolio of fixed-income bonds that tracks a well-diversified index of corporate bonds that may include non-investment-grade securities. The present value of retirement benefits, however, depends on yields on high-quality corporate bonds. Therefore, a risk is that the respective spreads on the broad index and the high-quality sector do not move in unison with a shift in the government bond yield curve. A similar spread risk is present in Section 4.2 in the example of immunizing multiple Type I liabilities. The difference is that the assets in that example are of higher quality than the liabilities.

Spread risk also is apparent in the derivatives overlay LDI strategies. In Sections 4.3 and 4.4, we illustrated how futures contracts can be used to hedge the interest rate risk of the multiple liabilities, either passively or contingently. In particular, the futures contracts are on 10-year US Treasury notes whereas the liabilities are corporate obligations. Movements in the corporate–Treasury yield spread introduce risk to the hedging strategy. Usually, yields on high-quality corporate bonds are less volatile than on more-liquid Treasuries. Government bonds are used in a wide variety of hedging as well as speculative trading strategies by institutional investors. Also, inflows of international funds typically are placed in government bonds, at least until they are allocated to other asset classes. Those factors lead to greater volatility in Treasury yields than comparable-maturity corporate bonds.

Another source of spread risk is the use of interest rate swap overlays. In Section 5, we showed how receive-fixed swaps, purchased receiver swaptions, and swaption collars can reduce the duration gap between pension plan assets and liabilities. In that example, ΔHedge Yields refers to fixed rates on interest rate swaps referencing three-month Libor. The spread risk is between high-quality corporate bond yields and swap rates. Typically, there is less volatility in the corporate/swap spread than in the corporate/Treasury spread because both Libor and corporate bond yields contain credit risk vis-à-vis Treasuries. Therefore, one of the usual advantages to hedging corporate bond risk with interest rate swaps is that those derivatives pose less spread risk than Treasury futures contracts.

Counterparty credit risk is a concern if the interest rate swap overlays are uncollateralized, as was common before the 2008–2009 financial crisis. Suppose that the interest rate swap portrayed in Exhibit 15 does not have a collateral agreement, or Credit Support Annex (CSA), to the standard International Swaps and Derivatives

Association (ISDA) contract. The credit risk facing the pension plan is that the swap dealer defaults at a time when the replacement swap fixed rate is below 4.16%. In the same manner, the credit risk facing the dealer is that the pension plan defaults at the time when the market rate on a comparable swap is above 4.16%. Therefore, credit risk entails the joint probability of default by the counterparty and movement in market rates that results in the swap being valued as an asset.

Since the 2008–2009 financial crisis, over-the-counter derivatives increasingly include a CSA to the ISDA contract to mitigate counterparty credit risk. Collateral provisions vary. A typical CSA calls for a zero threshold, meaning that only the counterparty for which the swap has negative market value posts collateral, which usually is cash but can be highly marketable securities. The CSA can be one way (only the "weaker" counterparty needs to post collateral when the swap has negative market value from its perspective) or two way (either counterparty is obligated to post collateral when the swap has negative market value). The threshold could be positive, meaning that the swap has to have a certain negative value before collateral needs to be exchanged. Another possibility is that one or both counterparties are required to post a certain amount of collateral, called an independent amount, even if the swap has zero or positive value. This provision makes the CSA similar to the use of margin accounts with exchange-traded futures contracts.

Collateralization on derivatives used in an LDI strategy introduces a new risk factor—the risk that available collateral becomes exhausted. That risk is particularly important for the example in Section 5, in which the pension plan would need to enter a sizable derivatives overlay to even use a 50% hedging ratio, let alone to fully hedge the interest rate risk. That is because the duration gap between assets and liabilities is often large, especially for plans having a significant equity allocation. Therefore, the probability of exhausting collateral is a factor in determining the hedging ratio and the permissible range in the ratio if strategic hedging is allowed.

The same concern about cash management and collateral availability arises with the use of exchange-traded futures contracts. These contracts entail daily mark-to-market valuation and settlement into a margin account. This process requires daily oversight because cash moves into or out of the margin account at the close of each trading day. In contrast, the CSA on a collateralized swap agreement typically allows the party a few days to post additional cash or marketable securities. Also, there usually is a *minimum transfer amount* to mitigate the transactions costs for small inconsequential payments.

Asset liquidity becomes a risk factor in strategies that combine active investing to the otherwise passive fixed-income portfolios. This risk is particularly important with contingent immunization, as in the example in Section 4.4. Then, some or all of the surplus is actively managed. But if losses reduce the surplus to some minimum amount, the positions need to be sold off to revert to a passive duration matching fixed-income portfolio of high-quality bonds. One of the lessons from the 2008–2009 financial crisis is that distressed assets that become hard to value, such as tranches of subprime mortgage-backed securities, also become illiquid.

In summary, an LDI manager has a fundamental choice between managing interest rate risk with asset allocation and with derivatives overlays. As with all financial management decisions, the choice depends on a thorough evaluation of risk and return trade-offs. In some circumstances, derivatives might be deemed too expensive or risky, particularly with regard to available collateral and cash holdings. Then the manager might choose to increase holdings of long-term, high-quality bonds that have high duration statistics. The growth of government zero-coupon bonds, such as US Treasury STRIPS (Separate Trading of Registered Interest and Principal of Securities), facilitates that asset reallocation process.

EXAMPLE 8

A derivatives consultant, a former head of interest rate swaps trading at a major London bank, is asked by a Spanish corporation to devise an overlay strategy to "effectively defease" a large debt liability. That means that there are dedicated assets to retire the debt even if both assets and the liability remain on the balance sheet. The corporation currently has enough euro-denominated cash assets to retire the bonds, but its bank advises that acquiring the securities via a tender offer at this time will be prohibitively expensive.

The 10-year fixed-rate bonds are callable at par value in three years. This is a one-time call option. If the issuer does not exercise the option, the bonds are then non-callable for the remaining time to maturity. The corporation's CFO anticipates higher benchmark interest rates in the coming years. Therefore, the strategy of investing the available funds for three years and then calling the debt is questionable because the embedded call option might be "out of the money" when the call date arrives. Moreover, it is likely that the cost to buy the bonds on the open market at that time will still be prohibitive.

The corporation has considered a cash flow matching approach by buying a corporate bond having the same credit rating and a call structure (call date and call price) close to the corporation's own debt liability. The bank working with the CFO has been unable to identify an acceptable bond, however. Instead, the bank suggests that the corporation buy a 10-year non-callable, fixed-rate corporate bond and use a swaption to mimic the characteristics of the embedded call option. The idea is to transform the callable bond (the liability) into a non-callable security synthetically using the swaption. Then the newly purchased non-callable bond "effectively" defeases the transformed "non-callable" debt liability.

To confirm the bank's recommendation for the derivatives overlay, the CFO turns to the derivatives consultant, asking if the corporation should (1) buy a payer swaption, (2) buy a receiver swaption, (3) write a payer swaption, or (4) write a receiver swaption. The time frames for the swaptions correspond to the embedded call option. They are "3y7y" contracts, an option to enter a seven-year interest rate swap in three years. The CFO also asks the consultant about the risks to the recommended swaption position.

1. Indicate the swaption position that the derivatives consultant should recommend to the corporation.
2. Indicate the risks in using the derivatives overlay.

Solution to 1:

The derivatives consultant should recommend that the corporation choose the fourth option and write a receiver swaption—that is, an option that gives the swaption buyer the right to enter into a swap to receive fixed and pay floating. When the corporation issued the callable bond, it effectively bought the call option, giving the corporation the flexibility to refinance at a lower cost of borrowed funds if benchmark rates and/or the corporation's credit spread narrows. Writing the receiver swaption "sells" that call option, and the corporation captures the value of the embedded call option by means of the premium received. Suppose that market rates in three years are higher than the strike rate on the swaption and the yield on the debt security. Then both options—the embedded call option in the bond liability, as well as the swaption—expire out of the money. The asset and liability both have seven years until maturity and are non-callable. Suppose instead that market rates fall and bond prices go up. Both options

are now in the money. The corporation sells the seven-year bonds (the assets) and uses the proceeds to call the debt liabilities at par value. The gain on that transaction offsets the loss on closing out the swaption with the counterparty.

Solution to 2:

Potential risks to using swaptions include (1) credit risk if the swaption is not collateralized, (2) "collateral exhaustion risk" if it is collateralized, and (3) spread risk between swap fixed rates and the corporation's cost of funds. First, suppose the receiver swaption is not collateralized. In general, the credit risk on an option is unilateral, meaning that the buyer bears the credit risk of the writer. That unilateral risk assumes the premium is paid in full upon entering the contract; in other words, the buyer has met their entire obligation. Therefore, the corporation as the swaption writer would have no additional credit exposure to the buyer. Second, assume that the swaption is collateralized. As the writer of the option, the corporation would need to regularly post cash collateral or marketable securities with either the counterparty or a third-party clearinghouse. The risk is that the corporation exhausts its available cash or holdings of marketable securities and cannot maintain the hedge. Spread risk arises because the value of the embedded call option in three years depends on the corporation's cost of funds at that time, including its credit risk. The value of the swaption depends only on seven-year swap fixed rates at that time. In particular, the risk is that the corporate/swap spread widens when benchmark rates are low and both options can be exercised. If the corporate spread over the benchmark rate goes up, the gain in the embedded call option is reduced. If the swap spread over the same benchmark rate goes down, the loss on the swaption increases. Fortunately, corporate and swap spreads over benchmark rates are usually positively correlated, but still the risk of an unexpected change in the spread should be identified.

7 BOND INDEXES AND THE CHALLENGES OF MATCHING A FIXED-INCOME PORTFOLIO TO AN INDEX

Though the need to offset liabilities through immunization requires a specific bond portfolio, many investors seek a broader exposure to the fixed-income universe. These investors may be attracted to the risk versus return characteristics available in bond markets, or they may seek to allocate a portion of their investable assets to fixed income as part of a well-diversified multi-asset portfolio. In either case, an investment strategy based on a bond market index offers an investor the ability to gain broad exposure to the fixed-income universe. Index-based investments generally offer investors the possibility of greater diversification and lower fees as well as avoiding the downside risk from seeking positive excess returns over time from active management.

An investor seeking to offset a specific liability through immunization gauges the success of his strategy based on how closely the chosen bonds offset the future liability or liabilities under different interest rate scenarios. In contrast, an investor seeking to match the returns of a bond market index will gauge an investment strategy's success in terms of how closely the chosen market portfolio mirrors the return of the underlying bond market index. Deviation of returns on the selected portfolio from bond market index returns are referred to as **tracking risk** or tracking error. Kenneth Volpert (2012) identifies several methods investors use to match an underlying market

index.[17] The first of these is **pure indexing**, in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk. The purchase of all securities within an index is known as the **full replication approach**. In **enhanced indexing strategy**, the investor purchases fewer securities than the full set of index constituents but matches primary risk factors (discussed later) reflected in the index. This strategy aims to replicate the index performance under different market scenarios more efficiently than the full replication of a pure indexing approach. **Active management** involves taking positions in primary risk factors that deviate from those of the index in order to generate excess return.

Casual financial market observers usually refer to an equity market index to gauge overall financial market sentiment. Examples often consist of a small set of underlying securities, such as the Dow Jones Industrial Average of 30 US stocks, the CAC 40 traded on Euronext in Paris, or the 50 constituent companies in the Hang Seng Index, which represent more than half the market capitalization of the Hong Kong stock market. When bond markets are mentioned at all, the price and yield of the most recently issued benchmark government bond is typically referenced rather than a bond market index. This contrast reflects the unwieldy nature of bond markets for both the average investor and financial professionals alike.

Although rarely highlighted in the financial press, investments based on bond market indexes form a very substantial proportion of financial assets held by investors. Fixed-income markets have unique characteristics that make them difficult to track, and investors therefore face significant challenges in replicating a bond market index. These challenges include the size and breadth of bond markets, the wide array of fixed-income security characteristics, unique issuance and trading patterns of bonds versus other securities, and the effect of these patterns on index composition and construction, pricing, and valuation. We will tackle each of these issues and their implications for fixed-income investors.

Fixed-income markets are much larger and broader than equity markets. According to the Global McKinsey Institute, global financial instruments reached a total value of USD 212 trillion in 2010, with nearly three-quarters of this total consisting of fixed-income instruments and loans, whereas only USD 54 trillion were equity securities.[18] In addition to the relative size of market capitalization between debt and equity, the number of fixed-income securities outstanding is vastly larger as reflected in broad market indexes. For instance, the MSCI World Index, capturing equities in 23 developed market countries and 85% of the available market capitalization in each market, consists of 1,642 securities, whereas the Bloomberg Barclays Global Aggregate Index, covering global investment-grade debt from 24 local currency markets, consists of more than 16,000 securities. Those fixed-income issuers represent a much wider range of borrowers than the relatively narrow universe of companies issuing equity securities. For example, the oldest and most widely recognized US bond market index, the Bloomberg Barclays US Aggregate Index (one of four regional aggregate benchmarks that constitute the Bloomberg Barclays Global Aggregate Index), includes US Treasuries, government agency securities, corporate bonds, mortgage-backed securities, asset-backed securities, and commercial mortgage-backed securities. Although the large number of index constituents provides a means of risk diversification, in practice it is neither feasible nor cost-effective for investors to pursue a full replication approach with a broad fixed-income market index.

17 Volpert (2012).

18 Roxburgh, Lund, and Piotrowski (2011, p, 2), based on a sample of 79 countries.

Different maturities, ratings, call/put features, and varying levels of security and subordination give rise to a much wider array of public and private bonds available to investors. Exhibit 17 illustrates the number of publicly traded fixed-income and equity securities outstanding for a select group of major global issuers.

Exhibit 17 Debt and Equity Securities Outstanding for Select Issuers

Issuer	Fixed-Income Securities	Common Equity Securities	Preferred Equity Securities
Royal Dutch Shell PLC	39	1	0
BHP Billiton Limited	36	1	0
Johnson & Johnson	26	3	0
Ford Motor Company	243	2	0

Source: Bloomberg as of 28 February 2015.

At the end of 2015, Royal Dutch Shell had 39 bonds outstanding across four currencies, some of which were both fixed and floating rate, with a range of maturities from under a year to bonds maturing in 2045. The existence of many debt securities for a particular issuer suggests that many near substitutes may exist for an investor seeking to pursue an enhanced index strategy. That said, the relative liquidity and performance characteristics of those bonds may differ greatly depending on how recently the bond was issued and how close its coupon is to the yield currently required to price the bond at par.

Unlike equity securities, which trade primarily over an exchange, fixed-income markets are largely over-the-counter markets that rely on broker/dealers as principals to trade in these securities using a quote-based execution process rather than the order-based trading systems common in equity markets. The traditional over-the-counter trading model in fixed-income markets has changed since the 2008 financial crisis.[19] The rising cost of maintaining risk-weighted assets on dealer balance sheets as a result of Basel III capital requirements has had an adverse effect on fixed-income trading and liquidity for a number of reasons. Broker/dealers have reduced bond inventories because of higher capital costs. With lower trading inventories, dealers have both a limited appetite to facilitate trading at narrow bid–offer spreads and are less willing to support larger "block" trades, preferring execution in smaller trade sizes. Finally, a significant decline in proprietary trading among dealers has had a greater pricing effect on less liquid or "off-the-run" bonds. Although many see these structural changes in fixed-income trading acting as a catalyst for more electronic trading, this trend will likely be most significant for the most liquid fixed-income securities in developed markets, with a more gradual effect on less frequently traded fixed-income securities worldwide.

Although fixed-income trading in many markets is difficult to track, in the United States, the world's largest global bond market, regulators developed a vehicle known as the Trade Reporting and Compliance Engine (TRACE) to facilitate mandatory reporting of over-the-counter transactions in eligible fixed-income securities starting in 2001. All broker/dealers that are Financial Industry Regulatory Authority (FINRA) member firms must report corporate bond transactions within 15 minutes of occurrence. Analysis of TRACE trading data demonstrates the distinct nature of

19 McKinsey & Company and Greenwich Associates, *Corporate Bond E-Trading: Same Game, New Playing Field*, August 2013.

fixed-income trading versus equities. For example, in 2012, 38% of the 37,000 TRACE-eligible fixed-income securities did not trade at all, with another 23% trading only a few times during the year, compared with the 1% that traded every business day, according to MarketAxess, a leading electronic trading provider.[20] It is also important to note that the average trade size in dollar terms in the US investment-grade bond market is roughly 70 times the size of the average stock trade.

The illiquid nature of most fixed-income instruments gives rise to pricing and valuation challenges for asset managers. For fixed-income instruments that are not actively traded and therefore do not have an observable price, it is common to use an estimation process known as **matrix pricing** or **evaluated pricing**. Matrix pricing makes use of observable liquid benchmark yields such as Treasuries of similar maturity and duration as well as the benchmark spreads of bonds with comparable times to maturity, credit quality, and sector or security type in order to estimate the current market yield and price. In practice, asset managers will typically outsource this function to a global custodian or external vendor. This estimation analysis is another potential source of variation between index performance and portfolio returns.

The complexity of trading and valuing individual fixed-income securities further underscores the challenges associated with managing an index-based bond portfolio. Early bond indexes, such as those from Standard & Poor's and Citigroup dating back to the 1920s, simply measured the average yield of corporate bonds. Not until the significant advances in computing power of the 1970s did the first broad-based, rate of return–based fixed-income index (now known as the Bloomberg Barclays US Aggregate Index) come into being.[21] Fixed-income indexes change frequently as a result of both new debt issuance and the maturity of outstanding bonds. Bond index eligibility is also affected by changes in ratings and bond callability. As a result, rebalancing of bond market indexes usually occurs monthly rather than semi-annually or annually as it does for equity indexes. Fixed-income investors pursuing a pure indexing strategy therefore must also incur greater transaction costs associated with maintaining a bond portfolio consistent with the index.

Given the significant hurdles involved in bond index matching, asset managers typically seek to target the primary risk factors present in a fixed-income index through a diversified portfolio. Volpert (2012) summarized these primary indexing risk factors as follows:[22]

- **Portfolio modified adjusted duration.** Effective duration, or the sensitivity of a bond's price to a change in a benchmark yield curve, is an important primary factor as a first approximation of an index's exposure to interest rate changes. It is important to factor in option-adjusted duration so that the analysis reflects securities with embedded call risk. Larger rate moves should incorporate the second-order convexity adjustment to increase accuracy.
- **Key rate duration.** Although effective duration may be a sufficient measure for small rate changes and parallel yield curve shifts, the **key rate duration** takes into account rate changes in a specific maturity along the yield curve while holding the remaining rates constant. This measure of duration gauges the index's sensitivity to non-parallel yield curve shifts. By effectively matching the key rate durations between the portfolio and the underlying index, a manager can significantly reduce the portfolio's exposure to changes in the yield curve.

20 McKinsey & Company and Greenwich Associates (2013, pp. 10–11).
21 The index was created in 1973 by Lehman Brothers, and its sale to Bloomberg LP was announced in December 2015.
22 This section is derived from Volpert (2012, pp. 1133–1138).

- **Percent in sector and quality.** Index yield is most effectively matched by targeting the same percentage weights across fixed-income sectors and credit quality, assuming that maturity parameters have also been met.
- **Sector and quality spread duration contribution.** The portfolio manager can minimize deviations from the benchmark by matching the amounts of index duration associated with the respective issuer sectors and quality categories. The former refers to the issuer type and/or industry segment of the bond issuer. In the case of the latter, the risk that a bond's price will change in response to an idiosyncratic rate move rather than an overall market yield change is known as spread risk. For non-government fixed-income securities, we separate the yield to maturity into a benchmark yield (typically the most recently issued or on-the-run government bond with the closest time to maturity) and a spread reflecting the difference between the benchmark yield and the security-specific yield. **Spread duration** refers to the change in a non-Treasury security's price given a widening or narrowing of the spread compared with the benchmark. Matching the relative quality between the portfolio and the fixed-income index will minimize this risk.
- **Sector/coupon/maturity cell weights.** Asset managers face a number of challenges in matching price/yield sensitivity beyond the use of effective duration. Although convexity is a useful second-order condition that should be used to improve this approximation, the negative convexity of callable bonds may distort the call exposure of an index and lead to costly rebalancing when rates shift. As a result, managers should seek to match the sector, coupon, and maturity weights of callable bonds by sector. Doing so is particularly important in the mortgage sector because of the refinancing of high-coupon securities with lower-coupon bonds.
- **Issuer exposure.** Concentration of issuers within a portfolio exposes the asset manager to issuer-specific event risk. The manager should therefore seek to match the portfolio duration effect from holdings in each issuer.

Another method used to address a portfolio's sensitivity to rate changes along the yield curve is referred to as the **present value of distribution of cash flows methodology**. This approach seeks to approximate and match the yield curve risk of an index over discrete time periods referred to as cash flow vertices, and it involves several steps as follows:

1. The manager divides the cash flows for each non-callable security in the index into discrete semi-annual periods, aggregates them, and then adds the cash flows for callable securities in the index based on the probability of call for each given period.
2. The present value of aggregated cash flows for each semi-annual period is computed, with the total present value of all such aggregated cash flows equal to the index's present value. The percentage of the present value of each cash flow vertex is calculated.
3. The time period is then multiplied by the present value of each cash flow. Because each cash flow represents an effective zero-coupon payment in the corresponding period, the time period reflects the duration of each cash flow. For example, the third period's contribution to duration might be 1.5 years × 3.0%, or 0.045.
4. Finally, each period's contribution to duration is added to arrive at a total representing the bond index's duration. The portfolio being managed will be largely protected from deviations from the benchmark associated with yield curve changes by matching the percentage of the portfolio's present value that comes due at specific points in time with that of the index.

The goal of matching these primary indexing risk factors is to minimize the difference between a given portfolio's return and that of an underlying benchmark index, known as **tracking error**. Tracking error is defined as the standard deviation of a portfolio's active return for a given period, whereby active return is defined as follows:

Active return = Portfolio return – Benchmark index return

If we assume that returns are normally distributed around the mean, then from a statistical perspective, 68% of those returns will lie within one standard deviation of the mean. Therefore, if a fund's tracking error is 50 bps, then for approximately two-thirds of the time period observations, we would expect the fund's return to be less than 50 bps above or below the index's return.

EXAMPLE 9

Cindy Cheng, a Hong Kong–based portfolio manager, has established the All Asia Dragon Fund, a fixed-income fund designed to outperform the Markit iBoxx Asian Local Bond Index (ALBI). The ALBI tracks the total return performance of liquid bonds denominated in local currencies in China, Hong Kong, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand. The index includes both sovereign and non-government bond issues, with constituent selection criteria by country as well as country weights designed to balance the desire for liquidity and stability.[23]

Individual bond weightings are based on market capitalization, and country weightings, reviewed annually, are designed to reflect the investability of developing Asian local currency bonds available to international investors. These weights are driven by local market size and market capitalization, secondary bond market liquidity, accessibility to foreign investors, and development of infrastructure that supports fixed-income investment and trading such as credit ratings, yield curves, and derivative products.

Given the large number of bonds in the index, Cheng uses a representative sample of the bonds to construct the fund. She chooses bonds so that the fund's duration, country weightings, and sector/quality percentage weights closely match the ALBI. Given the complexity of managing bond investments in these local markets, Cheng is targeting a 1.25% tracking error for the fund.

1. Interpret Cheng's tracking error target for the All Asia Dragon Fund
2. One of Cheng's largest institutional investors has encouraged her to reduce tracking error. Suggest steps Cheng could take to minimize this risk in the fund.

Solution to 1:

The target tracking error of 1.25% means that assuming normally distributed returns, in 68% or two-thirds of time periods, the All Asia Dragon Fund should have a return that is within 1.25% of the ALBI.

Solution to 2:

Cheng could further reduce tracking error beyond her choice of duration, country, and sector/quality weightings to mirror the index by using the present value of distribution of cash flows methodology outlined earlier. By doing so, she can better align the contribution to portfolio duration that comes from each country, sector, and issuer type based on credit quality.

23 Markit iBoxx ALBI™ Index Guide, January 2016, Markit Ltd.

Cheng should consider matching the amount of index duration that comes from each sector, as well as matching the amount of index duration that comes from various quality categories across government and non-government bonds, to minimize tracking error.

Finally, Cheng should evaluate the portfolio duration coming from each issuer to minimize event risk. Again, this evaluation should occur on a duration basis rather than as a percentage of market value to quantify the exposure more accurately versus the benchmark ALBI.

8 ALTERNATIVE METHODS FOR ESTABLISHING PASSIVE BOND MARKET EXPOSURE

Why is passive bond market exposure attractive for investors? A **passive investment** in the fixed-income market may be defined as one that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view. This approach is consistent with the efficient markets hypothesis in that the portfolio manager seeks to simply replicate broader fixed-income market performance rather than outperform the market. Stated differently, establishing passive bond market exposure does not require the in-depth analysis necessary to achieve an above-market return nor does it require the high trading frequency of active management, which should lead to lower costs for managing and servicing a portfolio. Finally, the stated goal of matching the performance of a broad-based bond index is consistent with the highest degree of portfolio diversification.

Several methods exist for establishing a passive bond market exposure. In what follows, we will explore both full index replication as well as an enhanced indexing strategy and compare the risks, costs, and relative liquidity of these strategies when applied to the bond market.

Bond market index replication is the most straightforward strategy that a manager can use to mimic index performance. Use of full replication reflects the belief or expectation that an active manager cannot consistently outperform the index on a risk-adjusted basis. Initial index replication does not require manager analysis but rather involves sourcing a wide range of securities in exact proportion to the index, many of which may be thinly traded. The manager's ongoing task under full replication is to purchase or sell bonds when there are changes to the index in addition to managing inflows and outflows for a specific fund. For example, the manager may have to sell when a security no longer meets the index criteria, such as when a security either matures or is downgraded.[24] On the other hand, managers must purchase newly issued securities that meet index criteria to maintain full replication, which, depending on the index, may occur quite frequently. Rolling bond maturities, as well as frequent new issuance eligible for inclusion in the index, drive a monthly rebalancing for most fixed-income indexes. The number of purchases and sales required to maintain an exact proportional allocation would be very significant for most bond indexes. As a result, although the large number of index constituents may well provide the best means of risk diversification, in practice it is neither feasible nor cost-effective for investors to pursue full replication for broad-based fixed-income indexes.

24 For the Bloomberg Barclays US Aggregate Bond Index, a fixed-income security becomes ineligible when it either has a maturity of less than one year or is downgraded below the minimum rating (Baa3, BBB–, and BBB– for Moody's Investors Service, Standard & Poor's, and Fitch Ratings, respectively). https://index.barcap.com.

Many limitations of the full replication approach are addressed by an enhanced indexing strategy. This approach's goal is to mirror the most important index characteristics and still closely track index performance over time while purchasing fewer securities. This general approach is referred to as a **stratified sampling** or **cell approach** to indexing. First, each cell or significant index portfolio characteristic is identified and mapped to the current index. Second, the fixed-income portfolio manager identifies a subset of bonds or bond-linked exposures, such as derivatives, with characteristics that correspond to the index. Finally, the positions in each cell are adjusted over time given changes to the underlying index versus existing portfolio positions. For example, say a fixed-income index contains 1,000 fixed-income securities, 10% of which are AAA rated. The portfolio manager might choose five to 10 AAA rated securities within a cell in order to mimic the performance of the AAA rated bonds within the index.

Enhanced indexing is also of critical importance to investors who consider environmental, social, or other factors when selecting a fixed-income portfolio. **Environmental, social, and corporate governance (ESG)**, also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.[25] For example, ESG investors may shun entire sectors such as alcohol-related, gambling, or tobacco companies, or alternatively, they may evaluate underlying issuers based on non-financial criteria such as their adherence to environmental, human rights, or labor standards.

Volpert (2012) outlines a number of enhancement strategies available to portfolio managers seeking to reduce the component of tracking error associated with the expenses and transactions costs of portfolio management as follows:[26]

- **Lower cost enhancements.** The most obvious enhancement is in the area of cost reduction, whether this involves minimizing fund expenses or introducing a more competitive trading process to reduce the bid–offer cost of trading.
- **Issue selection enhancements.** The use of bond valuation models to identify specific issues that are undervalued or "cheap" to their implied value provides another opportunity to enhance return.
- **Yield curve enhancements.** The use of analytical models to gauge and calculate relative value across the term structure of interest rates allows managers to develop strategies to both overweight maturities that are considered undervalued and underweight those that appear to be richly priced.
- **Sector/quality enhancements.** This strategy involves overweighting specific bond and credit sectors across the business cycle to enhance returns. Other sectors are underweighted as a result. This approach may tilt exposure toward corporates given a greater yield spread per unit of duration exposure or shorter maturities or it may over- or underweight specific sectors or qualities based on analysis of the business cycle.

For example, a manager may increase her allocation to Treasuries over corporates when significant spread widening is anticipated, or reverse this allocation if spread narrowing is deemed more likely.

- **Call exposure enhancements.** Because effective duration is a sufficient risk measure only for relatively small rate changes, anticipated larger yield changes may affect bond performance significantly, especially when a bond shifts from trading to maturity to trading to an earlier call date. Large expected yield changes increase the value of call protection, and any significant differences

25 See Hayat and Orsagh (2015).
26 Volpert (2012), pp. 1138–1145.

from index exposure should incorporate potentially large tracking risk implications, as well as the implicit market view that this difference implies. For example, an anticipated drop in yields might cause a callable bond to shift from being priced on a yield-to-maturity basis to a yield-to-call basis. Callable fixed-income securities (priced on a yield-to-call basis) trading above par tend to be less price sensitive for a given effective duration than those priced on a yield-to-maturity basis, suggesting a manager should use metrics other than effective duration in this case when changing exposure.

The stratified sampling approach provides an asset manager the ability to optimize portfolio performance across these characteristics with fewer securities than would be required through full index replication. By matching portfolio performance as closely as possible, investment managers also seek to minimize tracking error, limit the need to purchase or sell thinly traded securities, and/or frequently rebalance the portfolio as would be required when precisely matching the index.

EXAMPLE 10

Adelaide Super, a superannuation fund, offers a range of fixed interest (or fixed-income) investment choices to its members. Superannuation funds are Australian government-supported arrangements for Australian workers to save for retirement, which combine a government-mandated minimum percentage of wages contributed by employers with a voluntary employee contribution that offers tax benefits. Superannuation plans are similar to defined contribution plans common in the United States, Europe, and Asia.

Three of the bond fund choices Adelaide Super offers are as follows:

- **Dundee Australian Fixed-Income Fund.** The investment objective is to outperform the Bloomberg AusBond Composite Index in the medium to long term. The index includes investment-grade fixed-interest bonds with a minimum of one month to maturity issued in the Australian debt market under Australian law, including the government, semi-government, credit, and supranational/sovereign sectors. The index includes AUD-denominated bonds only. The investment strategy is to match index duration but add value through fundamental and model-driven return strategies.
- **Newcastleton Australian Bond Fund.** The fund aims to outperform the Bloomberg AusBond Composite Index over any three-year rolling period, before fees, expenses, and taxes, and uses multiple strategies such as duration, curve positioning, and credit and sector rotation rather than one strategy, allowing the fund to take advantage of opportunities across fixed-income markets under all market conditions.
- **Paisley Fixed-Interest Fund.** The fund aims to provide investment returns after fees in excess of the fund's benchmark, which is the Bloomberg AusBond Bank Bill Index and the Bloomberg AusBond Composite Index (equally weighted) by investing in a diversified portfolio of Australian income-producing assets. Paisley seeks to minimize transaction costs via a buy-and-hold strategy, as opposed to active management. The AusBond Bank Bill Index is based on the bank bill market, which is the short-term market (90 days or less) in which Australian banks borrow from and lend to one another via bank bills.

Rank the three fixed-income funds in order of risk profile, and suggest a typical employee for whom this might be a suitable investment.

Solution:

The Paisley Fixed-Interest Fund represents the lowest risk of the three fund choices, given both its choice of underlying bond index (half of which is in short-term securities) and lack of active management strategies. The Paisley Fund could be a suitable choice for an investor near retirement who is seeking income with a minimum risk profile.

The Dundee Fund represents a medium risk profile given the choice of the composite benchmark and suggests an enhanced approach to indexing. This fund may be the best choice for a middle-aged worker seeking to add a fixed-income component with moderate risk to his portfolio.

The Newcastleton Fund has the highest risk of the three choices and is an example of an actively managed fund that has a mandate to take positions in primary risk factors such as duration and credit that deviate from those of the index in order to generate excess return. This fund could be an appropriate choice for a younger worker who is seeking exposure to fixed income but willing to accommodate higher risk.

Investment managers have several alternatives to investing directly in fixed-income securities in order to seek a passive index-based exposure, including indirectly through a bond mutual fund or a fixed-income exchange-traded fund (ETF), as well as through synthetic means such as index-based total return swaps. In considering direct versus indirect investments, the asset manager must weigh the ongoing fees associated with mutual funds and ETFs against the bid–offer cost of direct investment in the underlying securities in the index. In addition, the asset manager can target individual issuers, maturities, and other characteristics in order to meet specific requirements, and the manager faces known interest and principal cash flows as long as the bond is not called or the issuer does not default through the stated maturity date. The indirect alternatives introduce a tradeoff between greater cost and diversification, as well as other factors outlined as follows.

Mutual funds are pooled investment vehicles whose shares or units represent a proportional share in the ownership of the assets in an underlying portfolio. In the case of open-ended mutual funds, new shares may be redeemed or issued at the fund's **net asset value** (NAV) established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding. Mutual fund purchases or sales received after a pre-specified cutoff time take place at the NAV on the following business day.

Open-ended bond mutual funds have several additional characteristics that distinguish them from direct investment in fixed-income instruments. The benefit from economies of scale is usually the overriding factor for smaller investors in their choice of a bond mutual fund over direct investment. Because bonds often trade at a minimum lot size of USD 1 million or higher per bond, successful replication of a broad index could easily require hundreds of millions of dollars in investments. Therefore, the additional cost in terms of an upfront load in some instances and an annual management fee may be well worth the greater diversification achievable across fixed-income markets within a larger fund. Although investors benefit from increased diversification, the fund must outline its stated investment objectives and periodic fees, but actual securities holdings are available only on a retroactive basis. Unlike the underlying securities, the bond mutual fund has no maturity date, as the fund manager continuously purchases and sells bonds to track index performance, and monthly interest payments fluctuate based on fund holdings. Finally, although many funds have early redemption penalties for investors who choose to liquidate

within 90 days of share purchase, bond mutual fund investors enjoy the advantage of being able to redeem holdings at the fund's NAV rather than facing a need to sell illiquid positions.

Exchange-traded funds share some mutual fund characteristics but have more tradability features. ETFs solicit broker/dealers, referred to as **authorized participants**, who enter into an agreement with the distributor of the fund, purchasing shares from or selling ETF shares to the fund in what are known as **creation units**—large blocks of ETF shares often traded against a basket of underlying securities. Authorized participants may invest longer-term in the ETF, or they may act as market makers by exchanging creation units with underlying bonds to provide liquidity and ensure the intraday price is a close approximation of the NAV.

Investors benefit from greater bond ETF liquidity versus mutual funds given their availability to be purchased or sold throughout the trading day at a discount or premium relative to the NAV of the underlying bonds. A significant spread between the market price of the underlying fixed-income securities portfolio and an ETF's NAV should drive an authorized participant to engage in arbitrage to profit from a divergence between the two prices. That said, the fact that many fixed-income securities are either thinly traded or not traded at all might allow such a divergence to persist to a much greater degree for a bond ETF than might be the case in the equity market.

Synthetic strategies provide another means of gaining exposure to an index. As in the case of portfolio immunization outlined earlier, both over-the-counter and exchanged-traded alternatives are available to portfolio managers in managing index exposure. Over-the-counter solutions entail customized arrangements between two counterparties that reference an underlying market price or index, and exchange-traded products involve financial instruments with standardized terms, documentation, and pricing traded on an organized exchange.

A **total return swap** (TRS) is the most common over-the-counter portfolio derivative strategy, combining elements of interest rate swaps and credit derivatives. Similar to an interest rate swap, a total return swap involves the periodic exchange of cash flows between two parties for the life of the contract. Unlike an interest rate swap, in which counterparties exchange a stream of fixed cash flows versus a floating-rate benchmark such as Libor (the London Interbank Offered Rate) to transform fixed assets or liabilities to a variable exposure, a TRS has a periodic exchange based on a reference obligation that is an underlying equity, commodity, or bond index. Exhibit 18 outlines the most basic TRS structure. The **total return receiver** receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread. The **total return payer** is responsible for paying the reference obligation cash flows and return to the receiver but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Exhibit 18 Total Return Swap Mechanics

The TRS transaction is an over-the-counter derivative contract based on an ISDA master agreement. This contract specifies a notional amount, periodic cash flows, and final maturity, as well as the credit and other legal provisions related to the transaction. The historical attractiveness of using TRS stemmed from the efficient risk transfer on the reference obligation from one counterparty to another on a confidential basis without requiring the full cash outlay associated with the mutual fund or ETF purchase. In fact, another way to think of the TRS is as a synthetic secured financing transaction in which the investor (the total return receiver) benefits from more-advantageous funding terms faced by a dealer (typically the total return payer) offering to facilitate the transaction.

The potential for both a smaller initial cash outlay and lower swap bid–offer costs, when compared with the transaction costs of direct purchase or use of a mutual fund or ETF, are the most compelling reasons to consider a TRS to add fixed-income exposure. That said, several considerations may offset these benefits in a number of instances. First, the investor does not legally own the underlying assets but rather has a combined synthetic long position in both the market and credit risk of the index that is contingent upon the performance of the total return payer. Given the shorter nature of these contracts compared with an investor's typical longer-term time horizon, the total return receiver must both perform the necessary credit due diligence on its counterparty and also face the rollover risk upon maturity of having the ability to renew the contract with reasonable pricing and business terms in the future. Second, as a funding cost arbitrage transaction, the TRS can allow investors to gain particular access to subsets of the fixed-income markets, such as bank loans or high-yield instruments for which cash markets are relatively illiquid or the cost and administrative complexity of maintaining a portfolio of these instruments is prohibitive for the investor. Finally, structural changes to the market, greater regulatory oversight of derivatives markets, and changes to Basel III capital rules affecting dealers have raised the cost and operational burden of these transactions. The need to collateralize mark-to-market positions significantly increases the operational risks of TRS, including more-frequent collateralization within a $T + 1$ timeframe, or shorter, as well as the need for expertise in execution and settlement.[27]

The availability of exchange-traded interest rate products continues to evolve with the shifting market landscape and changes in investor demand. For many years, the most prevalent liquid interest rate futures and option contracts available on global futures exchanges such as Eurex, the Intercontinental Exchange, and the Chicago Mercantile Exchange were limited to individual fixed-income securities. Examples include money market instruments such as Eurodollar futures and options contracts, as well as contracts on longer-term government securities such as US Treasuries, gilts, and German bunds in specific benchmark maturities. As for exchange-traded derivatives on debt indexes, this type of instrument only became legal in the United States in 2006, as the US Commodity Futures Trading Commission (CFTC) and the US Securities and Exchange Commission (SEC) issued joint final rules permitting the trading of futures on debt indexes.[28] Although the over-the-counter use of total return swaps on debt indexes continues, the use of exchange-traded futures on debt indexes has proven less popular, and the CME Group delisted its Barclays US Aggregate Bond Index contract in June 2015.[29] Other exchanges have been slow to adopt such instruments. Similarly, although the launch of ETF futures on equity indexes at the CME Group in 2005 marked a shift toward these instruments to gain broad-based

27 Aakko and Martel (2013).
28 US Commodity Futures Trading Commission, Press Release PR5195-06, CFTC and SEC Issue Rules for Trading Futures on Debt Security Index Contracts, 10 July 2006, available at www.cftc.gov and www.sec.gov.
29 CME Group, Advisory Notice #15-156, Product Modification Summary: Delist Barclays US Aggregate Bond Index Contracts, 8 June 2015, available at www.cmegroup.com

index exposure, the exchange stopped listing new ETF contracts in 2010 in response to a lack of liquidity in these instruments.[30] In contrast to futures market developments, the exchange-traded options market for interest rate–related ETFs remains active. As of the end of 2015, the Chicago Board Options Exchange offered options with physical settlement and American-style exercise on a range of interest rate ETFs across Treasury funds, high-yield, investment grade corporate, and inflation-protected securities.[31] Frequent changes in the availability of specific exchange-traded derivative instruments on fixed-income indexes make it challenging for investors to rely on such strategies, versus an over-the-counter hedge, over time.

9 BENCHMARK SELECTION

The choice of a benchmark is perhaps an investment manager's most important decision beyond the passive versus active decision or the form that the investment takes, as described earlier. Benchmark selection is one of the final steps in the broader asset allocation process.

The asset allocation process starts with a clear delineation of the portfolio manager's investment goals and objectives. Examples of such goals might include the protection of funds (especially against inflation), broad market replication, predictable returns within acceptable risk parameters, or maximum absolute returns through opportunistic means. The manager must agree on an investment policy with the asset owners, beneficiaries, and other constituents outlining return objectives, risk tolerance, and constraints to narrow choices available in the broader capital markets to meet these objectives. A **strategic asset allocation** targeting specific weightings for each permissible asset class is the result of this process, while a **tactical asset allocation** range often provides the investment manager some short-term flexibility to deviate from these weightings in response to anticipated market changes.

Bonds figure prominently in most asset allocations given that they represent the largest fraction of global capital markets, capture a wide range of issuers and, as borrowed funds, represent claims that should theoretically involve lower risk than common equity. Choosing a fixed-income benchmark is unique, however, in that the investor usually has some degree of fixed-income exposure embedded within its asset/liability portfolio, as outlined in the foregoing immunization and liability-driven investing examples. The investment manager must therefore consider these implicit or explicit duration preferences when choosing a fixed-income benchmark.

Benchmark selection must factor in the broad range of issuers and characteristics available in the fixed-income markets. In general, the use of an index as a widely accepted benchmark requires clear, transparent rules for security inclusion and weighting, investability, daily valuation and availability of past returns, and turnover. Unlike in equity indexes, fixed-income market dynamics can drive deviation from a stable benchmark sought by investors for a number of reasons. First, the finite maturity of bonds in a static portfolio implies that duration will drift downward over time. Second, market dynamics and issuer preferences tend to dictate both issuer composition for broad-based indexes as well as maturity selection for narrower indexes. For example, as shown in Exhibit 19, the composition of the Bloomberg Barclays US Aggregate Bond Index changed significantly during the years prior to and after the 2008 financial crisis, with a large increase in securitized debt pre-crisis and a significant rise in government debt thereafter:

30 Yesalavich (2010).
31 See www.cboe.com/InterestRateETF for the full range of available contracts.

Exhibit 19 Bloomberg Barclays US Aggregate Bond Index Sector Allocation, Selected Years

Year	Government	Corporate	Securitized
1993	53.0%	17.0%	30.0%
1998	46.0%	22.0%	32.0%
2000	38.0%	24.0%	39.0%
2005	40.2%	19.5%	40.2%
2008	38.6%	17.7%	43.7%
2010	45.8%	18.8%	35.5%
2015	44.8%	24.2%	31.0%

Source: Lehman Brothers, Barclays.

Separately, a corporate debt index investor might find her benchmark choice no longer desirable if issuers refinance maturing bonds for longer maturities and extend overall debt duration. Third, value-weighted indexes assign a larger share of the index to borrowers with the largest amount of outstanding debt, leading a more leveraged issuer or sector to receive a higher weight. Creditworthiness and leverage tend to be negatively correlated. As a particular issuer or sector of the economy borrows more, investors tracking a value-weighted index will automatically increase their fixed-income exposure to these borrowers. The greater allocation to more-levered borrowers is known as the "bums problem."[32] Recent examples of the bums problem for entire sectors of the fixed-income market include the large increase in global telecoms–related debt financing in 2000 and the increase in US mortgage-backed financing prior to the 2008 financial crisis, both of which negatively affected investors who faced higher allocation to these sectors through a value-weighted index.

The dynamics of fixed-income markets require investors to more actively understand and define their underlying duration preferences as well as a desired risk and return profile within their fixed-income allocation when conducting benchmark selection. Expressed differently, the desired duration profile may be considered the portfolio "beta," with the targeted duration equal to an investor's preferred duration exposure. Once these parameters are clear, investors may wish to combine several well-defined sub-benchmark categories into an overall benchmark. Examples of sub-benchmark categories might include Treasuries (or domestic sovereign bonds), US agencies or other asset-backed securities, corporate bonds, high-yield bonds, bank loans, developed markets global debt, or emerging markets debt.

For fixed-income investors seeking to reduce the cost of active management while addressing systematic biases such as the bums problem, a third alternative known as **smart beta** has emerged. Smart beta involves the use of simple, transparent, rules-based strategies as a basis for investment decisions. The starting point for smart beta investors is an analysis of the well-established, static strategies that tend to drive excess portfolio returns. In theory, asset managers who are able to isolate and pursue such strategies can capture a significant proportion of these excess returns without the significantly higher fees associated with active management. Although the use of smart beta strategies is more established among equity managers, fixed-income managers are increasing their use of these techniques as well.[33]

32 See Siegel (2003).
33 See Staal et al. (2015).

EXAMPLE 11

Given the significant rise in regional bond issuance following the 2008 financial crisis, Next Europe Asset Management Limited aims to grow its assets under management by attracting a variety of new local Eurozone investors to the broader set of alternatives available in the current fixed-income market. Several of the indexes that Next Europe offers as a basis for investment are as follows:

- **S&P Eurozone Sovereign Bond Index.** This index consists of fixed-rate, sovereign debt publicly issued by Eurozone national governments for their domestic markets with various maturities including 1 to 3 years, 3 to 5 years, 5 to 7 years, 7 to 10 years, and 10+ years. For example, the one- to three-year index had a weighted average maturity of 1.88 years and a modified duration of 1.82 as of 31 December 2015.[34]
- **Bloomberg EUR Investment Grade European Corporate Bond Index (BERC).** The BERC index consists of local, EUR-based corporate debt issuance in Eurozone countries and had an effective duration of 5.39 as of January 2016.
- **Bloomberg EUR High Yield Corporate Bond Index (BEUH).** This index consists of sub-investment grade, EUR-denominated bonds issued by Eurozone-based corporations. It had an effective duration of 4.44 as of January 2016.[35]
- **FTSE Pfandbrief Index.** The Pfandbrief, which represents the largest segment of the German private debt market, is a bond issued by German mortgage banks, collateralized by long-term assets such as real estate or public sector loans. These securities are also referred to as covered bonds, and are being used as a model for similar issuance in other European countries.

The FTSE Pfandbrief indexes include jumbo Pfandbriefs from German issuers, as well as those of comparable structure and quality from other Eurozone countries. The sub-indexes offer a range of maturities including 1 to 3 years, 3 to 5 years, 5 to 7 years, 7 to 10 years and 10+ years.[36]

Which of the above indexes would be suitable for the following investor portfolios?

1. A highly risk-averse investor who is sensitive to fluctuations in portfolio value.
2. A new German private university that has established an endowment with a very long-term investment horizon.
3. A Danish life insurer relying on the fixed-income portfolio managed by Next Europe to meet both short-term claims as well as offset long-term obligations.

Solution to 1:

Given this investor's high degree of risk aversion, an index with short or intermediate duration with limited credit risk would be most appropriate to limit market value risk. Of the alternatives listed above, the S&P Eurozone Sovereign Bond 1–3 Years Index or the FTSE 1–3 Year Pfandbrief Index (given the high credit quality of covered bonds) would be appropriate choices.

34 www.us.spindices.com
35 www.bloombergindexes.com
36 www.ftse.com/products/indices

Solution to 2:

This investor's very long investment horizon suggests that the BERC is an appropriate index, because it has the longest duration of the indexes given. In addition, the long-term S&P Eurozone Sovereign Bond or FTSE Pfandbrief indexes (10+ years) could be appropriate choices as well. Next Europe should consider the tradeoff between duration and risk in its discussion with the endowment.

Solution to 3:

The Danish life insurer faces two types of future obligation, namely a short-term outlay for expected claims and a long-term horizon for future obligations. For the short-term exposure, stability of market value is a primary consideration, and the insurer would seek an index with low market risk. Of the above alternatives, the 1–3 Years S&P Sovereign Bond or the FTSE Pfandbrief 1–3 Year alternatives would be the best choices. The longer-term alternatives in the Solution to 2 would be most appropriate for the long-term future obligations.

LADDERED BOND PORTFOLIOS

10

A popular fixed-income investment strategy in the wealth management industry is to build a "laddered" portfolio for clients. Exhibit 20 illustrates this approach, along with two other maturity-based strategies—a "bullet" portfolio and a "barbell" portfolio. The laddered portfolio spreads the bonds' maturities and par values more or less evenly along the yield curve. The bullet portfolio concentrates the bonds at a particular point on the yield curve, whereas the barbell portfolio places the bonds at the short-term and long-term ends of the curve. In principle, each can have the same portfolio duration statistic and approximately the same change in value for a parallel shift in the yield curve. A non-parallel shift or a twist in the curve, however, leads to very different outcomes for the bullet and barbell structures. An obvious advantage to the laddered portfolio is protection from shifts and twists—the cash flows are essentially "diversified" across the time spectrum.

Exhibit 20 Laddered, Bullet, and Barbell Fixed-Income Portfolios

This "diversification" over time provides the investor a balanced position between the two sources of interest rate risk—cash flow reinvestment and market price volatility. Bonds mature each year and are reinvested at the longer-term end of the ladder, typically at higher rates than short-term securities. Over time, the laddered portfolio likely includes bonds that were purchased at high interest rates as well as low interest rates. Investors familiar with "dollar cost averaging" will see the similarity. In addition, by reinvesting funds as bonds mature maintains the duration of the overall portfolio.

Another attractive feature to the laddered portfolio apparent in Exhibit 20 is in convexity. Convexity, technically, is the second-order effect on the value of an asset or liability given a change in the yield to maturity. Importantly, it is affected by the dispersion of cash flows, as indicated in Equation 1 repeated here:

$$\text{Covexity} = \frac{\text{Macaulay duration}^2 + \text{Macaulay duration} + \text{Dispersion}}{(1 + \text{Cash flow yield})^2}$$

If the three portfolios have the same duration (and cash flow yield), then the barbell clearly has the highest convexity and the bullet the lowest. The laddered portfolio also has high convexity because its cash flows by design are spread over the time line. Compared with the barbell, the laddered portfolio has much less cash flow reinvestment risk.

In practice, perhaps the most desirable aspect of the laddered portfolio is in liquidity management. This aspect is particularly relevant if the bonds are not actively traded, as is the case for many corporate securities. As time passes, there is always a bond that is close to redemption. Its duration will be low so that its price is fairly stable even in a time of interest rate volatility. If the client needs immediate cash, the soon-to-mature bond makes for high-quality collateral on a personal loan or, for an institution, a repo contract. As the bonds mature, the final coupon and principal can be deployed for consumption or reinvested in a long-term bond at the back of the ladder.

Another way for a wealth manager to build a laddered portfolio for a client is to use fixed-maturity corporate bond ETFs. These ETFs have a designated year of maturity and credit risk profile—for instance, 2021 investment-grade corporate bonds. This ETF is a passively managed (and, therefore, low-administrative-cost) fund that seeks to replicate the performance of an index of, for instance, 50 held-to-maturity investment-grade corporate bonds that mature in 2021. As discussed in previous sections, the ETF manager can use a stratified sampling approach to track the index.

Suppose that in 2017, the wealth manager buys for the client roughly equal positions in the 2018 through 2025 fixed-maturity corporate bond ETFs. These purchases create a laddered portfolio that should provide the same benefits as holding the bonds directly—price stability in the soonest-to-mature ETF and greater convexity than holding more of a bullet portfolio. Moreover, the ETFs should be more liquid than positions in the actual bonds.

But laddered portfolios are not without limitations. For many investors, the decision to build a laddered bond portfolio should be weighed against buying shares in a fixed-income mutual fund, especially if the portfolio consists of a limited number of corporate bonds. Clearly, the mutual fund provides greater diversification of default risk. Moreover, actual bonds can entail a much higher cost of acquisition. If the entire investment needs to be liquidated, the mutual fund shares can be redeemed more quickly than the bonds can be sold, and likely at a better price.

EXAMPLE 12

Zheng Zilong, CFA, is a Shanghai-based wealth adviser. A major client of his, the Wang family, holds most of its assets in residential property and equity investments. Mr. Zheng recommends that the Wang family also have a laddered portfolio of Chinese government bonds. He suggests the following portfolio, priced for settlement on 1 January 2017:

Coupon Rate	Payment Frequency	Maturity	Flat Price	Yield (s.a.)	Par Value	Market Value
3.22%	Annual	26-Mar-18	101.7493	1.758%	10 Million	10,422,826
3.14%	Annual	8-Sept-20	102.1336	2.508%	10 Million	10,312,292
3.05%	Annual	22-Oct-22	101.4045	2.764%	10 Million	10,199,779
2.99%	Semi-annual	15-Oct-25	101.4454	2.803%	10 Million	10,208,611
					40 Million	41,143,508

The yields to maturity on the first three bonds have been converted from a periodicity of one to two in order to report them on a consistent semi-annual bond basis, as indicated by "(s.a.)". The total market value of the portfolio is CNY 41,143,508. The cash flow yield for the portfolio is 2.661%, whereas the market value weighted average yield is 2.455%.

Most important for his presentation to the senior members of the Wang family is the schedule for the 30 cash flows:

1	26-Mar-17	322,000	16	8-Sep-20	10,314,000
2	15-Apr-17	149,500	17	15-Oct-20	149,500
3	8-Sep-17	314,000	18	22-Oct-20	305,000
4	15-Oct-17	149,500	19	15-Apr-21	149,500
5	22-Oct-17	305,000	20	15-Oct-21	149,500
6	26-Mar-18	10,322,000	21	22-Oct-21	305,000
7	15-Apr-18	149,500	22	15-Apr-22	149,500
8	8-Sep-18	314,000	23	15-Oct-22	149,500
9	15-Oct-18	149,500	24	22-Oct-22	10,305,000
10	22-Oct-18	305,000	25	15-Apr-23	149,500
11	15-Apr-19	149,500	26	15-Oct-23	149,500
12	8-Sep-19	314,000	27	15-Apr-24	149,500
13	15-Oct-19	149,500	28	15-Oct-24	149,500
14	22-Oct-19	305,000	29	15-Apr-25	149,500
15	15-Apr-20	149,500	30	15-Oct-25	10,149,500

Indicate the main points that Mr. Zheng should emphasize in this presentation about the laddered portfolio to senior members of the Wang family.

Solution:

Mr. Zheng should emphasize three features of the portfolio:

1 **High credit quality.** Given that the family already has substantial holdings in residential property and equity, which are subject to price volatility and risk, investments in government bonds provide the Wang family with holdings in a very low-risk asset class.

2 **Liquidity.** The schedule of payments shows that coupon payments are received each year. These funds can be used for any cash need, including household expenses. The large principal payments can be reinvested in longer-term government bonds at the back of the ladder.

3 **Yield curve diversification.** The bond investments are spread out along four segments of the government bond yield curve. If they were concentrated at a single point, the portfolio would have the risk of higher yields at that point. By spreading out the maturities in the ladder formation, the portfolio has the benefit of diversification.

SUMMARY

This reading covers structured and passive total return fixed-income strategies: immunization of single and multiple liabilities, indexation, and laddering. The reading makes the following main points:

- Passive fixed-income investing requires a frame of reference, such as a balance sheet, to structure the bond portfolio. This frame of reference can be as simple as the time to retirement for an individual or as complex as a balance sheet of rate-sensitive assets and liabilities for a company.
- Asset–liability management strategies consider both assets and liabilities.
- Liability-driven investing takes the liabilities as given and builds the asset portfolio in accordance with the interest rate risk characteristics of the liabilities.
- Asset-driven liabilities take the assets as given and structures debt liabilities in accordance with the interest rate characteristics of the assets.
- Assets and liabilities can be categorized by the degree of certainty surrounding the amount and timing of cash flows. Type I assets and liabilities, such as traditional fixed-rate bonds with no embedded options, have known amounts and payment dates. For Type I assets and liabilities, yield duration statistics such as Macaulay, modified, and money duration apply. Type II, III, and IV assets and liabilities have uncertain amounts and/or uncertain timing of payment. For Type II, III, and IV assets and liabilities, curve duration statistics such as effective duration are needed. A model is used to obtain the estimated values when the yield curve shifts up and down by the same amount.
- Immunization is the process of structuring and managing a fixed-income portfolio to minimize the variance in the realized rate of return over a known investment horizon.
- In the case of a single liability, immunization is achieved by matching the Macaulay duration of the bond portfolio to the horizon date. As time passes and bond yields change, the duration of the bonds changes and the portfolio needs to be rebalanced. This rebalancing can be accomplished by buying and selling bonds or using interest rate derivatives such as futures contracts and interest rate swaps.
- An immunization strategy aims to lock in the cash flow yield on the portfolio, which is the internal rate of return on the cash flows. It is not the weighted average of the yields to maturity on the bonds that constitute the portfolio.

- Immunization can be interpreted as "zero replication" in that the performance of the bond portfolio over the investment horizon replicates the zero-coupon bond that provides for perfect immunization. This zero-coupon bond has a maturity that matches the date of the single liability—there is no coupon reinvestment risk nor price risk as the bond is held to maturity (assuming no default).
- The risk to immunization is that as the yield curve shifts and twists, the cash flow yield on the bond portfolio does not match the change in the yield on the zero-coupon bond that would provide for perfect immunization.
- A sufficient, but not necessary, condition for immunization is a parallel (or shape-preserving) shift whereby all yields change by the same amount in the same direction. If the change in the cash flow yield is the same as that on the zero-coupon bond being replicated, immunization can be achieved even with a non-parallel shift to the yield curve.
- Structural risk to immunization arises from some non-parallel shifts and twists to the yield curve. This risk is reduced by minimizing the dispersion of cash flows in the portfolio, which can be accomplished by minimizing the convexity statistic for the portfolio. Concentrating the cash flows around the horizon date makes the immunizing portfolio closely track the zero-coupon bond that provides for perfect immunization.
- For multiple liabilities, one method of immunization is cash flow matching. A portfolio of high-quality zero-coupon or fixed-income bonds is purchased to match as closely as possible the amount and timing of the liabilities.
- A motive for cash flow matching can be accounting defeasance, whereby both the assets and liabilities are removed from the balance sheet.
- Immunization of multiple liabilities can be achieved by structuring and managing a portfolio of fixed income bonds. Because the market values of the assets and liabilities differ, the strategy is to match the money durations. The money duration is the modified duration multiplied by the market value. The basis point value is a measure of money duration calculated by multiplying the money duration by 0.0001.
- The conditions to immunize multiple liabilities are that (1) the market value of assets is greater than or equal to the market value of the liabilities, (2) the asset basis point value (BPV) equals the liability BPV, and (3) the dispersion of cash flows and the convexity of assets are greater than those of the liabilities.
- A derivatives overlay—for example, interest rate futures contracts—can be used to immunize single or multiple liabilities.
- The number of futures contracts needed to immunize is the liability BPV minus the asset BPV, divided by the futures BPV. If the result is a positive number, the entity buys, or goes long, futures contracts. If the result is a negative number, the entity sells, or goes short, futures contracts. The futures BPV can be approximated by the BPV for the cheapest-to-deliver security divided by the conversion factor for the cheapest-to-deliver security.
- Contingent immunization adds active management of the surplus, which is the difference between the asset and liability market values, with the intent to reduce the overall cost of retiring the liabilities. In principle, any asset classes can be used for the active investment. The entity can choose to over-hedge or under-hedge the number of futures contracts needed for passive immunization.
- Liability-driven investing (LDI) often is used for complex rate-sensitive liabilities, such as those for a defined benefit pension plan. The retirement benefits for covered employees depend on many variables, such as years of employment,

age at retirement, wage level at retirement, and expected lifetime. There are different measures for the liabilities: for instance, the accumulated benefit obligation (ABO) that is based on current wages and the projected benefit obligation (PBO) that is based on expected future wages. For each liability measure (ABO or PBO), a model is used to extract the effective duration and BPV.

- Interest rate swap overlays can be used to reduce the duration gap as measured by the asset and liability BPVs. There often is a large gap because pension funds hold sizable asset positions in equities that have low or zero effective durations and their liability durations are high.
- The hedging ratio is the percentage of the duration gap that is closed with the derivatives. A hedging ratio of zero implies no hedging. A hedging ratio of 100% implies immunization—that is, complete removal of interest rate risk.
- Strategic hedging is the active management of the hedging ratio. Because asset BPVs are less than liability BPVs in typical pension funds, the derivatives overlay requires the use of receive-fixed interest rate swaps. Because receive-fixed swaps gain value as current swap market rates fall, the fund manager could choose to raise the hedging ratio when lower rates are anticipated. If rates are expected to go up, the manager could strategically reduce the hedging ratio.
- An alternative to the receive-fixed interest rate swap is a purchased receiver swaption. This swaption confers to the buyer the right to enter the swap as the fixed-rate receiver. Because of its negative duration gap (asset BPV is less than liability BPV), the typical pension plan suffers when interest rates fall and could become underfunded. The gain on the receiver swaption as rates decline offsets the losses on the balance sheet.
- Another alternative is a swaption collar, the combination of buying the receiver swaption and writing a payer swaption. The premium received on the payer swaption that is written offsets the premium needed to buy the receiver swaption.
- The choice among hedging with the receive-fixed swap, the purchased receiver swaption, and the swaption collar depends in part on the pension fund manager's view on future interest rates. If rates are expected to be low, the receive-fixed swap typically is the preferred derivative. If rates are expected to go up, the swaption collar can become attractive. And if rates are projected to reach a certain threshold that depends on the option costs and the strike rates, the purchased receiver swaption can become the favored choice.
- Model risks arise in LDI strategies because of the many assumptions in the models and approximations used to measure key parameters. For example, the liability BPV for the defined benefit pension plan depends on the choice of measure (ABO or PBO) and the assumptions that go into the model regarding future events (e.g., wage levels, time of retirement, and time of death).
- Spread risk in LDI strategies arises because it is common to assume equal changes in asset, liability, and hedging instrument yields when calculating the number of futures contracts, or the notional principal on an interest rate swap, to attain a particular hedging ratio. The assets and liabilities are often on corporate securities, however, and their spreads to benchmark yields can vary over time.
- The Credit Support Annex to the standard ISDA swap agreement often calls for collateralization by one or both counterparties to the contract. This requirement introduces the risk of exhausting available securities or cash assets to serve as collateral.

- Investing in a fund that tracks a bond market index offers the benefits of both diversification and low administrative costs. The deviation of the returns between the index and the fund is called tracking risk, or tracking error. Tracking risk arises when the fund manager chooses to buy only a subset of the index, a strategy called enhanced indexing, because fully replicating the index can be impractical as a result of the large number of bonds in the fixed-income universe.
- Corporate bonds are often illiquid. Capital requirements have reduced the incentive for broker/dealers to maintain inventory in thinly traded securities. The lack of active trading is a challenge for valuation. Matrix pricing uses available data on comparable securities to estimate the fair value of the illiquid bonds.
- The primary risk factors encountered by an investor tracking a bond index include decisions regarding duration (option-adjusted duration for callable bonds, convexity for possible large yield shifts, and key rate durations for non-parallel shifts) and portfolio weights (assigned by sector, credit quality, maturity, coupon rate, and issuer).
- Index replication is one method to establish a passive exposure to the bond market. The manager buys or sells bonds only when there are changes to the index. Full replication can be expensive, however, as well as infeasible for broad-based fixed-income indexes that include many illiquid bonds.
- Several enhancement strategies can reduce the costs to track a bond index: lowering trading costs, using models to identify undervalued bonds and to gauge relative value at varying points along the yield curve, over/under weighting specific credit sectors over the business cycle, and evaluating specific call features to identify value given large yield changes.
- Investors can obtain passive exposure to the bond market using mutual funds and exchange-traded funds that track a bond index. Shares in mutual funds are redeemable at the net asset value with a one-day time lag. Exchange-traded fund (ETF) shares have the advantage of trading on an exchange.
- A total return swap, an over-the-counter derivative, allows an institutional investor to transform an asset or liability from one asset category to another—for instance, from variable-rate cash flows referencing Libor to the total return on a particular bond index.
- A total return swap (TRS) can have some advantages over a direct investment in a bond mutual fund or ETF. As a derivative, it requires less initial cash outlay than direct investment in the bond portfolio for similar performance. A TRS also carries counterparty credit risk, however. As a customized over-the-counter product, a TRS can offer exposure to assets that are difficult to access directly, such as some high-yield and commercial loan investments.
- Selecting a particular bond index is a major decision for a fixed-income investment manager. Selection is guided by the specified goals and objectives for the investment. The decision should recognize several features of bond indexes: (1) Given that bonds have finite maturities, the duration of the index drifts down over time; (2) the composition of the index changes over time with the business cycle and maturity preferences of issuers; and (3) value-weighted indexes assign larger shares to borrowers having more debt, leading to the "bums problem" that bond index investors can become overly exposed to leveraged firms.
- A laddered bond portfolio is a common investment strategy in the wealth management industry. The laddered portfolio offers "diversification" over the yield curve compared with "bullet" or "barbell" portfolios. This structure is especially

attractive in stable, upwardly sloped yield curve environments as maturing short-term debt is replaced with higher-yielding long-term debt at the back of the ladder.

- A laddered portfolio offers an increase in convexity because the cash flows have greater dispersions than a more concentrated (bullet) portfolio.
- A laddered portfolio provides liquidity in that it always contains a soon-to-mature bond that could provide high-quality, low-duration collateral on a repo contract if needed.
- A laddered portfolio can be constructed with fixed-maturity corporate bond ETFs that have a designated maturity and credit risk profile.

REFERENCES

Aakko, Markus, and Rene Martel. 2013. "Understanding Derivative Overlays, in All Their Forms." PIMCO (February).

Adams, James, and Donald J. Smith. 2009. "Mind the Gap: Using Derivatives Overlays to Hedge Pension Duration." *Financial Analysts Journal*, vol. 65, no. 4 (July/August): 60–67.

Adams, James, and Donald J. Smith. 2013. "Synthetic Floating-Rate Debt: An Example of an Asset-Driven Liability Structure." *Journal of Applied Corporate Finance*, vol. 25, no. 4 (Fall): 50–59.

Fabozzi, Frank J. 2013. *Bond Markets, Analysis, and Strategies*, 8th ed. Upper Saddle River, NJ: Prentice Hall.

Hayat, Usman, and Matt Orsagh. 2015. *Environmental, Social and Governance Issues in Investing: A Guide for Investment Professionals*. Charlottesville, VA: CFA Institute.

Roxburgh, Charles, Susan Lund, and John Piotrowski. 2011. "Mapping Global Capital Markets 2011." McKinsey Global Institute.

Siegel, L.B. 2003. *Benchmarks and Investment Management*. Charlottesville, VA: Research Foundation of the Association for Investment Management and Research.

Smith, Donald J. 2014. *Bond Math: The Theory behind the Formulas*, 2nd ed. Hoboken, NJ: Wiley Finance.

Staal, Arne, Marco Corsi, Sara Shores, and Chris Woida. 2015. "A Factor Approach to Smart Beta Development in Fixed Income." *Journal of Index Investing*, vol. 6, no. 1: 98–110.

Volpert, Kenneth E. 2012. "Introduction to Bond Portfolio Management." In *Handbook of Fixed-Income Securities*, 8th ed. Edited by Frank J. Fabozzi. New York: McGraw Hill: 1123–1150.

Yesalavich, Donna K. 2010. "CME Pulls Back on ETF Futures." *Wall Street Journal*, 16 December.

PRACTICE PROBLEMS

The following information relates to Questions 1–8

Serena Soto is a risk management specialist with Liability Protection Advisors. Trey Hudgens, CFO of Kiest Manufacturing, enlists Soto's help with three projects. The first project is to defease some of Kiest's existing fixed-rate bonds that are maturing in each of the next three years. The bonds have no call or put provisions and pay interest annually. Exhibit 1 presents the payment schedule for the bonds.

Exhibit 1 Kiest Manufacturing Bond Payment Schedule As of 1 October 2017

Maturity Date	Payment Amount
1 October 2018	$9,572,000
1 October 2019	$8,392,000
1 October 2020	$8,200,000

The second project for Soto is to help Hudgens immunize a $20 million portfolio of liabilities. The liabilities range from 3.00 years to 8.50 years with a Macaulay duration of 5.34 years, cash flow yield of 3.25%, portfolio convexity of 33.05, and basis point value (BPV) of $10,505. Soto suggested employing a duration-matching strategy using one of the three AAA rated bond portfolios presented in Exhibit 2.

Exhibit 2 Possible AAA Rated Duration-Matching Portfolios

	Portfolio A	Portfolio B	Portfolio C
Bonds (term, coupon)	4.5 years, 2.63% 7.0 years, 3.50%	3.0 years, 2.00% 6.0 years, 3.25% 8.5 years, 3.88%	1.5 years, 1.25% 11.5 years, 4.38%
Macaulay duration	5.35	5.34	5.36
Cash flow yield	3.16%	3.33%	3.88%
Convexity	31.98	34.51	50.21
BPV	$10,524	$10,506	$10,516

Soto explains to Hudgens that the underlying duration-matching strategy is based on the following three assumptions.

1. Yield curve shifts in the future will be parallel.
2. Bond types and quality will closely match those of the liabilities.
3. The portfolio will be rebalanced by buying or selling bonds rather than using derivatives.

© 2017 CFA Institute. All rights reserved.

The third project for Soto is to make a significant direct investment in broadly diversified global bonds for Kiest's pension plan. Kiest has a young workforce, and thus, the plan has a long-term investment horizon. Hudgens needs Soto's help to select a benchmark index that is appropriate for Kiest's young workforce and avoids the "bums" problem. Soto discusses three benchmark candidates, presented in Exhibit 3.

Exhibit 3 Global Bond Index Benchmark Candidates

Index Name	Effective Duration	Index Characteristics
Global Aggregate	7.73	Market cap weighted; Treasuries, corporates, agency, securitized debt
Global Aggregate GDP Weighted	7.71	Same as Global Aggregate, except GDP weighted
Global High Yield	4.18	GDP weighted; sovereign, agency, corporate debt

With the benchmark selected, Hudgens provides guidelines to Soto directing her to (1) use the most cost-effective method to track the benchmark and (2) provide low tracking error.

After providing Hudgens with advice on direct investment, Soto offered him additional information on alternative indirect investment strategies using (1) bond mutual funds, (2) exchange-traded funds (ETFs), and (3) total return swaps. Hudgens expresses interest in using bond mutual funds rather than the other strategies for the following reasons.

Reason 1 Total return swaps have much higher transaction costs and initial cash outlay than bond mutual funds.

Reason 2 Unlike bond mutual funds, bond ETFs can trade at discounts to their underlying indexes, and those discounts can persist.

Reason 3 Bond mutual funds can be traded throughout the day at the net asset value of the underlying bonds.

1 Based on Exhibit 1, Kiest's liabilities would be classified as:

A Type I.

B Type II.

C Type III.

2 Based on Exhibit 2, the portfolio with the greatest structural risk is:

A Portfolio A.

B Portfolio B.

C Portfolio C.

3 Which portfolio in Exhibit 2 fails to meet the requirements to achieve immunization for multiple liabilities?

A Portfolio A

B Portfolio B

C Portfolio C

4 Based on Exhibit 2, relative to Portfolio C, Portfolio B:

A has higher cash flow reinvestment risk.

B is a more desirable portfolio for liquidity management.

C provides less protection from yield curve shifts and twists.

5 Soto's three assumptions regarding the duration-matching strategy indicate the presence of:

A model risk.

B spread risk.

C counterparty credit risk.

6 The global bond benchmark in Exhibit 3 that is *most* appropriate for Kiest to use is the:

A Global Aggregate Index.

B Global High Yield Index.

C Global Aggregate GDP Weighted Index.

7 To meet both of Hudgens's guidelines for the pension's bond fund investment, Soto should recommend:

A pure indexing.

B enhanced indexing.

C active management.

8 Which of Hudgens's reasons for choosing bond mutual funds as an investment vehicle is correct?

A Reason 1

B Reason 2

C Reason 3

SOLUTIONS

1 A is correct. Type I liabilities have cash outlays with known amounts and timing. The dates and amounts of Kiest's liabilities are known; therefore, they would be classified as Type I liabilities.

2 C is correct. Structural risk arises from the design of the duration-matching portfolio. It is reduced by minimizing the dispersion of the bond positions, going from a barbell structure to more of a bullet portfolio that concentrates the component bonds' durations around the investment horizon. With bond maturities of 1.5 and 11.5 years, Portfolio C has a definite barbell structure compared with those of Portfolios A and B, and it is thus subject to a greater degree of risk from yield curve twists and non-parallel shifts. In addition, Portfolio C has the highest level of convexity, which increases a portfolio's structural risk.

3 A is correct. The two requirements to achieve immunization for multiple liabilities are for the money duration (or BPV) of the asset and liability to match and for the asset convexity to exceed the convexity of the liability. Although all three portfolios have similar BPVs, Portfolio A is the only portfolio to have a lower convexity than that of the liability portfolio (31.98, versus 33.05 for the $20 million liability portfolio), and thus, it fails to meet one of the two requirements needed for immunization.

4 B is correct. Portfolio B is a laddered portfolio with maturities spread more or less evenly over the yield curve. A desirable aspect of a laddered portfolio is liquidity management. Because there is always a bond close to redemption, the soon-to-mature bond can provide emergency liquidity needs. Barbell portfolios, such as Portfolio C, have maturities only at the short-term and long-term ends and thus are much less desirable for liquidity management.

5 A is correct. Soto believes that any shift in the yield curve will be parallel. Model risk arises whenever assumptions are made about future events and approximations are used to measure key parameters. The risk is that those assumptions turn out to be wrong and the approximations are inaccurate. A non-parallel yield curve shift could occur, resulting in a mismatch of the duration of the immunizing portfolio versus the liability.

6 C is correct. Kiest has a young workforce and thus a long-term investment horizon. The Global Aggregate and Global Aggregate GDP Weighted Indexes have the highest durations (7.73 and 7.71, respectively) and would be appropriate for this group. Hudgens also wants to avoid the "bums" problem, however, which arises as a result of a market-cap-weighted portfolio increasing the weight of a particular issuer or sector that has increasing borrowings. The Global Aggregate Index is a market-cap-weighted index. As a result, the Global Aggregate GDP Weighted Index is the most appropriate selection for Kiest.

7 B is correct. Low tracking error requires an indexing approach. A pure indexing approach for a broadly diversified bond index would be extremely costly because it requires purchasing all the constituent securities in the index. A more efficient and cost-effective way to track the index is an enhanced indexing strategy, whereby Soto would purchase fewer securities than the index but would match primary risk factors reflected in the index. Closely matching these risk factors could provide low tracking error.

8 B is correct. Although a significant spread between the market price of the underlying fixed-income securities portfolio and an ETF's NAV should drive an authorized participant to engage in arbitrage, many fixed-income securities

are either thinly traded or not traded at all. This situation might allow such a divergence to persist to a much greater degree for a bond ETF than might be the case in the equity market.

CUSTOMER SERVICE

68

PORTFOLIO MANAGEMENT
STUDY SESSION

11

Fixed-Income Portfolio Management (2)

This study session covers yield curve and credit strategies for fixed-income portfolios. Fundamental concepts necessary for understanding yield curves and yield curve strategies are reviewed. Portfolio management strategies, which are based on the investor's expectations regarding the level, slope, and curvature of the yield curve, are presented. Strategies used to construct and manage fixed-income credit portfolios follow. Coverage includes various credit spread measures, bottom-up and top-down approaches to credit strategies, and credit-related risks.

READING ASSIGNMENTS

Reading 23	Yield Curve Strategies by Robert W. Kopprasch, CFA, and Steven V. Mann, PhD
Reading 24	Credit Strategies by Campe Goodman, CFA, and Oleg Melentyev, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

23

Yield Curve Strategies

by Robert W. Kopprasch, PhD, CFA, and Steven V. Mann, PhD

Robert W. Kopprasch, PhD, CFA (USA). Steven V. Mann, PhD, is at the University of South Carolina (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe major types of yield curve strategies;
☐	**b.** explain why and how a fixed-income portfolio manager might choose to alter portfolio convexity;
☐	**c.** formulate a portfolio positioning strategy given forward interest rates and an interest rate view;
☐	**d.** explain how derivatives may be used to implement yield curve strategies;
☐	**e.** evaluate a portfolio's sensitivity to a change in curve slope using key rate durations of the portfolio and its benchmark;
☐	**f.** construct a duration-neutral government bond portfolio to profit from a change in yield curve curvature;
☐	**g.** evaluate the expected return of a yield curve strategy.

INTRODUCTION

1

Active portfolio management seeks to outperform a benchmark. Portfolio returns are often evaluated relative to a benchmark that has characteristics aligned with the investment manager's mandate or style. Managers seek to outperform the benchmark by constructing a portfolio that is not fully representative of the index. Any differences from the benchmark are typically deliberate and not the result of illiquidity or inconvenience.

Active yield curve strategies are designed to capitalize on expectations regarding the level, slope, or shape (curvature) of yield curves. This reading focuses on the challenges of developing and implementing active fixed-income portfolio strategies for which the primary tools are based in the dynamics of yield curves. In most instances, we have chosen to illustrate the strategies and dynamics using the US Treasury curve

© 2017 CFA Institute. All rights reserved.

because of data availability. These same strategies, however, can be implemented in any jurisdiction with a well-developed sovereign debt market—a market where there are regular bond issuances along the yield curve and the market is liquid.

Section 2 discusses some foundational concepts essential for understanding yield curve strategies and expands on three basic changes to yield curves: level, slope, and curvature. It also addresses convexity, an important tool for fixed-income portfolio managers. Section 3 discusses how a portfolio manager can use strategies to express a directional view on interest rates. Section 4 addresses how and why a portfolio manager might choose to position his or her portfolio in anticipation of various yield curve environments. Section 5 compares the performance of various duration-neutral portfolios in multiple yield curve environments. Section 6 presents a framework for analyzing the expected return of a yield curve strategy. Section 7 provides a summary.

2 FOUNDATIONAL CONCEPTS FOR ACTIVE MANAGEMENT OF YIELD CURVE STRATEGIES

An understanding of yield curves and their behavior is necessary to understand how fixed-income markets work. The three primary forms of the yield curve—par, spot, and forward curves—contain useful information; the challenge lies in extracting and interpreting this information to make better investment decisions. Extracting the information contained in a yield curve is a focus for fixed-income professionals, central bankers, and other market participants.

What Is a Yield Curve?

When someone refers to "the yield curve," the implied assumption is that there is one yield curve that applies to all investors in a given market. In reality, a yield curve is a stylized representation of the yields available to investors at various maturities within a market. To model a yield curve, one must make certain assumptions, and those assumptions may vary by investor or by the intended use of the curve. Problems with modeling the yield curve include the following:

- Unsynchronized observations of various maturities on the curve
- Gaps in maturities that require interpolation and/or smoothing
- Observations that seem inconsistent with neighboring values
- Differences in accounting or regulatory treatment of certain bonds that may make them look like outliers

As an example, the on-the-run curve can differ significantly from a curve that includes off-the-run securities, especially during a crisis when "flight to quality" becomes common and investors gravitate to the more liquid on-the-run issues. Consider the curve in Exhibit 1 from 1998, during the Long-Term Capital Management crisis:

Exhibit 1 Weekend-Adjusted Yields for Coupon Treasuries (as of 30 October 1998)

Notes: The three-year Treasury note had been discontinued as an on-the-run issue. The "3" on the chart shows the yield value of the most recently issued three-year note, which was only marginally longer than the new two-year notes at the time.
Source: Salomon Brothers.

Notice how the (interpolated) on-the-run curve, shown as the solid line in Exhibit 1, does not adequately represent the securities available for purchase in the Treasury market. In Exhibit 1, the interpolated yield for the January 2017 maturity is about 4.85%. Actual Treasuries with January 2017 maturity, however, could have been purchased at that time with yields of about 5.35%. Investors considering the purchase of similar-maturity, non-Treasury securities could have drawn two very different conclusions regarding the attractiveness of those investments depending on whether they used the interpolated on-the-run curve or the actual off-the-run curve.

2.1 A Review of Yield Curve Dynamics

A historical perspective of yield curves illustrates the variety of yield curve changes from which a fixed-income portfolio manager seeks to profit. Exhibit 2 depicts the changing level, slope, and curvature of the on-the-run US Treasury curve (sampled quarterly) during the past 40 years—clearly, the yield curve is dynamic. The many possible changes in the yield curve can be distilled into three basic movements: a change in (1) level (a parallel shift in the yield curve); (2) slope (a flattening or steepening of the yield curve); and (3) curvature. These three basic movements are discussed below.

Exhibit 2 On-the-Run US Treasury Curves, Monthly, 1977–2016

Source: US Federal Reserve Bank.

A change in level occurs when all the yields represented on the curve change by the same number of basis points. This movement is usually referred to as a parallel shift. For simplicity, when a portfolio manager models the impact of an expected yield curve change, it is often assumed that the curve changes only in parallel shifts, but Exhibit 2 shows clearly that this assumption is unreliable.

Exhibit 3 plots yield levels for the 34 years ending in 2016, using the US 10-year on-the-run note as the proxy for the entire curve. For nearly this entire time span, yields have been generally declining, resulting in yields in major fixed-income markets around the world that are at historically low levels.

Exhibit 3 On-the-Run 10-Year US Treasury Yield, 1982–2016

Source: Yield Book.

During the period shown in Exhibit 3, US rates have fallen to new lows and rates in other parts of the world have done something previously believed to be impossible: They have gone into negative territory. Exhibit 4 shows the 10-year history of the 5-year euro area government bond rate as it moved toward and then below zero.[1]

Although euro rates briefly reached negative values in April 2015, they have been consistently below zero for virtually all of 2016. Even though below-zero rates do not cause theoretical problems, other issues arise. Several governments have issued bonds with a negative yield, but these have mainly been re-openings of existing bonds with positive coupon rates.[2] If negative rates persist, we may see a new-issue bond with a negative coupon. Consider this: If the coupon rate is negative, we now have two-way credit exposure—the bond owner now owes regular payments to the issuer. We would also need new payment mechanisms to facilitate the "reverse" flow of coupons from investor to issuer. And, bond analysis must adapt to a new reality—if bonds are issued with negative coupon rates, the duration on those bonds will be longer than the maturity.

1 The European Central Bank estimates zero-coupon yield curves for the euro area using actively traded euro-denominated bonds issued by euro area central governments.

2 In a reopening, an issuer sells more of a bond that already exists in the marketplace. The new bonds have the same coupon, maturity, and even the same security identifier as the existing bond.

Exhibit 4 Five-Year Euro Area Government Bond Rate (September 2006–September 2016)

Source: Yield Book.

Yield curve slope is measured as the spread between the yield on a long-maturity bond and the yield on a shorter-maturity bond. For example, the slope of the US Treasury yield curve could be determined by the difference between the yield on the 30-year Treasury bond (30s) and the yield on the 2-year Treasury note (2s). If the 2-year benchmark yield is 0.625% and the 30-year benchmark yield is 2.875%, the slope of the curve is the difference between the two yields—in this case, 2.250%, or 225 bps. As the spread increases or widens, the yield curve is said to steepen. As the spread narrows, the yield curve is said to flatten. If the spread turns negative, the yield curve is described as inverted. These are changes in slope that managers try to anticipate and exploit. Most of the time, the spread is positive and the yield curve is upward sloping. A positive yield curve is thus also known as a "normal" yield curve.

Exhibit 5 plots the slope of the yield curve, using on-the-run 30s yield minus on-the-run 2s yield as the proxy for the slope. It is referred to as the 2s–30s spread.

Exhibit 5 2s–30s Yield Spread, 1982–2016

Source: Yield Book.

Yield curve curvature is a function of the relationship between yields at the short end of the curve, at a midpoint along the curve, and at the long end of the curve. A common measure of yield curve curvature is the **butterfly spread**:

$$\text{Butterfly spread} = -(\text{Short-term yield}) + (2 \times \text{Medium-term yield}) - \text{Long-term yield} \quad (1)$$

The butterfly spread takes on larger positive values when the yield curve has more curvature. One widely used measure of the butterfly spread is calculated using the on-the-run 2-year, 10-year, and 30-year Treasuries as the short-, medium-, and long-term yields, respectively:

–(2-Year yield) + (2 × 10-Year yield) – 30-Year yield

Exhibit 6 displays the historical levels in this proxy for the US Treasury yield curve's curvature.

Exhibit 6 Butterfly Spread 2s/10s/30s, 1982–2016

Source: Yield Book.

The three changes in yield curve shape do not occur in isolation—they are correlated with one another. That is, certain directional moves in the level of interest rates tend to be associated with certain changes in the shape of the curve. For an upward shift in level, the yield curve typically flattens and becomes less curved. Conversely, for a downward shift in level, the yield curve typically steepens and becomes more curved. This occurs because short-term rates tend to be more volatile than long-term rates—for any generalized movement in the yield curve, the short end of the curve tends to move much more than the long end.[3]

3 See, for example, *Principles of Principal Components* by Bulent Baygün, Janet Showers, and George Cherpelis. Salomon Smith Barney (31 January 2000).

2.2 Duration and Convexity

For the reader's convenience, we provide a brief review of various duration measures.

- **Macaulay duration** is analogous to a bond's effective maturity, incorporating all of the bond's projected cash flows—both principal and interest. It is a weighted average of time to receive the bond's promised payments. The present value of each payment to be received is weighted by the present value of all future payments.
- **Modified duration** provides a more direct measure of the relationship between changes in a bond's yield and percentage changes in its price. Modified duration is the Macaulay duration statistic divided by one plus the yield to maturity for each period. It provides an estimate of the percentage price change for a bond given a 1% (100 bps) change in its yield to maturity. It is important to remember that modified duration estimates the percentage price change of the full price, including accrued interest. Given the low coupon rates of most government bonds issued in the last several years, forgetting this detail leads to only a small estimation error. At higher coupon levels, however, the estimation error may be more substantial if the bond has significant accrued interest.
- **Effective duration** is the sensitivity of a bond's price to a change in a benchmark yield curve (as opposed to the price response to a change in the bond's own yield, which might result from factors other than changes in the benchmark yields). Effective duration is similar to modified duration, but its calculation is flexible to allow its use in cases when the bond has an embedded option. As an example, a callable bond has cash flows that are contingent on future interest rates. The issuer may call the bond as interest rates fall—depending on its ability to refinance the debt. Such a bond does not have well-defined cash flows to plug into the modified and Macaulay duration calculations.
- **Key rate duration** (also called partial duration, or partials) is a measure of a bond's sensitivity to a change in the benchmark yield curve at a specific maturity point or segment. Key rate durations help identify "shaping risk" for a bond or a portfolio—that is, its sensitivity to changes in the shape of the benchmark yield curve (e.g., the yield curve becoming steeper or flatter, or showing more or less curvature).
- The **money duration** of a bond is a measure of the price change in units of the currency in which the bond is denominated. Money duration can be stated per 100 of par value or in terms of the bond's actual position size in the portfolio. In the United States, money duration is commonly called "dollar duration."
- The **price value of a basis point** (PVBP) is an estimate of the change in a bond's price given a 1 bp change in yield to maturity. PVBP "scales" money duration so that it can be interpreted as money gained or lost for each basis point change in the reference interest rate. This measure is also referred to as the "dollar value of an 0.01" (pronounced oh-one) and abbreviated as DV01. It is calibrated to a bond's par value of 100—a DV01 of $0.08 is equivalent to 8 cents per 100 points. (The terms PVBP and DV01 are used interchangeably; we will generally default to PVBP but DV01 has the same meaning).

Duration is a first-order effect that attempts to capture a linear relationship between bond prices and yield to maturity. **Convexity** is a second-order effect that describes a bond's price behavior for larger movements in yield. It captures the extent to which the yield/price relationship deviates from a linear relationship. If a bond has positive convexity, then the bond price increases more if interest rates decrease (and decreases less if interest rates increase) than the duration estimate would suggest. Said another way, the expected return of a bond with positive convexity will be higher than the

return of an identical-duration, lower-convexity bond if interest rates change. This price behavior is valuable to investors, and therefore a bond with higher convexity might be expected to have a lower yield than a similar-duration bond with less convexity.

Although convexity is valuable when interest rates are expected to change, it is likely to be even more valuable when interest rate volatility is expected to increase. This dynamic tends to drive changes in the shape of the yield curve—as convexity becomes more valuable, investors will bid up prices on the longer-maturity bonds (which have more convexity), and the long end of the curve may decline or even invert (or invert further), increasing the curvature of the yield curve.

Macaulay and modified duration cannot be used to measure the price risk of securities whose cash flows change when interest rates change.[4] Similarly, nominal convexity calculations assume that the cash flows do not change when yields change. **Effective convexity**, like effective duration, uses a methodology that can accommodate cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities [MBS]). This measure is used when describing the price behavior of bonds with embedded options.

A helpful heuristic for understanding convexity is that, for zero-coupon bonds:

- Macaulay durations increase linearly with maturity—a 30-year zero-coupon bond has three times the duration of a 10-year zero-coupon bond.
- Convexity is approximately proportional to duration squared; therefore, a 30-year zero-coupon bond has about nine times the convexity of a 10-year zero-coupon bond.[5]
- Coupon-paying bonds have more convexity than zero-coupon bonds of the same duration—a 30-year coupon-paying bond with a duration of approximately 18 years has more convexity than an 18-year zero-coupon bond.[6] The more widely dispersed a bond's cash flows are around the duration point, the more convexity it will exhibit. For this reason, a zero-coupon bond has the lowest convexity of all bonds of a given duration.

Although convexity can be a valuable tool when positioning a portfolio, it is important to remember that convexity is a second-order effect; it operates behind duration in importance and can largely be ignored for small yield changes. When convexity is added with the use of derivatives, however, it can be extremely important to returns. This will be demonstrated later in this reading. Negative convexity may also be an important factor in a bond or portfolio's returns. For bonds with short options positions embedded in their structures (such as MBS or callable bonds) or portfolios with short options positions, convexity's effect may be large.

Adding convexity to a portfolio is not free: Portfolios with higher convexity are most often characterized by lower yields. Investors will be willing to pay for increased convexity when they expect yields to change by more than enough to cover the give-up in yield. Convexity is more valuable when yields are more volatile.

---

4 In the early 1970s, researchers noticed that if one analytically solved (using calculus) for a bond's volatility in response to a small yield change, the solution involved a complicated expression that could be simplified into Macaulay duration divided by (1 + Periodic yield). This formula became known as "modified" duration. But, the derivation of that expression assumed that the cash flows did not change when interest rates changed. Thus, modified duration cannot be used when analyzing securities that violate this assumption, such as callables and mortgage-backed securities, among others.

5 This statement is true for Macaulay duration but only approximate for modified duration because of the divisor $(1 + y/2)$.

6 This is explained in "Understanding Duration and Convexity," Robert Kopprasch, Chapter 5 in *The Handbook of Fixed Income Securities*, 2nd Edition, Frank J. Fabozzi, ed., Dow Jones–Irwin, 1986.

A portfolio's convexity can be altered by shifting the maturity/duration distribution of bonds in the portfolio, by adding physical bonds with the desired convexity properties, or by using derivatives. We will discuss these approaches in more detail as we move to discussing specific approaches to implementing the yield curve strategies introduced herein.

3 MAJOR TYPES OF YIELD CURVE STRATEGIES

This reading focuses on "active" yield curve strategies. Although the term "active" seems to imply active or frequent trading, some active strategies entail little or no trading. Instead, the term "active strategies" implies only that the manager makes a deliberate choice to deviate from the characteristics of the relevant benchmark in an attempt to outperform that benchmark.

At the most basic level, fixed-income portfolio returns come either from yield (typically defined by the cash flows associated with the portfolio) or price change over the measurement interval. In the current low interest rate environment, significant yield accumulation is a difficult challenge, so managers use some techniques to enhance portfolio yield. The two most obvious are (1) maturity extension (if the yield curve is upward sloping) and (2) buying lower-credit securities. There are other techniques as well, and we discuss them in the following section on strategies under a stable yield curve. Yield return takes a long time to accumulate, however, and yield can be quickly overwhelmed by price change. So, it can be especially important for managers to either use expected price changes to enhance return or protect the portfolio from unexpected price changes to preserve the yield. We will also discuss the first of these two approaches in the sections that follow.

We have loosely classified the active strategies into two groups based on the yield curve environment in which they are typically used. As you will see from the discussion in the balance of this reading, however, each strategy may be useful in more than one environment.

1. Active strategies under assumption of a stable yield curve
   - Buy and hold
   - Roll down/ride the yield curve
   - Sell convexity
   - The carry trade
2. Active strategies for yield curve movement of level, slope, and curvature
   - Duration management
   - Buy convexity
   - Bullet and barbell structures

Portfolio managers have several tools at their disposal to add value relative to a benchmark. The most powerful tool is duration adjustment, but leverage, sector weightings, and convexity can also be used to enhance portfolio returns. The application of these strategies depends on several factors, including the following:

- The investment mandate that the investment manager has been hired to fulfill
- The investment guidelines imposed by the asset owner, especially regarding duration or duration deviations from a benchmark, credit quality, geographic constraints, turnover, concentration, and so on

- The investment manager's expectations regarding future yield curve moves and the manager's conviction in those expectations
- The costs of being wrong—whether measured as outright loss, poor relative performance, client loss, or reputational impairment

A Note to Readers Regarding Portfolios

The examples in this reading use numerous portfolios. Some use fictional bonds, and others use actual Treasury bonds available at the time of writing. Typically, the latter will be the "on-the-run" (i.e., the most recently issued) Treasury benchmark bonds. The same bonds appear in some different examples, sometimes with the same size positions, making them appear identical. Note, however, that they may have been priced at slightly different points in time, and thus the analytics (yield, duration, and so on) vary slightly. These differences are not mistakes but rather reflect the market at work.

3.1 Strategies under Assumptions of a Stable Yield Curve

The primary strategies a portfolio manager might use when she expects the yield curve to remain stable—no change in level, slope, or curvature—are 1) buy and hold; 2) riding the yield curve; 3) sell convexity; and 4) the carry trade.

3.1.1 *Buy and Hold*

In an active "buy and hold" strategy, the portfolio manager constructs a portfolio whose characteristics diverge from the benchmark characteristics, and the portfolio is held nearly constant with no active trading during a certain period. If the portfolio manager believes the yield curve is likely to remain stable, she may make an active decision to position the portfolio with longer duration and higher yield to maturity in order to generate higher returns than the benchmark. Alternatively, she may target segments of the yield curve where price changes are not likely to materially affect the portfolio's total return. The lack of turnover in the portfolio makes the strategy appear passive, but it can be quite aggressive at the same time.

3.1.2 *Riding the Yield Curve*

Riding the yield curve is a strategy based on the premise that, as a bond ages it will decline in yield if the yield curve is upward sloping. This concept is known as "roll down"—the bond rolls down the (static) curve. It has some similarities to the buy-and-hold strategy in that the securities, once purchased, are not typically traded. It differs from buy and hold, however, in its time horizon and expected accumulation. The manager is not only accumulating coupon income but is expecting to add to returns by selling the security at a lower yield at the horizon.

A portfolio manager will ride the yield curve when he expects a reasonably static yield curve. This strategy requires an upward-sloping yield curve; the manager will buy a bond in anticipation of profiting from the price increase as the time to maturity shortens. Say, for example, a five-year maturity par bond is selling at a yield to maturity of 5% and a four-year maturity par bond is selling at a yield to maturity of 4%. As time passes and the five-year bond becomes a four-year bond, its price will rise to the point that its yield to maturity equals 4%. In addition to collecting the interest income during the period, the portfolio manager benefits from this price appreciation. This strategy may be particularly effective if the manager targets portions of the yield curve that are relatively steep and where price appreciation resulting from the bond's migration to maturity can be significant.

If the manager's curve view changes, the "trade" will be unwound and the portfolio will be repositioned in accordance with the manager's revised expectations.

3.1.3 *Sell Convexity*

Recall that the price of a bond with higher convexity increases more if interest rates decrease, and decreases less if interest rates increase, than does the price of an equal-duration but lower-convexity bond. The expected (instantaneous) return of a bond with greater convexity will be higher than the return of an otherwise identical lower-convexity bond if interest rates change. If, as is usually the case, a bond with higher convexity has a lower yield, and the portfolio manager believes that the yield curve is likely to remain unchanged, the convexity in his portfolio is of little value to him. Holding those higher-convexity bonds means he is giving up yield. In this instance, he might choose to sell convexity.

To sell convexity, the portfolio manager could sell calls on bonds held in the portfolio, or he could sell puts on bonds he would be willing to own if, in fact, the put was exercised. In either case, the option premium received would augment the yield of the portfolio and the portfolio convexity would be lower—an acceptable condition if he thinks future volatility is likely to be less than what current options prices reflect.[7]

The portfolio would earn additional returns in the form of option premiums. Selling convexity outright is a strategy used only infrequently by managers of traditional fixed-income portfolios, because many institutional asset owners are reluctant to allow their fixed income investment managers to engage in option writing.

There are securities that inherently provide an option-writing opportunity for managers that are otherwise constrained. Callable bonds are one example. In exchange for a higher yield at the outset, the owner of the callable bond has effectively sold a call option to the issuer of the bond. He owns all of the downside but risks having the bond called away from him if yields fall (and prices rise) beyond the call price. This price behavior is often referred to as "negative convexity." The option is not separable from the security, but it is still very much a call option.

Mortgage-backed securities are another example of securities that provide an option-writing opportunity. Homeowners are the "issuers" of the underlying mortgages (they issue the mortgage, and the bank buys it). The homeowner must eventually repay the principal, and typically has the right to prepay—or call—the mortgage. In exchange for the higher yield typically available on MBS (compared with non-callable bonds of a similar duration), the portfolio manager has assumed some negative convexity. Although this option is very complex, making it difficult to fully understand and value, the reader should be aware that owning MBS in a portfolio is loosely equivalent to writing options.

3.1.4 *Carry Trade*

Another way to position a portfolio in anticipation of a static curve is to use the advantages of "carry." In general terms, a **carry trade** involves buying a security and financing it at a rate that is lower than the yield on that security. In a common carry trade, a portfolio manager borrows in the currency of a low interest rate country, converts the loan proceeds into the currency of a higher interest rate country, and invests in a higher-yielding security of that country. This trade frequently uses a high degree of leverage. The goal is to earn the spread between the two rates—earning more on the higher-yielding instrument than you are paying on the lower-yielding (financing) instrument. To be executed successfully, the trade must be unwound before any change in interest rates creates a loss in the higher-yielding security that exceeds the carry earned to date. (Although interest parity implies that the higher-yielding currency is overvalued relative to the lower-yielding currency—and thus should depreciate—there is substantial evidence that interest rate differentials are not predictive of subsequent

7 Note that selling a call would also reduce portfolio duration, whereas selling a put would increase duration. To keep portfolio duration the same, a manager could sell an appropriate combination of calls and puts.

exchange rate movements. Nonetheless, one must be conscious of the currency risk involved in cross-currency carry trades.) Although commonly spoken of in the context of cross-border trades, a carry trade might just as easily be executed using two securities of the same currency. The carry trade can be inherently risky, because the portfolio holds (typically) longer-term securities financed with short-term securities.

Crowding and the Yen Carry Trade

Japan has attempted to stimulate its economy by suppressing the value of the yen relative to the US dollar and other currencies. Hedge funds and others borrowed the yen at very low interest rates—close to zero—and converted the yen to US dollars. Those dollars were then invested in US Treasuries at a much higher yield than the interest cost for the borrowed yen. This creates "positive carry" because of the differential in interest rates. When executed in large volume, the buying drives up US bond prices.

Profits on the carry trade accrue from three aspects of the trade: the carry—or spread—between US and Japanese interest rates, a rise in US bond prices, and a rising US dollar versus the yen. Success is contingent on a stable yield curve and a lower (or at least stable) value of the yen.

Popular carry trades are subject to "crowding" risk, where the trades are done in such large volume by so many investors that the exit becomes crowded as all try to unwind the trade within a short span of time. The yen–Australian dollar carry trade is a good example of this crowding risk. In early 2007, the Australian dollar offered an average interest rate of 6.4% while the Japanese yen yielded approximately 0.4%, creating an interest rate differential of 6%. Investors continued to pile into this trade through late 2007. When the global financial crisis hit in 2008, there was a massive unwinding of the trade, pushing the Australian dollar down almost 50%. Similarly, the emerging market carry trade of the mid-1990s was very popular as investors borrowed the currencies of lower-interest-rate countries such as Japan or the United States and invested in the much higher-yielding bonds of emerging countries. As fears of potential emerging market defaults spiked, investors rushed for the exit and huge outflows from emerging market currencies precipitated an emerging market crisis followed by a global market crash.

Since the 2008 global financial crisis, however, short-term interest rates have been close to zero in much of the developed world, dampening enthusiasm for the yen carry trade but making carry in general very popular and profitable.

3.2 Strategies for Changes in Market Level, Slope, or Curvature

Investors often hold individualized expectations about the yield curve that they generate from economic analysis, data mining exercises, Fed watching, or other techniques. To the extent that investors position their portfolios based on these expectations, they are disagreeing with the forward expectations embedded in the yield curve. If their expectations turn out to be correct, they will earn superior returns. If their expectations are not met, however, they may suffer losses. There is no compelling evidence that any investor can consistently make superior directional calls. That is one reason why many fixed-income portfolio managers are assigned tight duration constraints. The following discussion covers the primary strategies portfolio managers may use in anticipation of a change in the level of interest rates or in the slope or shape of the yield curve.

3.2.1 *Duration Management*

In its simplest form, duration management shortens portfolio duration in anticipation of rising interest rates (decreasing bond prices) and lengthens portfolio duration in anticipation of declining interest rates (increasing bond prices). This strategy requires

a manager to correctly anticipate changes in interest rates. If executed successfully, duration management offers a substantially greater opportunity for active return than most other strategies.

As Exhibit 3 illustrated, the long bull market in bonds was unmistakable. Being long duration (choosing a portfolio duration greater than that of the benchmark) during this nearly 35-year period was a winning active strategy, despite occasional periods of yield increases.

Despite the difficulty in predicting the direction or magnitude of interest rate changes, duration management is one of a fixed-income manager's primary tools—positioning the portfolio to enhance profit as yields decline or minimize losses as yields rise.

As Equation 2 shows, modified duration, D, can be used to estimate the percentage change in a security's price (or the portfolio's value), P, given a change in rates.

$$\% P \text{ change} \approx -D \times \Delta Y \text{ (in percentage points)} \quad (2)$$

Note that when ΔY is negative, the calculated price change is positive because of the leading negative sign in the equation.

So, for example, if a bond (or portfolio) has a duration of 5 and one expects a 1% (100 bp) change in rates, the expected price change will be 5%.

If a portfolio manager expects that rates will decline, she will likely want to extend duration so that the price change (profit) resulting from the decline in rates will be greater than it would have been had the portfolio duration remained unchanged. If she expects rates to rise, she will adopt a more defensive posture by reducing the portfolio duration.

It is not simply a matter of increasing or decreasing duration, however. How the portfolio manager reduces or extends duration will affect the final result. Because yield curves seldom shift in parallel, equivalent duration adjustments can result in varying outcomes. Although duration positioning relative to the benchmark will dominate, the manager's positioning as the yield curve steepens or flattens as yields change can enhance or diminish her returns.

For example, consider a simple portfolio (Portfolio 1) allocated to three positions: one-third in cash, one-third in a sovereign bond with a duration of four years, and one-third in a sovereign bond with a duration of eight years. The portfolio would have a market-weighted duration of approximately 4.0 years. Suppose the manager wants to increase the duration to 6.0 years. There are many ways to do this, and Exhibit 7 outlines two alternatives.

Exhibit 7 Similar-Duration Portfolios May Respond Very Differently to the Same Change in Yields

		Allocation		
	Duration	Current Portfolio	Alternative 1	Alternative 2
Position 1 (cash)	0	33%	0	33%
Sovereign 1	4	33%	50%	0
Sovereign 2	8	33%	50%	0
Sovereign 3	6	0	0	33%
Sovereign 4	12	0	0	33%
Market-weighted duration		4	6	6

One alternative would be to reduce the cash position to zero, adding half of the cash to the 4-year duration bond and the other half to the 8-year duration bond (Alternative 1). A second alternative would be to leave the cash position unchanged, sell the 4- and 8-year duration bonds, and buy in their place 6- and 12-year duration bonds (Alternative 2).

The two alternative portfolios would have identical market-weighted durations, but they would respond differently to non-parallel yield curve moves because of their different structures. Say that the long end of the yield curve—bonds with durations greater than 9—rallied (rates at the long end declined more than rates at the shorter end). Alternative 2 would outperform Alternative 1. With no exposure to bonds with durations greater than eight years, Alternative 1 would not participate in the rally. So you can see that duration positioning—the pattern of bonds across the maturity spectrum—is important for non-parallel changes in the yield curve.

For a straight bond, one with no embedded options, the relationship among duration, price change, and yield change is straightforward (see Equation 2). If all yields moved in parallel, we could simply sum the anticipated price changes of the bonds in a portfolio based on duration and the yield change to estimate our return based on our yield forecast. We could also predict the extra price volatility of our portfolio for a given change in duration. Our prediction would be quite accurate. We could incorporate convexity measures as well for more accuracy, especially if our forecast yield changes were large, although projections incorporating convexity are much less intuitive than the linear duration estimation.

When not all of the points on the curve move by the same amount, however, our forecast's accuracy deteriorates. As a result, some parts of the portfolio may perform better than expected, some parts as expected, and some parts worse than expected. The lack of perfect correlation among yield movements means the portfolio duration calculation should be thought of as an *estimate* rather than a precise measure of interest rate sensitivity, and portfolio managers must carefully monitor their duration distribution across the portfolio, especially relative to their benchmark. An essential tool in monitoring duration distribution is "key rate duration," which we will discuss further in Section 3.2.3.

3.2.1.1 Using Derivatives to Alter Portfolio Duration If a portfolio is fully invested, it is often easier to reduce duration than to increase it. Duration can be reduced by the sale of some securities and holding cash. To increase duration (without using derivatives), it is necessary to sell shorter-duration securities and simultaneously buy longer-duration securities. When altering duration through simultaneous purchases and sales of securities, the portfolio manager may find herself in a position of having to sell securities that she would have preferred to retain—securities that were hard to find or that have low liquidity and are costly to transact.

It is much easier to alter portfolio duration using interest rate derivatives.[8] A derivatives overlay keeps the lengthening or shortening of duration separate from security selection, and it does not require a change in basic portfolio structure. (An overlay strategy uses derivative instruments to either obtain, offset, or substitute for certain portfolio exposures beyond those provided by the physical investment portfolio.)

8 We specify "interest rate derivatives" here because the word "derivatives" alone has different meanings to different segments of the fixed-income population. For example, an MBS manager might use the term to mean interest-only strips and principal-only strips (also called IOs and POs). Others might think of collateralized mortgage obligations (CMOs), whose cash flows are derived from those of more basic MBS. Structured notes are also referred to as derivatives. In this paragraph, we are talking about simple interest rate derivatives, such as puts and calls on bonds and interest rate futures (themselves called derivatives). We are also including caps and floors (typically on Libor) and various swaptions (options on swaps).

One way to adjust portfolio duration with derivatives is to use futures contracts. Fixed-income futures contracts are sensitive to changes in the price of the underlying bond. No cash outlay is required in futures contracts beyond posting and maintaining margin. There are two important concepts necessary to calculate the futures trade required to alter a portfolio's duration—money duration and price value of a basis point (PVBP).

Money duration is market value multiplied by modified duration, divided by 100.[9] PVBP is market value multiplied by modified duration, divided by 10,000. PVBP scales money duration so that it can be interpreted as money gained or lost for each basis point change in the reference interest rate. For example, a portfolio with $10 million market value and a duration of 6 has PVBP = $6,000.

($10 million × 6)/10,000 = $6,000

In other words, for every 1 bp shift in the US Treasury curve (upward or downward), the portfolio loses (or gains) $6,000. To extend the portfolio's duration to 7, we must add $1,000 PVBP, without changing the portfolio size. The duration extension could be accomplished using a US dollar fixed-income futures contract. Take, for example, a US Treasury 10-year note futures contract that, in this example, is assumed to have a PVBP of $85. To add $1,000 PVBP to our $10 million portfolio, we would need to buy 12 contracts:

Required additional PVBP ÷ PVBP of the futures contract
= Number of contracts required

1,000 ÷ 85 = 11.76 or 12 contracts

It is possible to extend portfolio duration using leverage rather than futures. Take the $10 million portfolio with a duration of 6 from the example above. Again, to increase the effective portfolio duration to 7, we need to add $1,000 PVBP. The portfolio manager can use leverage to purchase $1.67 million of similar bonds with a duration matching the portfolio duration of 6. The following calculation estimates the value of bonds required:

Required additional PVBP	$1,000
÷ Duration of bonds to be purchased and financed	÷ 6
× 10,000	× 10,000
Additional market value of bonds to be purchased using leverage:	≈ $1.67 mil

To calculate the effective portfolio duration, use the following equation.

$$\frac{\text{Notional portfolio value}}{\text{Portfolio equity}} \times \text{Duration} \approx \text{Effective portfolio duration}$$

$$\frac{\$11.67 \text{ million}}{\$10 \text{ million}} \times 6 \approx 7$$

In this equation, "Duration" refers to the duration of the assets (including levered bonds) alone, without regard to the liabilities that funded them.[10] That adjustment is done by the first term of the equation (Notional value/Equity).

9 Any time we use the term "duration" and are referring to a measure of bond price change, we are referring to either modified duration or effective duration (which is always calibrated in terms of a modified duration). Effective duration is used for securities with embedded options.

10 The implicit assumption here is that the position is funded with overnight loans so that the liability has zero duration. If term funding (say, three months) is used, then the duration of the liability must be netted against the duration of the additional bonds purchased in determining the amount of bonds needed to reach the duration target. The following example using swaps rather than additional bonds illustrates the mechanics of this calculation.

Assuming that bonds with the appropriate duration can be purchased and financed—in this example, bonds with a duration of 6, leverage alone can perform the duration extension—there is no need to use longer-duration bonds. This form of leverage highlights the importance of examining a position's PVBP (here, $7,000) rather than merely its duration when seeking to modify portfolio duration. Of course, there is no requirement limiting us to the use of bonds with a duration of 6. We could have used bonds with a duration of 3, but doing so would have required adding twice as much in market value to achieve the desired PVBP, and the interest cost would have been higher. Or we could have chosen bonds with a longer duration and then used less market value and less borrowing to achieve the same result. Either of these approaches would add a bit of curve risk to the portfolio, because now it would own bonds subject to yield changes at a shorter or longer point on the curve.

Leverage adds interest rate risk because it increases the portfolio's sensitivity to changes in rates (its duration is higher, after all). Note that using leverage in portfolios which contain credit risk amplifies both credit risk and liquidity risk.

Interest rate swaps could also be used to achieve the increase in duration. Although swaps are not as liquid as futures, nor as flexible in the short term as using leverage, swaps can be created for virtually any maturity and are not limited to the standard maturities in note or bond futures. And, although the legal and liquidity considerations differ between swaps and either futures or leverage, theoretically they are hard to distinguish from one another. A receive-fixed position (receive fixed, pay floating) in a swap is essentially a long position in a bond and a short position in a short-term security, much like the long bond/short financing position of leverage, or the long bond/short repo position of a futures contract.

Interest rate swaps share a feature with futures that some investors find disturbing—they lack a well-defined duration. If, when we use the term "duration," we mean "the percentage value change for a 100 bp rate shift," that measure is really undefined because a new futures position or a new swap has no market value. Both the future and the swap add dollar (or money) volatility to the portfolio, however, because their value changes as rates change. The money duration or PVBP measures capture this effect on a portfolio.

The process for determining the notional value of swaps to add to a portfolio (either to lengthen duration, using a receive-fixed swap, or shorten duration, by adding a pay-fixed swap) is the same as that shown earlier for futures. We first determine the desired PVBP of the portfolio, and then we assess what size swap position would add the required amount. Because swaps do not have a standardized size like futures do, we instead calculate the amounts in $1,000,000, and scale accordingly.

Consider the following three interest rate swaps (all versus three-month Libor):

Maturity	Effective PVBP Receive Fixed	Effective PVBP Pay Floating	Net Effective PVBP	PVBP per Million
5-Year	0.0485	0.0025	0.0460	460
10-Year	0.0933	0.0025	0.0908	908
20-Year	0.1701	0.0025	0.1676	1,676

Using the same base example as previously, where the starting portfolio is $10 million with a duration of 6, resulting in a PVBP of $6,000, what swap position would we have to add to bring the portfolio duration up to 7 as before? Remember that in the earlier example, we determined that we needed to add PVBP of $1,000 to move the portfolio from a duration of 6.0 to a duration of 7.0.

- Using five-year swaps, we would need to add 1,000/460 or $2.17 million in swaps.

- Using 10-year swaps, we would need to add 1,000/908 or $1.1 million in swaps.
- Using 20-year swaps, we would need to add 1,000/1,676 or $0.60 million in swaps.

Notice how these answers are consistent with the previous futures example. In that example, we had to add approximately 12 contracts, or $1.2 million face value. Using 10-year swaps, we would add $1.1 million. This slight difference arises because the futures contract was tracking a "cheapest to deliver" that is slightly shorter than the 10-year note. Naturally, the 20-year swaps have more volatility than the 10-year swaps, and a lower face amount would be needed for the same exposure. Similarly, the lower-volatility five-year swap would have to be added in larger size to achieve the same exposure.

Any of these three positions would add the same dollar volatility to the portfolio for a parallel shift in yields (assuming that swap spreads relative to Treasuries remain constant). But, each would have its primary exposure to a different part of the curve, and therefore, if the curve moved in a non-parallel fashion, these swaps would not perform identically. Clearly, some curve risk is inherent in the selection process.

3.2.2 *Buy Convexity*

A portfolio manager may choose to alter portfolio convexity without changing duration in order to increase or decrease the portfolio's sensitivity to an anticipated change in the yield curve. Recall that convexity measures the sensitivity of duration to changes in yield. If yields rise, a portfolio of a given duration but with higher convexity will experience less of a price decline than a similar-duration, lower-convexity portfolio. Similarly, if yields fall, the higher-convexity portfolio will outperform a lower-convexity portfolio of the same duration. When a portfolio manager is operating under very tight duration constraints, convexity can be an important portfolio management tool.

Adding convexity by shifting the distribution of bonds in a portfolio, as illustrated in Exhibit 7, can enhance returns, but the effects of this strategy will likely be quite modest. Portfolios with broader mandates that include credit securities, and whose performance is evaluated relative to a benchmark, often have portfolios consisting of hundreds of securities; managers will find it difficult to alter the portfolio structure quickly. With the additional impediment of the illiquidity inherent in credit securities (and thus the likelihood that the portfolio contains bonds that the manager is reluctant to sell), altering portfolio structure to become more bulleted (concentrated maturities) or more barbelled (dispersed maturities) can be cumbersome. Portfolios with broader mandates can alter convexity using derivatives such as options and swaptions, callable bonds, and mortgage-backed securities.

We have previously stated that the goal of increasing convexity is to mitigate price declines and enhance price increases (beyond those provided by duration) resulting from changes in interest rates. Another way to state this concept is to say that the manager wants to add more curvature to the price–yield function of his portfolio. The most direct way to do this is to add instruments that have a lot of curvature in their price response to yield changes. Exhibit 8 shows the trajectory of the value of a call option on a bond relative to the bond price.

Exhibit 8 Call Option on a Bond

The option exhibits the curvature portfolio managers can find so valuable. As the price of the underlying bond declines, the option value also declines, although at a slower (and slowing) pace than the price of the bond itself. If the bond price falls below the option's strike price, the intrinsic value of the option is zero; any further decline in the bond price will have no effect on the (terminal) value of the option. When the price of the underlying bond rises, the option's value quickly increases and its performance will begin to match the underlying one-for-one (its "delta," the sensitivity of the option's price to changes in the price of the underlying bond, approaches 1.0). This rapid curvature, or acceleration and deceleration of price response, is very effective at adding convexity to a portfolio.

If the option's delta (measured in absolute price change) is calculated correctly into the duration of the portfolio, the rapid change in delta translates into increased portfolio duration as rates decline and prices rise, and into lower duration as prices fall. This dynamic is the essence of convexity.

For the portfolio to benefit from higher convexity, the anticipated decline in rates must occur within a short window of time. Recall that, all else being equal, a bond with higher convexity has a lower yield than a bond without that higher convexity. The lower yield creates a drag on returns. If the yield change unfolds over too long a period, the yield sacrificed will be larger than the expected price effect.

The next section discusses the use of portfolio structure—using bullets and barbells—to profit from a change in yield curve slope and curvature.

3.2.3 *Bullet and Barbell Structures*

Because yield curve moves are most frequently not parallel, managers often structure their portfolios to take advantage of a non-parallel move (a change in slope or curvature). The most common strategies used to capitalize on these non-parallel moves are bullet and barbell structures.

Two portfolios can have the same duration but be structured very differently in anticipation of a given yield curve change. A **bullet** portfolio is made up of securities targeting a single segment of the curve.[11] This structure is typically used to take advantage of a steepening yield curve—a bulleted portfolio will have little or no exposure at maturities longer or shorter than the targeted segment of the curve. If long rates rise (and the yield curve steepens), the bulleted portfolio will lose less than a portfolio

11 When we use the term "bullet portfolio," we are talking about a portfolio with maturities near the center of some range, as opposed to a barbell, which concentrates its maturities at the ends of the range. Although it is possible to have a 30-year bullet portfolio or a 1-year bullet portfolio, we are focused here on *comparing* two portfolios with similar duration but vastly different maturity structures.

of similar duration but composed of exposures distributed across the yield curve. If the yield curve steepens through a reduction in short rates, the bulleted portfolio has given up very little in profits given the small magnitude of price changes at the short end of the curve.

Barbells are portfolios combining securities concentrated in short and long maturities (and, consequently, owning less in the intermediate maturities) relative to the benchmark. They are typically used to take advantage of a flattening yield curve. If long rates fall more than short rates (and the yield curve flattens) the portfolio's long-duration securities will capture the benefits of the falling rates in a way that the intermediate-duration securities cannot. If the yield curve flattens through rising short-term rates, portfolio losses are limited by the lower price sensitivity to the change in yields at the short end of the curve, whereas the (non-barbell) benchmark's middle securities will do poorly.

Key rate durations (KRDs) are often used to identify bullets and barbells. Also called partial durations, KRDs can be used to estimate a bond's sensitivity to changes in the shape of the benchmark yield curve. KRDs measure durations of fixed-income instruments at key points on the yield curve such as 2-year, 5-year, 7-year, 10-year and 30-year maturities.

Of course, the sum of the KRDs must closely approximate the effective duration of a bond or portfolio. Otherwise, for parallel shifts in the benchmark yield curve, KRDs would indicate a different interest rate sensitivity and be inconsistent with the effective duration.[12]

Consider the two portfolios shown in Exhibit 9. These are Treasury portfolios constructed as temporary substitutes for a more inclusive Treasury index that includes off-the-run issues. The initial goal in the construction of Portfolio 1 was to match the general duration characteristics of the index. The goal in constructing Portfolio 2 was to modify Portfolio 1 in such a way as to keep the aggregate duration nearly the same while creating a slightly more barbelled portfolio.

Exhibit 9 Two Portfolios: Similar Duration, Different Convexity

Panel A: Portfolio 1

Ticker	Coupon	Maturity	YTM	Effective Duration	Par Amount (thousands)	Market Value	Effective Convexity
2 Year	0.75	31 Jan 2018	0.816	1.979	19,000	18,975	—
3 Year	0.75	15 Feb 2019	0.987	2.96	16,000	15,888	—
5 Year	1.375	31 Jan 2021	1.345	4.842	10,500	10,515	—
10 Year	2.25	15 Nov 2025	1.935	8.887	7,500	7,745	—
30 Year	3.00	15 Nov 2045	2.762	20.142	7,000	7,380	—
Portfolio 1	**1.325**		**1.333**	**5.834**	**60,000**	**60,503**	**0.779**
Index	**2.012**		**1.430**	**5.853**			**0.801**

Panel B: Portfolio 2

Ticker	Coupon	Maturity	YTM	Effective Duration	Par Amount (thousands)	Market Value	Effective Convexity
2 Year	0.75	31 Jan 2018	0.816	1.979	31,000	30,959	
3 Year	0.75	15 Feb 2019	0.987	2.96	9,000	8,937	

12 Indeed, for complex securities such as MBS, with significant modeling complexity, this check is required to see if the KRDs make sense in the overall modeling context.

Exhibit 9 (Continued)

Panel B: Portfolio 2

Ticker	Coupon	Maturity	YTM	Effective Duration	Par Amount (thousands)	Market Value	Effective Convexity
5 Year	1.375	31 Jan 2021	1.345	4.842	5,000	5,007	
10 Year	2.25	15 Nov 2025	1.935	8.887	7,000	7,228	
30 Year	3.00	15 Nov 2045	2.762	20.142	8,000	8,435	
Portfolio 2	**1.294**		**1.290**	**5.714**	**60,000**	**60,566**	**0.877**
Index	**2.012**		**1.430**	**5.853**			**0.801**

- The effective duration of both portfolios is close to that of the index (5.85).
- The convexity of Portfolio 1 is also close to that of the index (0.779 versus 0.801).[13]
- The convexity of Portfolio 2 is higher than that of the Portfolio 1 (0.877 versus 0.779) and of the index (0.877 versus 0.801).

In Exhibit 10, we compare the key rate duration-based PVBPs of each portfolio and the index. Exhibit 11 graphs the distribution of partial PVBPs for the two portfolios.

Exhibit 10 Partial PVBPs

	Partial or Key Rate PVBPs							
	Total	1 Year	2 Year	3 Year	5 Year	10 Year	20 Year	30 Year
Portfolio 1	0.059	0	0.0056	0.0073	0.0126	0.0127	0.0014	0.0191
Portfolio 2	0.059	0	0.0096	0.0040	0.0074	0.0119	0.0018	0.0238
Index	0.061	0.0017	0.0033	0.0063	0.0147	0.0093	0.0085	0.0173

Note that the sum of the partial PVBPs closely approximates the money duration of the portfolio (= Effective duration × Portfolio value per $1 of par) divided by 100. For Portfolio 1, this equals [5.834 × (60,503/60,000)]/100 = 0.0588. The nominal key rate exposure at 20 years results from coupon payments on the longer-maturity bonds.

- The sums of the partial PVBPs for each of the two portfolios are the same (0.059) and close to the benchmark partial PVBPs (0.061).
- Portfolio 1 has key rate PVBPs distributed along the yield curve, underweighting the 5- and 20-year relative to the index, but the 2-, 3-, 10-, and 30-year maturities are well represented, evidencing a bullet.
- Portfolio 2 materially overweights the 2s and 30s relative to the index and underweights the 3-, 5- and 20-year segments, evidencing a barbell.

13 Convexity statistics must always be interpreted carefully because there is no convention for how they are scaled. As noted earlier, the convexity of a zero-coupon bond is approximately equal to its duration squared. A five-year zero-coupon bond has duration of roughly 5, so we should expect its convexity to be on the order of 25. Reported convexity numbers, however, frequently reflect dividing the "raw" number by 100. We follow that practice throughout this reading. Thus, the convexity shown here for the index (0.801) would correspond to 80.1 before rescaling. Properly accounting for the scaling of convexity numbers is especially important when they are used in approximating returns, as we do later in this reading.

Exhibit 11 Distribution of Partial PVBPs for Each Portfolio

Portfolio 2 is likely to perform similarly to Portfolio 1 and the index for parallel shifts because of their similar overall durations. But in a curve flattening, especially one with added curvature such as that specified in Exhibit 12, Portfolio 2 will outperform based on its barbell structure.

Exhibit 12 Flattening Yield Curve Scenario

Panel A

Key Rate Curve Shift			
Maturity	**Beginning Curve**	**End Curve**	**Curve Shift**
2 Year	0.816	0.816	0.0
3 Year	0.987	1.037	5.0
5 Year	1.345	1.445	10.0
10 Year	1.935	2.185	25.0
20 Year	2.349	2.324	–2.5
30 Year	2.762	2.462	–30.0
2s–30s Spread	1.946	1.646	–30.0
Butterfly Spread	0.292	1.092	

Panel B

In Exhibit 13, we can see, as anticipated, that the barbelled portfolio (Portfolio 2) performed substantially better than the non-barbelled portfolio (Portfolio 1).

Exhibit 13 Change in Portfolio Values for Flattening Yield Curve

	Partial PVBP				Change in Value	
Maturity	Portfolio 1	Portfolio 2	Yield Curve Change (bps)	Par Amount of Portfolios	Portfolio 1	Portfolio 2
2 Year	0.0056	0.0096	0.0	$60,000,000	—	—
3 Year	0.0073	0.0040	5.0	$60,000,000	($21,900)	($12,000)
5 Year	0.0126	0.0074	10.0	$60,000,000	($75,600)	($44,400)
10 Year	0.0127	0.0119	25.0	$60,000,000	($190,500)	($178,500)
20 Year	0.0014	0.0018	–2.5	$60,000,000	$2,100	$2,700
30 Year	0.0191	0.0238	–30.0	$60,000,000	$343,800	$428,400
					$57,900	**$196,200**

EXAMPLE 1

Yield Curve Strategies

During a recent meeting of the investment committee of Sanjit Capital Management Co. (Mumbai), the portfolio managers for the firm's flagship fixed-income fund were asked to discuss their expectations on Indian interest rates over the course of the next 12 months. Indira Gupta expects the yield curve to steepen significantly, with short rates falling in response to a government stimulus package and long rates rising as non-domestic investors sell their bonds in response to a possible sovereign credit rating downgrade. Vikram Sharma also sees short rates declining as the Reserve Bank of India substantially lowers its policy rate to stimulate economic growth, but he expects the long end of the curve to remain unchanged. He has only moderate conviction in his forecast for the long end of the curve. Ashok Pal disagrees with his co-workers. He believes the Indian economy is doing quite nicely and expects interest rates to remain stable during the next year.

From the following list, identify which yield curve strategy each of the three portfolio managers would most likely use to express his or her yield curve view. Justify your response.

Strategy:

- Roll down/ride the yield curve
- Sell convexity
- Carry trade
- Duration management
- Buy convexity
- Bullet
- Barbell

Solution:

Based on her view that the yield curve will steepen significantly with short rates falling and long rates rising, Gupta would most likely implement a bullet structure, concentrating the portfolio holdings in bonds whose duration are closely matched to the duration of the index. The bullet structure offers protection against a steepening yield curve.

Based on his view that short rates will decline significantly while long rates remain unchanged, Sharma is unlikely to shorten duration but would adopt a bullet portfolio structure. This approach avoids longer-maturity securities to insulate the portfolio against possible adverse moves at the long end of the curve. The duration of his portfolio holdings may be less concentrated than Gupta's given his more benign view of long rates.

Based on his view that interest rates will remain stable during the next 12 months, Pal is most likely to sell convexity for the year ahead. With an expectation for stable interest rates, he sees little value in the convexity that currently exists in his portfolio. Pal can sell convexity through the sale of options on bonds in his portfolio, or he could replace some of the current positions with callable bonds or mortgage backed securities.

4 FORMULATING A PORTFOLIO POSITIONING STRATEGY GIVEN A MARKET VIEW

We now move from describing these strategies to demonstrating how they can be used to position a portfolio given expectations for a given yield curve change. We will explore a variety of different scenarios.

Modifying a portfolio for the anticipated yield curve change requires the following:

- A clear understanding of the benchmark against which the portfolio is being evaluated and the role the portfolio is intended to fill in the client's portfolio;
- Understanding of any client-imposed constraints, such as duration, minimum and overall credit quality, diversification, or leverage;
- A detailed understanding of the current portfolio characteristics;
- A yield forecast (of course); and
- Knowledge of the portfolio positioning strategies most applicable to the anticipated yield curve environment.

We look at how one portfolio manager might approach the portfolio positioning challenge.

4.1 Duration Positioning in Anticipation of a Parallel Upward Shift in the Yield Curve

Hillary Lloyd is a portfolio manager at AusBank. She manages a portfolio benchmarked to the XYZ Short- and Intermediate-Term Sovereign Bond Index, which has an effective duration of 2.00 (Exhibit 14). Her mandate allows her portfolio duration to fluctuate ±0.30 year from the benchmark duration. Her current portfolio of annual coupon-paying bonds is shown in Exhibit 15.

Exhibit 14 Benchmark Index Characteristics

Benchmark XYZ (Short/Intermediate Sovereign Index):	
Yield to Maturity	**Effective Duration**
2.30%	2.000

Exhibit 15 Current Portfolio

Maturity	Coupon	Price	YTM	Par Amount	Market Value	% Total Market Value	Beginning Effective Duration	Ending Effective Duration
1 Year	1.50	100	1.50	5,000	5,000	5%	0.985	0.000
2 Year	1.91	100	1.91	65,000	65,000	65%	1.944	0.979
3 Year	2.23	100	2.23	24,000	24,000	24%	2.871	1.930
4 Year	2.50	100	2.50	3,000	3,000	3%	3.762	2.846
5 Year	2.74	100	2.74	2,000	2,000	2%	4.614	3.726
6 Year	2.95	100	2.95	1,000	1,000	1%	5.426	4.566
Portfolio	2.01%		2.01%		100,000	100%	2.261	1.305

Lloyd is highly confident that yields will increase by 60 bps across the curve in the next 12 months. Her research department has prepared a table of expected returns based on her forecast, shown in Exhibit 16. Lloyd must now select which securities to sell and which ones to buy to maximize her return during the next year while staying within her portfolio constraint.

Exhibit 16 Expected Returns under Conditions of (1) a Stable Yield Curve and (2) a +60 bp Parallel Yield Curve Shift

Security Descriptor (all are par bonds)			Next 12-Month Price and Return Expectations under Assumption of Stable Yield Curve		Implied Forward Yield and Implied Yield Change		Next 12-Month Yield Forecast and Holding Period Return Estimation under Forecast Interest Rate Change (+60 bps)	
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]
Maturity	Coupon	Current price	New Price with Rolldown[a]	Holding Period Return	Implied Forward Yield[b]	Implied Yield Change	Yield Curve Forecast	Holding Period Return[c]
1 Year	1.50%	100	100.00	1.50%	2.33%	0.83%	2.10%	1.50%
2 Year	1.91%	100	100.40	2.31%	2.61%	0.70%	2.51%	1.72%
3 Year	2.23%	100	100.62	2.85%	2.85%	0.62%	2.83%	1.69%
4 Year	2.50%	100	100.78	3.28%	3.07%	0.57%	3.10%	1.56%

(continued)

Exhibit 16 (Continued)

Security Descriptor (all are par bonds)			Next 12-Month Price and Return Expectations under Assumption of Stable Yield Curve		Implied Forward Yield and Implied Yield Change		Next 12-Month Yield Forecast and Holding Period Return Estimation under Forecast Interest Rate Change (+60 bps)	
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]
Maturity	Coupon	Current price	New Price with Rolldown[a]	Holding Period Return	Implied Forward Yield[b]	Implied Yield Change	Yield Curve Forecast	Holding Period Return[c]
5 Year	2.74%	100	100.90	3.64%	3.27%	0.53%	3.34%	1.41%
6 Year	2.95%	100	100.97	3.92%	3.46%	0.51%	3.55%	1.18%

[a] Although calculating the price of the bond given rolldown is not a focus of this reading, we know it is helpful to some candidates to work through the derivation of each number. The general formula for calculating a bond price given the market discount rate is as follows:

$$\text{PV} = \frac{\text{PMT}}{(1+r)^1} + \frac{\text{PMT}}{(1+r)^2} + \cdots + \frac{\text{PMT} + \text{FV}}{(1+r)^n}$$

where PV is the present value (the price of the bond); PMT is the coupon payment per period; FV is the future value paid at maturity (the par value of the bond); r is the market discount rate, or required rate of return per period; and n is the number of evenly spaced periods to maturity. For example, in the foregoing table (Column D), the new price with rolldown for the two-year (annual payment) bond *after* it "rolls down" to become a one-year bond is calculated using the following inputs: FV = 100, PMT = 1.91, r = 1.50%, and n = 1. The new price with rolldown is PV = 100.40.

[b] The implied forward rate is the rate implied by the current term structure of interest rates at which investors would be indifferent to maturity. So, in the simplest case of zero-coupon bonds, we can buy the two-year zero bond with a yield of 1.91% or a one-year zero bond with a yield of 1.50%. If we buy the two-year zero, at the end of two years we would collect \$1.0386 ($[1 + 0.0191]^2$) for every \$1 invested. If we buy the one-year zero, at the end of one year we would have \$1.015 (1 + 0.015). What one-year rate one year from now would make us indifferent between buying the one-year zero and the two-year zero today? This is the one-year forward rate. Derivation of the forward yield requires the spot zero curve (which can be derived by "bootstrapping" from the par curve) as an input.

[c] The one-year holding period return for the two-year bond, assuming a 60 bp increase in yields (the one-year rate rises from 1.50% to 2.10%), can be determined using the following inputs: FV = 100, PMT = 1.91, r = 2.10%, and n = 1. The new price is PV = 99.81. The one-year holding period return is then calculated as [(99.81 − 100.00) + 1.91]/100 = 0.0172, or 1.72%.

Column E reflects the return from "riding the yield curve," assuming no change in the yield curve. Recall that the return of a sovereign bond over a one-year period (Column E at the one-year maturity), regardless of maturity, is always the one-year risk-free rate if the spot rates evolve as implied by the current forward curve at the end of the first year. If Lloyd's forecast was for a stable yield curve, she would likely own as much of the longer-maturity bonds as possible, because their returns are the highest in the stable curve scenario as they roll down the curve.

Consider the following, however:

- If Lloyd's forecast of a 60 bp move upward in rates is correct, then the two-year bond offers the highest return (1.72%).
- The five- and six-year bonds have forecast yields (as they become four- and five-year bonds) that are higher than the corresponding implied forward yields. Thus, they can be expected to return less than the one-year rate of 1.50%. (The implied yield change of the six-year bond is 51 bps in the stable yield curve environment. If yields move by more than the implied yield change—in this

case, Lloyd is forecasting a 60 bp change in yield—there must be a downward price adjustment for the bond to reach its forecast yield. The move up in yield drives the price lower, resulting in a return lower than the one-year rate.]

- Bonds with two to three years to maturity all have forecast yields below their implied forwards and can be expected to return more than 1.50%. Any bond with an implied forward yield change greater than the forecasted increase in yield can be expected to have a return higher than the one-year rate if the forecast rates are realized.

The "best" bond is determined by a combination of the basis point difference in forward yield versus the forecast yield (or implied change versus forecast yield change) translated through the duration of the bond at the horizon. In our example, as bond maturity becomes shorter, the yield difference increases but the duration also decreases. The best bond has the highest product of these two terms.

For example, consider the two-year bond. If the yield on the bond evolves to its implied forward yield of 2.33% (column F) as a one-year bond one year from now, it will return 1.50%. But if, instead of changing in yield by 83 bps to reach the forward yield, it changes by only +60 bps to reach the forecast yield of 2.10% (column H), the 23 bps of "unused" forward migration can be thought of as a last-minute rally in the one-year bond at the horizon. For a duration just under one year (0.98) at the horizon, this 23 bp "rally" would add just under 23 bps to a bond priced near par. Using Equation 3 to calculate the holding period return, we see that it does: The two-year bond has a holding period return of 1.72%, 22 bps higher than it would have had it simply moved to its implied forward yield.[14]

$$\begin{aligned}\text{Total return} &\approx -1 \times \text{Ending effective duration}\\ &\quad \times (\text{Ending yield to maturity} - \text{Beginning yield to maturity})\\ &\quad + \text{Beginning yield to maturity} \qquad (3)\\ &\approx -1 \times 0.98 \times (2.10 - 1.91) + 1.91\\ &\approx 1.72\%\end{aligned}$$

Guided by the information obtained from the expected returns table, a manager facing no portfolio constraints would sell all current bond holdings except for the two-year bond. Then, he would use all of the sales proceeds to buy more two-year bonds, because these offer the highest one-year return. The portfolio duration would be 1.944 (see Exhibit 17) and would meet the requirement of being 2.00 ± 0.30.

Exhibit 17 Revised Portfolio

Maturity	Coupon	Price	Yield to Maturity	Par Amount (thousands)	Market Value (thousands)	% Total Market Value	Effective Duration
1 Year	1.50%	100.00	1.50%		—	0.0%	0.985
2 Year	1.91%	100.00	1.91%	100,000	100,000	100.0%	1.944
3 Year	2.23%	100.00	2.23%		—	0.0%	2.871
4 Year	2.50%	100.00	2.50%		—	0.0%	3.762
5 Year	2.74%	100.00	2.74%		—	0.0%	4.614

(continued)

14 Ending duration is used in Equation 3 because the price change is assumed to occur instantaneously at the end of the one-year horizon.

Exhibit 17 (Continued)

Maturity	Coupon	Price	Yield to Maturity	Par Amount (thousands)	Market Value (thousands)	% Total Market Value	Effective Duration
6 Year	2.95%	100.00	2.95%		—	0.0%	5.426
Portfolio	**1.91%**	**100.00**	**1.91%**	**100,000**	**100,000**	**100.0%**	**1.944**

4.2 Portfolio Positioning in Anticipation of a Change in Interest Rates, Direction Uncertain

Stephanie Joenk manages the emerging markets government bond portfolio for a major German bank. The investment mandate requires that the portfolio's effective duration match that of benchmark, the Bloomberg Emerging Market Sovereign Bond Index. She expects Brazilian interest rates to be extremely volatile in the coming year, given the pending federal government elections. Based on her bank's internal economic forecasts and her own analysis, she expects that rates will move by 250 bps in the year ahead, although the direction of change will depend on the outcome of the elections.

To position the portfolio to profit from this view, Joenk plans to increase the portfolio's convexity. The portfolio would gain more in a declining rate environment and lose less in a rising rate environment than it would without the added convexity. She is willing to give up yield to improve her returns.

Joenk currently holds a Brazilian 10-year bond with a duration that, combined with the other positions in her portfolio, keeps the effective duration aligned with the benchmark. Other securities that are readily available in the market include 6-month bills as well as 3-year notes and 30-year bonds. Exhibit 18 shows the details of these securities.

Exhibit 18 Brazilian Government Notes and Bonds

Security	Coupon	Maturity Date	Price	Yield to Maturity	Effective Duration	Effective Convexity
Brazil 6 month	6.000	17 Jan 2017	102.70	1.110	0.538	0.006
Brazil 3 year	8.875	14 Oct 2019	119.75	2.599	2.895	0.105
Brazil 10 year	6.000	7 April 2026	104.80	5.361	7.109	0.666
Brazil 30 year	5.000	27 Jan 2045	82.50	6.332	13.431	2.827

Joenk can add convexity by selling the 10-year Brazilian bonds and investing all of the proceeds into a duration-matched barbell position of shorter and longer bonds:

		Duration	Convexity
Sell:	Brazil 10 year	7.109	0.666
Buy:	Brazil 3 year	2.895	0.105
	Brazil 30 year	13.431	2.827

To maintain the effective duration match between the portfolio and the index, the weighted duration of the combined trade (buy 3-year notes and buy 30-year bonds) must equal the duration of the 10-year notes she is selling:[15]

$$7.109 = (\text{Duration of 3-year note} \times \text{Weight of 3-year note})$$
$$+ (\text{Duration of 30-year bond} \times \text{Weight of 30-year bond})$$
$$7.109 = 2.895x + 13.431(1 - x)$$

Solving for x, we find $x = 0.60$

The proceeds from the sale of the 10-year note should be allocated 60% to the 3-year note and 40% to the 30-year bond:

(60% × 2.895) + (40% × 13.431) = 7.109

The gain in convexity will be 0.528:

(60% × 0.105) + (40% × 2.827) – (100% × 0.666) = 0.528

(Weight of the 3 year) × (Convexity of the 3 year) + (Weight of the 30 year) × (Convexity of the 30 year) – (Weight of the 10 year) × (Convexity of the 10 year) = 0.528

The give-up in yield will be –127 bps:

(60% × 2.599%) + (40% × 6.332%) – (100% × 5.361%) = –0.127 or –1.27%

(Weight of the 3 year) × (YTM of the 3 year) + (Weight of the 30 year) × (YTM of the 30 year) – (Weight of the 10 year) × (YTM of the 10 year) = 0.127

If the forecast change in rates does not materialize, the "yield drag" will cause the returns of the higher-convexity portfolio to be less than that of the initial portfolio with its lower convexity.

4.3 Performance of Duration-Neutral Bullets, Barbells, and Butterflies Given a Change in the Yield Curve

In this section, we compare the response of duration-neutral bullet and barbell portfolio structures to parallel shifts in the yield curve as well as changes in the slope of the yield curve.

4.3.1 *Bullets and Barbells*

Exhibit 19 displays a parallel shift of the yield curve with three bonds marked along the curve: A, B, and C. Our bulleted portfolio (Portfolio B) consists 100% of Bond B. The barbelled portfolio (Portfolio AC) consists of Bonds A and C, with 50% of the market value allocated to each.

15 Of course, the market values must be equal as well in order to preserve the money duration of the portfolio.

Exhibit 19 A Parallel Downward Shift of the Yield Curve

Portfolio AC has greater convexity than Portfolio B. This convexity affects how each portfolio responds to parallel shifts and changes in the slope of the yield curve. To facilitate the discussion, we will use several zero-coupon bonds to construct portfolios AC and B. This does not limit the applicability of our conclusions to portfolios composed solely of zero-coupon bonds, but it does make the bond math much easier. For purposes of this example, we make the following assumptions, summarized in Exhibit 20:

- The semi-annual bond equivalent yields on the overnight risk free money market fund (Position A), the 5-year note (Position B), and the 10-year note (Position C) are 2%, 3%, and 3.4%, respectively.
- Position A has a duration of essentially zero.
- Position B is a 5.075-year zero-coupon bond, with a modified duration of 5 (5.075/1.015).[16]
- Position C is a 10.17-year zero-coupon bond, with a modified duration of 10 (10.17/1.017).
- Portfolio AC, invested 50% in Position A and 50% in Position C, has a modified duration of 5 (50% × 0 + 50% × 10 = 5).

Exhibit 20 Position and Portfolio Characteristics

	Securities			Portfolios	
	A	B	C	B	AC
Maturity (years)	0.0027	5.075	10.17	5.075	5.086
Semi-annual, bond equivalent yield (%)	2.00%	3.00%	3.40%	3.00%	2.70%
Modified duration	0.00	5.00	10.00	5.00	5.00

We look now at how these portfolios perform when the curve experiences an instantaneous parallel downward yield curve shift, a curve flattening, or a curve steepening.

16 Recall that Macaulay duration of a zero-coupon bond is equal to its maturity. Modified duration is the Macaulay duration divided by one plus the yield per period. Modified duration provides an estimate of the percentage price change for a bond given a change in its yield to maturity.

In an instantaneous downward parallel shift, as illustrated in Exhibit 19, the higher-convexity barbell portfolio AC will outperform bullet portfolio B slightly because of AC's greater sensitivity to declining yields and rising prices. (Recall, however, that AC's advantage resulting from its higher convexity deteriorates over time because B accretes income at a higher rate—3.0% versus 2.7%. Under our assumption of an instantaneous shift, however, we can ignore yield differentials.)

Suppose the curve flattens: The yield differential between A and C decreases. We assume that the long end of the curve is unchanged but that short rates rise, as illustrated in Exhibit 21. In this scenario, Bond A (the risk-free overnight money market fund) does not decline in value given its duration of near zero. Bond C (the 10-year notes) does not change in value because its yield does not change. Portfolio B loses money, however, because the yield on position B (the five-year notes) rises. In this flattening scenario, the barbell portfolio (AC) outperforms the bullet portfolio (B).

Exhibit 21 A Flattening of the Yield Curve: Short Rates Rise

Let us now look at another simple "flattener" scenario, illustrated in Exhibit 22. This time we assume the curve flattens via a rise in short rates and a decline in long rates—we will "pin" the curve at B:

Exhibit 22 A Flattening of the Yield Curve: Short Rates Rise and Long Rates Fall

The price of Bond B is unaffected because the bond's yield is constant. The price of Bond A is unchanged given its zero (cash-like) duration. The price of Bond C increases as the bond's yield declines. In aggregate, the value of Portfolio AC rises while the value of Portfolio B remains unchanged. Again, the barbell portfolio (AC) outperforms the bullet portfolio (B).

We will now look at the behavior of these two portfolios if the yield curve steepens. Exhibit 23 illustrates this steepening scenario. The curve is "pinned" at C, and the yields of Bonds A and B decline.

Exhibit 23 A Steepening of the Yield Curve: Short and Intermediate Rates Fall

In this case, bullet Portfolio B outperforms barbell Portfolio AC, the opposite of what occurred when the curve flattened. Bonds A and C experience no change in price, while Bond B increases in value. (If portfolio managers say they are "positioned for a flattening," you can infer that their portfolios are somewhat barbelled versus the benchmark. If managers say they are "positioned for a steepener," their portfolios are somewhat bulleted versus the benchmark.)

Although our stylized barbell Portfolio AC and bullet Portfolio B represent extremes, they readily demonstrate two main points:

1. Barbell portfolios, given the location of their bonds along the curve, outperform bullet portfolios if the yield curve flattens.
2. For similar reasons, bullet portfolios outperform barbell portfolios if the yield curve steepens.

Let us consider an example of how a portfolio manager might use a barbell structure to increase portfolio convexity and to position for yield curve flattening. We will also make reference to key rate durations, or partial durations, and their related measures, partial DV01 and partial PVBP. We briefly review how these partials are calculated before we use them in an example.

How Are Partials Calculated?

Partial durations are calculated by moving a single point on the pricing yield curve, interpolating the change in rates for each adjacent maturity, calculating the new forward yields and resulting cash flows, and thus determining the price sensitivity of the bond resulting from the move in that point on the curve. This calculation is made for each maturity point on the pricing curve. The maturities used for the partial calculation must

reflect the maturity range of the portfolio and the benchmark. For portfolios with maturities that range from 1 month to 30 years, the set of partials to be used must balance the need to have an adequate number of points to effectively represent the curve with the complexity of calculating each partial. The Yield Book, a fixed-income analytics system used for many examples in this reading, offers partials at 1, 2, 3, 5, 10, 20, and 30 years. Note that, in some of our examples, the portfolio holds a position in 7-year notes and no position in 20-year bonds, and no partial is calculated for the 7-year point but one is calculated for the 20-year point. Although we have no partial for the 7-year maturity, the price response of bonds in the 7-year maturity range can reasonably be captured by interpolation between the 5-year and 10-year partials, whereas a 20-year partial is needed to reliably estimate the price sensitivity of portfolio holdings with maturities between 10 and 30 years.

A simple alternative to this process is to look at the price difference of the bond (or portfolio) in the up 10 bps and down 10 bps cases for one partial point on the curve, and normalize that to a 1 bp change (divide by 20). This gives the measure known as partial price value of a basis point (PPVBP) or partial DV01 (PDV01). In some of the examples that follow, we use PPVBPs to look at curve exposure relative to a benchmark.

Haskell Capital Management Dan Haskell is the CEO and primary portfolio manager for Haskell Capital Management. His firm recently (and narrowly) lost a competition for a $60 million portfolio management assignment to Pyramid Capital Management. The sponsor commented favorably on Haskell's investment process and performance but noted that the consistency of Pyramid's returns was the deciding factor. The portfolio was due to be funded on Friday, 29 January. On Thursday evening, however, the primary portfolio manager at Pyramid announced that he was taking an extended leave of absence for health reasons. On Friday morning, the sponsor called Haskell to inform him that he was awarded the business. The portfolio will be funded with $60 million in cash that afternoon. The benchmark is a US investment-grade index similar to the Citi US Broad Investment Grade Index (USBIG). (USBIG tracks the performance of US dollar–denominated bonds issued in the US investment-grade bond market.) Haskell intends to overweight the corporate, MBS, and asset-backed securities (ABS) components of the index because he believes these instruments are priced "cheap" to Treasuries. The performance record is to begin immediately upon funding.

Haskell considers the investment situation:

- A credit/collateralized portfolio consisting of corporates, MBS, and ABS cannot be assembled on a Friday afternoon.
- The market has been very volatile lately, and leaving the $60 million in cash has the potential to lead to severe underperformance if the market were to rally next week while the non-Treasury portion of the portfolio was being assembled.
- Haskell knows he has to temporarily invest the credit portion of the portfolio, but he is sensitive to transaction costs.
- He also believes that a "flattening twist" of the yield curve was highly likely, with yields on maturities shorter than 2024 rising and yields on longer maturities falling.

With those considerations in mind, Haskell decides to purchase a portfolio of highly liquid on-the-run Treasury securities that would approximately match the duration of the benchmark. On-the-run Treasuries trade with almost no bid–offer spread, so any portfolio re-positioning Haskell might look to do in the weeks ahead could be accomplished with minimal transaction cost effect. The all-Treasury portfolio would have a lower yield than the benchmark because it would have no credit exposure, but he also expected that it would have higher convexity because it did not own MBS or callable bonds.

Exhibit 24 shows the pro forma portfolio:

Exhibit 24 Pro Forma Portfolio Consisting of On-the-Run Treasury Securities (Portfolio 1)

Security	Coupon	Maturity	YTM	Effective Duration	Par Amount (thousands)	Market Value	Effective Convexity
2 Year	0.75	31 Jan 2018	0.816	1.979	17,000	16,978	—
3 Year	0.75	15 Feb 2019	0.987	2.960	14,700	14,597	—
5 Year	1.375	31 Jan 2021	1.345	4.842	9,500	9,514	—
7 Year	1.75	31 Jan 2023	1.649	6.629	6,300	6,342	—
10 Year	2.25	15 Nov 2025	1.935	8.887	6,500	6,712	—
30 Year	3.00	15 Nov 2045	2.762	20.142	6,000	6,326	—
Portfolio	**1.355**		**1.356**	**5.821**	**60,000**	**60,469**	**0.779**
Index	**2.012**		**1.430**	**5.853**			**0.801**

Haskell realizes that he will have to adjust this portfolio as it was assembled so as not to exceed the $60 million in funding. The effective duration and convexity of the pro forma portfolio nearly matches that of the benchmark. The yield curve exposure also closely matches that of the benchmark at most maturities, as shown by the key rate duration comparison shown in Exhibit 25.

Exhibit 25 Partial PVBP vs. the Benchmark: Pro Forma Portfolio (1)

Key rate PVBPs	Total	1 Year	2 Year	3 Year	5 Year	10 Year	20 Year	30 Year
Pro forma portfolio (1)	0.059	0	0.0056	0.0073	0.0126	0.0127	0.0014	0.0191
Index	0.061	0.0017	0.0033	0.0063	0.0147	0.0093	0.0085	0.0173

Haskell noted that his pro forma portfolio is similar to the benchmark in yield curve exposure, as measured by partial PVBPs, except for the 20-year area. The index has significant exposure to 30-year bonds that had been issued some time ago, whereas the pro forma portfolio has none. (The small "exposure" shown in the chart is from coupons of the longer bonds.) But Haskell is slightly overweight in the 10-year area and the 30-year area, so he is comfortable with the structure versus the benchmark.

Because he expects that the yield curve is likely to flatten, Haskell is seeking to create a more barbell-like portfolio structure while continuing to match the duration of the benchmark. His revised portfolio is shown in Exhibit 26. He also compares the KRDs of this new portfolio with those of his original portfolio (Exhibits 27 and 28).

Exhibit 26 More Barbelled Portfolio (2)

Security	Coupon	Maturity	YTM	Effective Duration	Par Amount	Market Value	Effective Convexity
2 Year	0.75	31 Jan 2018	0.816	1.979	29,000	28,962	
3 Year	0.75	15 Feb 2019	0.987	2.960	8,000	7,944	
5 Year	1.375	31 Jan 2021	1.345	4.842	4,700	4,707	
7 Year	1.75	31 Jan 2023	1.649	6.629	4,300	4,329	
10 Year	2.25	15 Nov 2025	1.935	8.887	6,500	6,712	
30 Year	3.00	15 Nov 2045	2.762	20.142	7,500	7,908	
Portfolio	**1.330**		**1.317**	**5.800**	**60,000**	**60,562**	**0.877**
Index	**2.012**		**1.430**	**5.853**			**0.801**

Exhibit 27 Key Rate Durations: Pro Forma Portfolio (1) vs. More Barbelled Portfolio (2)

Key Rate PVBPs	Total	1 Year	2 Year	3 Year	5 Year	10 Year	20 Year	30 Year
Pro forma portfolio (1)	0.059	0	0.0056	0.0073	0.0126	0.0127	0.0014	0.0191
More barbelled portfolio (2)	0.059	0	0.0096	0.0040	0.0074	0.0119	0.0018	0.0238

Exhibit 28 Key Rate Durations: Evidence of the Barbell

In this comparison of the two prospective portfolios, Haskell's barbell structure can be seen in the higher columns for the 2-year and 30-year partials, with lower partials through the middle of the maturity spectrum.

The effective duration of this revised (more barbelled) portfolio is nearly identical to that of the original (5.80 versus 5.82). The effective convexity has increased as expected in light of the barbell—from 0.779 to 0.877. The revised portfolio has more duration in the 2- and 30-year maturities than the original and less duration through the middle maturities, consistent with the barbelled structure Haskell was seeking.

How would the portfolios perform if the curve flattens as Haskell expects?

Portfolio 2 is expected to outperform Portfolio 1 in the flattening because of its more barbelled structure. Exhibit 29 shows the results on a bond-level basis.

Exhibit 29 Market Value Changes from Analytical Software

			Pro Forma Portfolio (1)				More Barbelled Portfolio (2)			
Security	Coupon	Maturity Date	Par	Beginning Market Value	Horizon Market Value	Change	Par	Beginning Market Value	Horizon Market Value	Change
2 Year	0.75	31 Jan 2018	17,000	16,978	16,916	–62	29,000	28,962	28,857	–105
3 Year	0.75	15 Feb 2019	14,700	14,597	14,527	–70	8,000	7,944	7,906	–38
5 Year	1.38	31 Jan 2021	9,500	9,514	9,466	–48	4,700	4,707	4,683	–24
7 Year	1.75	31 Jan 2023	6,300	6,342	6,313	–29	4,300	4,329	4,309	–20
10 Year	2.25	15 Nov 2025	6,500	6,712	6,727	15	6,500	6,712	6,727	15
30 Year	3.00	15 Nov 2045	6,000	6,326	6,557	231	7,500	7,908	8,196	288
Total			**60,000**	**60,469**	**60,506**	**37**	**60,000**	**60,562**	**60,678**	**116**

Exhibit 30 shows that using partial PVBPs to assess the portfolio structure is a reasonable approach to take.

Exhibit 30 Market Value Changes Estimated Using Partial PVBPs

			Pro Forma Portfolio (1)		More Barbelled Portfolio (2)	
Maturity	Key Rate Curve Shift (bps)	Portfolio Par Amount ($ thousands)	Partial PVBP	Predicted Portfolio Impact ($ thousands)	Partial PVBP	Predicted Portfolio Impact ($ thousands)
2 Year	18.3	60,000	0.0056	–61.5	0.0096	–105.4
3 Year	16.3	60,000	0.0073	–71.4	0.0040	–39.1
5 Year	10.4	60,000	0.0126	–78.6	0.0074	–46.2
7 Year		60,000	—	—	—	—
10 Year	–3.5	60,000	0.0127	26.7	0.0119	25.0
20 Year	–11.3	60,000	0.0014	9.5	0.0018	12.2
30 Year	–19.1	60,000	0.0191	218.9	0.0238	272.7
Total				**43.5**		**119.2**

The predicted change using partials is calculated as follows:

Predicted change = Portfolio par amount × Partial PVBP × (–Curve shift)

The predicted change of $43,500 for the original portfolio and $119,200 for the modified portfolio can be compared to the actual portfolio changes for the original and modified portfolios—$37,000 and $116,000, respectively (shown in Exhibit 29). These results are close enough to validate the use of partials as an indicator of portfolio structure and likely portfolio performance in our flattening yield curve scenario.

Note that Exhibit 30 does not provide a key rate duration at the 7-year maturity, whereas it does provide one for the 20-year maturity, even though Haskell's proposed portfolio does not hold 20-year bonds. Refer to the boxed sidebar "How Are Partials Calculated?" and recall that we can pick the curve segments to shift without specifically aligning a KRD with each maturity in the portfolio.

EXAMPLE 2

Using Partial Durations to Estimate Portfolio Sensitivity to a Curve Change

Assume Haskell revises his yield curve forecast as shown in Exhibit 31: Yields for the 2-year through 10-year maturities each decline by 5 bps, and the yield for the 30-year maturity increases by 23 bps.

Exhibit 31 A Steeper and Less Curved Yield Curve

	Yield Curve Shift		
Maturity	Beginning Curve	Ending Curve	Curve Shift
2 Year	0.816	0.767	–5.0
3 Year	0.987	0.937	–5.0
5 Year	1.345	1.296	–5.0
7 Year	1.649	1.600	–5.0
10 Year	1.935	1.885	–5.0
30 Year	2.762	2.991	23.0
2s–30s Spread	1.946	2.224	28.0
2/10/30 Butterfly spread	0.292	0.012	

Using the data from Exhibit 31, we compare the partial durations of the two portfolios Haskell is considering:

Key Rate PVBPs	Total	1 Year	2 Year	3 Year	5 Year	10 Year	20 Year	30 Year
Pro forma portfolio (1)	0.0587	0	0.0056	0.0073	0.0126	0.0127	0.0014	0.0191
More barbelled portfolio (2)	0.0585	0	0.0096	0.0040	0.0074	0.0119	0.0018	0.0238

Which portfolio would Haskell prefer to own under this scenario?

Solution:

If the curve becomes steeper and less curved, intuitively Haskell should prefer Portfolio 1. Portfolio 1 has significantly more partial duration at the intermediate maturities of 3 and 5 years, as well as substantially less partial duration at the shorter (2-year) and longer (30-year) maturities compared with Portfolio 2. Portfolio 1 thus would be expected to outperform Portfolio 2 under a scenario

in which the yield curve steepens and its curvature decreases. This is confirmed as shown in the following table, which estimates the portfolio change using the portfolio's key rate durations:

Market Value Changes Estimated Using Partial Key Rate Durations

			Pro Forma Portfolio (1)		More Barbelled Portfolio (2)	
Maturity	Actual Shift (bps)	Portfolio Par Amount ($000)	Partial PVBP	Change ($000)	Partial PVBP	Predicted Change ($000)
2 Year	–5.0	60,000	0.0056	16.8	0.0096	28.8
3 Year	–5.0	60,000	0.0073	21.9	0.0040	12.0
5 Year	–5.0	60,000	0.0126	37.8	0.0074	22.2
7 Year	–5.0	60,000	0	—	0	—
10 Year	–5.0	60,000	0.0127	38.1	0.0119	35.7
20 Year	9.0	60,000	0.0014	–7.5	0.0018	–9.7
30 Year	23.0	60,000	0.0191	–263.5	0.0238	–328.4
Total				–156.5		–239.5

4.3.2 *Butterflies*

Bullet and barbell portfolio structures can be combined in a long–short structure. A butterfly trade is a combination of a barbell (wings of the butterfly) and a bullet (body of the butterfly). As such, the butterfly involves taking positions in three securities with varying maturities: short term, intermediate term, and long term. Recall our securities and portfolios from Exhibit 20:

	Securities			Portfolios	
	A	B	C	B	AC
Maturity (years)	0.0027	5.075	10.17	5.075	5.086
Semi-annual, bond equivalent yield (%)	2.00%	3.00%	3.40%	3.00%	2.70%
Modified duration	0.00	5.00	10.00	5.00	5.00

The butterfly consists of either a long barbell (long Portfolio AC) and a short bullet (short Portfolio B) or a short barbell and a long bullet. Portfolio weights are selected so that the butterfly position is money duration neutral—the money durations of the long and the short portfolios are equal but opposite in sign, so changes in value of these portfolios would offset each other in the event of a parallel yield curve shift. Butterflies often entail leverage. In an unlevered portfolio, shorting the wings (or body) entails underweighting the corresponding segment of the yield curve relative to the portfolio's benchmark.

Because the butterfly structure is money duration neutral, the butterfly portfolio's value should be unchanged given a small parallel shift in the reference yield curve.

A butterfly that is long in the wings and short in the body has positive convexity (it is long the higher convexity barbell and short the lower convexity bullet). It can be expected to benefit from a flattening of the yield curve. Because convexity is more

valuable in more volatile rate environments, the long wings/short body butterfly will also generate a small additional profit if interest rates are more volatile than the market is currently pricing.[17]

A butterfly that is short in the wings (the barbell portfolio) and long in the body (the bullet portfolio) is a trade predicated on a view of stable interest rates (it is selling convexity) or on a yield curve steepening (based on its portfolio structure). If the market is pricing in an expectation for volatility while the portfolio manager believes that rates will be stable, convexity will be of little value to the manager. He likely believes that convexity is overpriced and would be willing to sell the convexity by being short the wings (barbell portfolio) and long the body (bullet portfolio). By doing so, he would earn the additional yield of the less convex portfolio.

There are various ways to structure (i.e., weight) the wings of a butterfly portfolio; among the most common are 1) duration neutral; 2) 50/50; and 3) regression weighting.[18]

Duration-neutral weighting selects the weights so that the duration of the wings equals the duration of the body and the market values are also the same. Thus, the positions are also money duration neutral.

Portfolios that can use leverage might adopt a 50/50 weighting, shorting the body and allocating the proceeds of the short sale to the wings such that half the duration value (market value multiplied by modified duration) is allocated to each wing of the barbell portfolio. The overall structure would be money neutral only by coincidence. Such an approach is used primarily by market participants who finance their positions (e.g., dealer firms). The portfolio manager may believe that the body (bullet portfolio) is too rich or too expensive relative to the wings (barbell portfolio) but may lack a view on how that pricing anomaly will be resolved.

Suppose, for example, that a portfolio manager believes that the yield on the 5-year note is too low relative to the 2s and 10s. (Its price is too high, and thus it is "rich" relative to the 2s and 10s.) By extension, we can say that she believes the yield curve is too straight or linear. If her view is correct, the pricing anomaly can be resolved by the 5s moving up in yield, the 2s moving down in yield, or the 10s moving down in yield—or some combination of these three.

There are additional ways in which these various trades might be structured. For example, another version of the curvature trade uses four positions, much like a butterfly with an elongated body (see Exhibit 32). For example, the portfolio manager can put on a duration-neutral trade at the short end of the curve that will profit if that end of the curve steepens, and he can simultaneously put on a duration-neutral trade at the long end of the curve that will profit if that end of the curve becomes flatter (i.e., money duration neutral long the 2-year note and short the 5-year note, and money duration neutral short the 10-year note and long the 30-year bond.)

Each pair will produce profits if the yield curve adds curvature. There is no single formula for allocating the funds to these positions—the relative weights of the two positions are discretionary. If the yield curve does add curvature, a long–short position in only the 2s/5s should produce profits, and a short–long position in only the 10s/30s should also produce profits. The degree of leverage (and therefore the size of the overall trade) is also discretionary. This four-position trade is sometimes called a condor, probably because of its similarities to (and despite large differences from) the four-strike options position also known as a condor.

---

17 Volatility must be greater than the market expects, resulting in greater curvature of the curve and/or a large move in interest rates in general. It is not the volatility by itself that adds to the butterfly's profits.

18 Some portfolio managers use regression analysis to arrive at weightings adjusted for differences in yield volatilities between the long end and the short end of the curve. Typically, a relatively short look-back period (30 to 45 days) is used for the analysis to capture the securities' behavior in the recent environment rather than some longer-term relationship that might be irrelevant to the trade today.

Exhibit 32 Butterflies and Condors

EXAMPLE 3

Bullets and Barbells

Observe the three US government Treasury bond portfolios in Exhibit 33—Base Portfolio, Portfolio A, and Portfolio B. Each has the same market value of $60 million. These portfolios differ significantly in terms of key characteristics, however—including yield to maturity, effective duration, and effective convexity—because of their different portfolio structures.

Exhibit 33 Three US Treasury Bond Portfolios

Base Portfolio

Security	Coupon	Maturity	Market Price	Market Value	Weight	Yield to Maturity	Effective Duration	Effective Convexity
US 2 year	0.750	2/28/2018	99.836	17,000,000	0.28	0.840	1.920	0.046
US 3 year	1.000	3/15/2019	99.992	14,500,000	0.24	1.000	2.940	0.101
US 5 year	1.125	2/28/2021	99.008	9,500,000	0.16	1.330	4.810	0.259
US 7 year	1.500	2/28/2023	99.000	6,500,000	0.11	1.650	6.630	0.485
US 10 year	1.625	2/15/2026	97.781	6,500,000	0.11	1.870	9.220	0.936
US 30 year	2.500	2/15/2046	96.453	6,000,000	0.10	2.670	21.850	5.959
				60,000,000	**1.00**	**1.339**	**5.918**	**0.828**

Exhibit 33 (Continued)

Portfolio A

Security	Coupon	Maturity	Market Price	Par Amount	Weight	Yield to Maturity	Effective Duration	Effective Convexity
US 2 year	0.750	2/28/2018	99.836	45,000,000	0.75	0.840	1.920	0.046
US 3 year	1.000	3/15/2019	99.992		0.00	1.000	2.940	0.101
US 5 year	1.125	2/28/2021	99.008		0.00	1.330	4.810	0.259
US 7 year	1.500	2/28/2023	99.000	—	0.00	1.650	6.630	0.485
US 10 year	1.625	2/15/2026	97.781	—	0.00	1.870	9.220	0.936
US 30 year	2.500	2/15/2046	96.453	15,000,000	0.25	2.670	21.850	5.959
				60,000,000	**1.00**	**1.298**	**6.903**	**1.524**

Portfolio B

Security	Coupon	Maturity	Market Price	Par Amount	Weight	Yield to Maturity	Effective Duration	Effective Convexity
US 2 year	0.750	2/28/2018	99.836	—	0.00	0.840	1.920	0.046
US 3 year	1.000	3/15/2019	99.992	—	0.00	1.000	2.940	0.101
US 5 year	1.125	2/28/2021	99.008	5,000,000	0.08	1.330	4.810	0.259
US 7 year	1.500	2/28/2023	99.000	45,000,000	0.75	1.650	6.630	0.485
US 10 year	1.625	2/15/2026	97.781	10,000,000	0.17	1.870	9.220	0.936
US 30 year	2.500	2/15/2046	96.453	—	0.00	2.670	21.850	5.959
				60,000,000	**1.00**	**1.660**	**6.910**	**0.541**

Discuss which portfolio (A or B) would be preferred to the base portfolio under each of the following yield curve scenarios.

- Scenario 1: The 2s–30s spread is expected to widen by 100 bps as short and intermediate rates fall and long rates remain stable. Also, interest rate volatility is expected to be low during the next year.
- Scenario 2: The 2s–30s spread is expected to narrow by 100 bps as short and intermediate rates rise and long rates fall. Also, interest rate volatility is expected to be high during the next year.

Your answer should make reference to the expected shape of the yield curve; the allocation of notes and/or bonds in the selected portfolio; and the effective duration, effective convexity, and yield to maturity of the selected portfolio.

Solution for Scenario 1:

- A widening spread indicates a steepening yield curve.
- A steeper yield curve and low volatility favors a bulleted portfolio (concentrated in the intermediate maturities—the 5-, 7-, and 10-year notes) because the intermediate maturities should perform better than the combination of the short-end and long-end positions in the expected steepening environment.
- Portfolio B is the portfolio best positioned for this scenario.

- The higher effective duration (6.910) of Portfolio B relative to the base portfolio will benefit Portfolio B as intermediate interest rates decline.
- Portfolio B will also benefit through the yield pickup of 32.1 bps (1.660% – 1.339%) received in exchange for giving up convexity of 0.287 (0.541 – 0.828).

Solution for Scenario 2:

- A narrowing spread defines a flattening yield curve.
- A flatter yield curve and high volatility favors a barbelled portfolio (concentrated in the short and long maturities—the 2-year notes and 30-year bonds, respectively).
- Portfolio A is the portfolio best positioned for this scenario.
- Together, the short and long ends of the curve should perform better than the intermediate maturities in the expected flattening environment. Note that for the same rate rise, the short end will lose less money than the intermediate maturities in Portfolio B.
- The higher effective duration (6.903) of Portfolio A relative to the base portfolio will benefit Portfolio A as long-term interest rates decline.
- The small give-up in yield (1.298% – 1.339%) is a reasonable exchange for the added convexity of 0.696 (1.524 – 0.828).

4.4 Using Options

Because the convexity of shorter maturities is relatively small, as Exhibit 34 shows, it is hard to add convexity to a portfolio without buying longer-maturity securities. It is much simpler to extend duration and add convexity with options. In this example, we will use options on bond futures.

For our starting portfolio, we will use a laddered portfolio of equal par amounts of recently issued (on-the-run) Treasury bonds: 2-year, 3-year, 5-year, 7-year, 10-year, and 30-year bonds, as shown in Exhibit 34.[19]

Exhibit 34 Pre-Trade Portfolio (as of 18 March 2016)

				Market			Duration		Amount (thousands)	
Security	Coupon	Maturity	Effective Convexity	Yield to Maturity	Price	Accrued Interest	Nominal	Effective	Par Value	Market Value
US 2 year	0.750	28 Feb 2018	0.046	0.84	99.836	0.045	1.92	1.92	10,000	9,988
US 3 year	1.000	15 Mar 2019	0.101	1.00	99.992	0.019	2.93	2.94	10,000	10,001
US 5 year	1.125	28 Feb 2021	0.259	1.33	99.008	0.067	4.78	4.81	10,000	9,908
US 7 year	1.500	28 Feb 2023	0.485	1.65	99.000	0.090	6.56	6.63	10,000	9,909
US 10 year	1.625	15 Feb 2026	0.936	1.87	97.781	0.161	9.08	9.22	10,000	9,794
US 30 year	2.500	15 Feb 2046	5.959	2.67	96.453	0.247	20.72	21.85	10,000	9,670
Total portfolio	**1.417**	**9.4 Yrs.**	**1.276**	**1.55**	**98.693**	**0.104**	**7.59**	**7.82**	**60,000**	**59,270**

19 All data and analytics are from the Yield Book, as of 18 March 2016.

To demonstrate the convexity of options, we will:

- sell a portion of the 30-year bond position to fund the purchase of the options;
- sell an additional portion of the 30-year bond position to ensure that the money duration (and thereby the portfolio duration) remains unchanged; and
- establish a cash position with the excess proceeds from the securities sale.

We will use short-maturity at- or near-the-money options to illustrate this trade because they contain a great deal of convexity. On 18 March 2016, the June 2016 30-year Treasury bond futures contract was trading at 163.22. The May 2016 expiration call option on the 30-year future (US161F6) carries a strike price of 161. As we are placing the trade, the cheapest-to-deliver security for the June futures was the 4.50% of 15 February 2036. Here is some useful information:

Instrument	PVBP	Price	Delta	Convexity
Call option	0.149	3.97	0.644	826.041
June 2016 30-year bond future	0.2354	163.22		
30-Year bond	0.2113	106.82		

The PVBP of the call option is substantially less than that of the 30-year bond. We will therefore need more par value of the option than the bond it replaces if we are to maintain the portfolio duration. To derive the needed par value of the option, we multiply the par value of the bonds we are selling by the ratio of the bond's PVBP to the option's PVBP: 0.2113/0.149 = 1.418. Thus, we sell 6,800 par of the 30-year bond and buy 9,640 underlying par amount of the option (approximately equal to 6,800 × 1.418). The resulting portfolio is shown in Exhibit 35; with equivalent market value and duration, it has an effective money duration equal to that of the pre-trade portfolio.

Exhibit 35 Bond Portfolio with Call Option

						Market		Amount (thousands)	
Security	Coupon	Maturity	Effective Convexity	Effective Duration	Yield to Maturity	Price	Accrued Interest	Par Value	Market Value
Cash	0.508	23 Mar 2016	0	0	0.508	100.000	0	6,193	6,193
US161F6	0	20 May 2016	826.041	375.30	n/a	3.970	0	9,640	383
US 2 Year	0.750	28 Feb 2018	0.046	1.92	0.835	99.836	0.045	10,000	9,988
US 3 Year	1.000	15 Mar 2019	0.101	2.94	1.003	99.992	0.019	10,000	10,001
US 5 Year	1.125	28 Feb 2021	0.259	4.81	1.333	99.008	0.067	10,000	9,908
US 7 Year	1.500	28 Feb 2023	0.485	6.63	1.653	99.000	0.090	10,000	9,909
US 10 Year	1.625	15 Feb 2026	0.936	9.22	1.871	97.781	0.161	10,000	9,794
US 30 Year	2.500	15 Feb 2046	5.959	21.85	2.673	96.453	0.247	3,200	3,094
Total Portfolio:	**1.031**	**5.3 years**	**5.952**	**7.82**	**1.32**	**85.791**	**0.067**	**69,033**	**59,270**

Note: Note the extremely high value for convexity of the option (826.041).

We analyzed the relative performance of the two portfolios under yield curve changes ranging from +75 bps to –75 bps, in 25 bp increments. The change is assumed to occur over a relatively short time horizon, prior to the expiration of the option we are using for illustrative purposes (1 month and 25 days). Total holding period returns (un-annualized) are shown in Exhibit 36.

Exhibit 36 Total Returns under Alternative Yield Scenarios

Yield Scenario	–75	–50	–25	0	+25	+50	+75
				Total Return:			
Pre-trade portfolio	6.495	4.358	2.309	0.344	–1.542	–3.354	–5.097
Post-trade portfolio	7.321	4.820	2.417	0.113	–1.645	–2.920	–4.149
Difference	+0.826	+0.462	+0.108	–0.231	–0.103	+0.434	+0.948

Exhibit 37 illustrates the higher convexity of the post-trade portfolio with the option position relative to the pre-trade portfolio, and Exhibit 38 plots the return differential between the two portfolios (performance of the portfolio with options minus the performance of the portfolio without options).

Exhibit 37 Adding Convexity with Options

Exhibit 38 Return Differential

In Exhibit 38, we can see the drag on performance created by owning convexity when interest rates do not move up or down in a meaningful fashion. Costs involved include the initial purchase price of the options and the forgone interest income on the 6.8 million of 30-year bonds. It is also evident that the post-trade portfolio materially outperforms the pre-trade portfolio irrespective of the direction of rate change—as long as the movement is greater than 25 bps in either direction.

In a rising interest rate scenario, even if the call options expire worthless, total performance of the portfolio with the options is greater than the performance of the pre-trade portfolio. If rates decline, the options' own convexity adds value—the options outperform the 30-year bond, enhancing overall portfolio performance. Exhibit 39 shows the accelerating rate of performance as yields continue to decline.

Exhibit 39 Option Dollar Return

We deliberately chose an extreme example to illustrate the effect of adding convexity using options. Convexity is not free, but it is obtainable. If everyone is concerned about extreme interest rate movements and unsure of the direction of such movements, option premiums—and thus the cost of obtaining convexity—can be very high.

4.4.1 *Changing Convexity Using Securities with Embedded Options*

In the previous example, we purchased options to enhance convexity. To reduce convexity, we might sell options or buy MBS. A manager might choose to sell convexity if he holds the view that yields will be relatively stable for the duration of the trade.

In this example, we will sell options indirectly by buying MBS, which have embedded call options that belong to the homeowners who have "issued" the underlying mortgages.

Our starting position is $10 million in the US Treasury Note 1.375% maturing 31 January 2021 (the "old" five-year note as this is being written[20]). This note has an effective duration of 4.72. Given the manager's expectation of low yield volatility over a short horizon, she decides to sell convexity by selling the Treasury and buying the 30-year Federal National Mortgage Association (FNMA) 3% MBS, which has a slightly shorter effective duration of 4.60.

The returns over a short horizon (1 month and 20 days) are as shown in Exhibit 40. Those returns are graphed in the left panel of Exhibit 41, and the return differential is shown in the right panel.

Exhibit 40 MBS vs. Treasury: Total Returns under Alternative Yield Scenarios

Yield Scenario	–75	–50	–25	0	+25	+50	+75
FNMA 30-year 3%	2.647	2.204	1.458	0.432	–0.855	–2.340	–3.941
US 1.375% 31 Jan 2021	3.774	2.588	1.417	0.262	–0.879	–2.005	–3.117
Difference	–1.127	–0.384	0.041	0.17	0.024	–0.335	–0.824

Exhibit 41 MBS vs. Treasury: One-Month and 20-Day Horizons

As seen in Exhibit 41, the yield advantage of MBS boosts returns in scenarios where there is little change in rates. If, however, the rate moves are more pronounced (in this case, greater than 25 bps in either direction), the performance of the MBS suffers. The negative convexity of MBS means it is more sensitive to increases in rates and

20 The Treasury bond sold just prior to the current on-the-run bond is known as the "old" bond or note, and the one sold before that is called the "old-old" bond or note. In March 2016, as this is being written, the 28 Feb 2021 maturity is the current five-year note, and the 31 Jan 2021 is the "old" five-year note.

less sensitive to declines in rates than the Treasury it replaced. (As interest rates rise, prepayments of the underlying mortgages decline, lengthening the duration of the MBS and making it more sensitive to rising rates. As interest rates fall, prepayments of the underlying mortgages rise, shortening the effective duration of the MBS and decreasing its sensitivity to declining rates. These behaviors are diametrically opposed to the behavior of securities with positive convexity.) In addition, because the horizon is short, there is little opportunity to accumulate the yield premium offered by MBS, which might have offset some of the negative relative price performance. As expected, selling convexity (or equivalently, buying negative convexity) works well if interest rates do not move much, and it works poorly if interest rates move significantly.

COMPARING THE PERFORMANCE OF VARIOUS DURATION-NEUTRAL PORTFOLIOS IN MULTIPLE CURVE ENVIRONMENTS

5

Throughout this reading, we have been discussing convexity as a useful tool in active yield curve strategies. Is convexity overrated? In this section, we evaluate the performance of portfolios with more and less convexity (barbells and bullets) relative to a baseline, laddered portfolio under a variety of yield curve scenarios.

5.1 The Baseline Portfolio

Assume we have a portfolio that consists of six equally weighted positions in the current on-the-run US Treasuries. It is similar to a classic laddered portfolio in which securities are spread out evenly across the maturity spectrum. Exhibit 42 shows the details of this portfolio.[21]

Exhibit 42 Laddered Portfolio

Bond	Nominal	Market Value (millions)	Coupon	Maturity	Price	Yield to Maturity	Effective Duration
1	2 year	10	0.875	30 Nov 2017	99.828	0.964	1.939
2	3 year	10	1.250	15 Dec 2018	99.891	1.287	2.946
3	5 year	10	1.625	30 Nov 2020	99.672	1.694	4.785
4	7 year	10	2.000	30 Nov 2022	99.656	2.053	6.550
5	10 year	10	2.250	15 Nov 2025	99.859	2.266	8.992
6	30 year	10	3.000	15 Nov 2045	100.172	2.991	20.364
Portfolio		60				1.876	7.596

The yield on the portfolio is 1.876%. The portfolio has a market value of $60 million and an effective duration of 7.596. We will consider this as the neutral duration point, and when we restructure the portfolio for various scenarios, we will always target the same duration. This will be the benchmark portfolio against which we evaluate alternative portfolio structures.

21 This analysis was run on The Yield Book using prices for 15 December 2015, and assumes same-day settlement.

5.2 The Yield Curve Scenarios

We define six yield curve scenarios in Exhibit 43. The starting yield curve is shown in column 2, and the six scenarios are shown in columns 3–8.

Exhibit 43 Yield Curve Scenarios

		Curve Move					
1	2	3	4	5	6	7	8
Maturity (years)	Starting Yield	Parallel –100	Parallel +100	Flatter	Steeper	Less Curvature	More Curvature
2	0.964	0.010	1.964	**0.964**	**0.964**	0.892	1.036
3	1.287	0.287	2.287	1.269	1.305	1.174	1.400
4	1.490	0.490	2.490	1.455	1.526	1.337	1.644
5	1.694	0.694	2.694	1.640	1.748	1.499	1.889
7	2.053	1.053	3.053	1.964	2.142	1.776	2.330
10	2.266	1.266	3.266	2.123	2.409	1.866	2.666
20	2.629	1.629	3.629	2.308	2.950	2.429	2.829
30	2.991	1.991	3.991	2.491	3.491	2.991	2.991

Columns 3 and 4 depict a commonly used scenario of a parallel shift down or up 100 bps. At the time this analysis was run, the Yield Book put limits on yield changes that would force rates to be negative, and it floored rates at 1 bp. The two-year note is affected by this limitation, and its yield declines by 95 bps instead of 100 bps. In this example, missing the last 5 bps on the two-year has little effect on either the answer or the lesson in the example. As an aside, Yield Book has changed its code to now allow most rates to go negative.[22]

Columns 5 and 6 define flatter and steeper yield curves, as illustrated in Exhibit 44. These curves are pinned at the two-year maturity (as highlighted by bold text in Exhibit 43).

22 At this time (2016) the Yield Book's MBS prepayment model cannot process negative rates.

Exhibit 44 Flatter and Steeper Yield Curve Scenarios

2s–30s Spread	2s	30s	Spread
Starting yield curve	0.964	2.991	2.027
Flatter	0.964	2.491	1.527
Steeper	0.964	3.491	2.527

Finally, Columns 7 and 8 define yield curves that have less curvature and more curvature, respectively, as displayed in Exhibit 45. The reduction of curvature and the addition of curvature can also be confirmed by calculating the changes in the butterfly spread.

Exhibit 45 Yield Curves with More Curvature and Less Curvature

(continued)

Exhibit 45 (Continued)

Butterfly spread	2s	10s	30s	Spread
Starting yield curve	0.964	2.266	2.991	0.577
Less curvature	0.892	1.866	2.991	–0.151
More curvature	1.036	2.666	2.991	1.305

Butterfly spread = – 2-Year yield + (2 × 10-Year yield) – 30-Year yield

To evaluate the effect of convexity, we construct two extreme portfolios—one barbelled and one bulleted—and examine the behavior of each under our various yield curve scenarios.

5.3 Extreme Barbell vs. Laddered Portfolio

Our extreme barbell portfolio in Exhibit 46 consists of only the 2-year note and 30-year bond, weighted to achieve virtually the same effective duration as our benchmark portfolio. This portfolio possesses the maximum convexity that can be achieved given our portfolio constraints. The portfolio has an effective duration of 7.595 (versus 7.596 for the benchmark portfolio) and a convexity of 1.578 (versus the benchmark portfolio's convexity of 1.134). The barbell portfolio gives up nearly 30 bps in yield. Although we are using an instantaneous yield curve shift for this analysis, note that over a longer horizon, the barbell portfolio would be penalized for the give-up in yield.

Exhibit 46 An Extreme Barbell Portfolio

Bond	Nominal	Market Value (millions)	Coupon	Maturity	Price	Yield to Maturity	Effective Duration
1	2 year	41.58	0.875	30 Nov 2017	99.828	0.964	1.939
2	3 year		1.250	15 Dec 2018	99.891	1.287	2.946
3	5 year		1.625	30 Nov 2020	99.672	1.694	4.785
4	7 year		2.000	30 Nov 2022	99.656	2.053	6.550
5	10 year		2.250	15 Nov 2025	99.859	2.266	8.992
6	30 year	18.42	3.000	15 Nov 2045	100.172	2.991	20.364
Portfolio		60.00				1.586	7.595

Recall that a portfolio with higher convexity will outperform in a parallel move. This is confirmed in Exhibit 47. The return advantage arising from the convexity inherent in a barbell structure is relatively minor for a parallel move, just 22 to 28 bps. The reward of the barbell structure is more significant for changes in slope and curvature—provided the portfolio manager correctly forecasts the direction of the change. Note in our example how effective the barbell portfolio is in capitalizing on more curvature. It outperforms the benchmark by more than 100 bps, primarily because it does not hold the bonds that go up in relative yield. (When the yield curve is adding curvature in a rising rate environment, yields on the 5s to 10s may be expected to rise more than the yields on the 2s and the 30s, and when adding curvature in a declining rate environment, the yields on 5s and 10s will fall less than the yields on the 2s and 30s.)

Exhibit 47 Return Comparisons: Extreme Barbell Portfolio vs. Benchmark Portfolio

	Extreme Barbell Portfolio	Benchmark Portfolio	
Duration	7.595	7.596	
Convexity	1.578	1.134	
Yield Curve Scenario	**Return**	**Return**	**Return Difference**
−100	8.517	8.241	0.276
+100	−6.823	−7.041	0.218
Flatter	3.243	2.125	1.118
Steeper	−2.971	−1.974	−0.997
Less curvature	0.107	1.146	−1.039
More curvature	−0.107	−1.124	1.017

In restructuring the portfolio to take on the barbell structure, the portfolio manager must be highly certain that the yield curve will not steepen or lose curvature—those particular curve changes could lead to underperformance rather than the anticipated outperformance.

5.4 Extreme Bullet

We showed that the barbell portfolio does poorly when the curve gives up some curvature, primarily because it does not own the middle of the curve, which are the bonds that perform relatively well as the curve loses curvature. Therefore, if a manager expects the curve to become less curved over the forecast horizon, he will want to adopt a bulleted portfolio structure. In our example, the bullet is constructed with two bonds—the closest on either side of the 7.596 duration target, as seen in Exhibit 48. (If, by chance, the target duration equals the duration of one of the available bonds, then all funds can be invested in that one bond. That is the ultimate bullet portfolio, other than a portfolio of zeros with no interim cash flows).

Exhibit 48 An Extreme Bullet Portfolio

Bond	Nominal	Market Value (millions)	Coupon	Maturity	Price	Yield to Maturity	Effective Duration
1	2 year		0.875	30 Nov 2017	99.828	0.964	1.939
2	3 year		1.250	15 Dec 2018	99.891	1.287	2.946
3	5 year		1.625	30 Nov 2020	99.672	1.694	4.785
4	7 year	34.25	2.000	30 Nov 2022	99.656	2.053	6.550
5	10 year	25.75	2.250	15 Nov 2025	99.859	2.266	8.992
6	30 year		3.000	15 Nov 2045	100.172	2.991	20.364
Portfolio		60.00				2.144	7.598

The returns on this bullet portfolio are as expected, as shown in Exhibit 49.

- For parallel shifts in the yield curve (±100 bps), the lack of convexity in the bullet portfolio causes it to lag behind the benchmark return regardless of the direction of rates.
- Whereas we saw earlier that the barbell portfolio does well in a flattening environment, here we see how much the bullet lags in that same environment.
- The bullet portfolio does perform well if the yield curve steepens, producing 110 bps of relative outperformance. Concentrating all of the assets in the middle of the yield curve (in this case, the 7s and 10s) produces an extremely positive relative return if the curve loses curvature. If the yield curve adds curvature, however, the concentration of assets in the middle of the curve produces poor relative performance.

Exhibit 49 Return Comparisons: Extreme Bullet Portfolio vs. Benchmark Portfolio

	Extreme Bullet Portfolio	Benchmark Portfolio	
Duration	7.598	7.596	
Convexity	0.643	1.134	
Yield Curve Scenario	**Return**	**Return**	**Return Difference**
–100	7.939	8.241	–0.302
+100	–7.277	–7.041	–0.236
Flatter	0.881	2.125	–1.244
Steeper	–0.875	–1.974	1.099
Less curvature	2.590	1.146	1.444
More curvature	–2.534	–1.124	–1.410

5.5 A Less Extreme Barbell Portfolio vs. Laddered Portfolio

Exhibit 47 demonstrated the limited (≈25 bp) return advantage to convexity in the extreme barbell portfolio given a parallel shift in the curve. It also uncovered the large potential underperformance in the steepening and less curvature scenarios, where the barbell underperformed by ≈100 bps. If these exposures represent a level of risk too high given the portfolio manager's confidence in his yield forecast, a modified barbell portfolio as shown in Exhibit 50 may be more appropriate. This less extreme barbell portfolio uses four securities instead of two, having exposure to the middle of the yield curve through the 3-year and 10-year notes, which were absent in the extreme barbell. It maintains an effective duration of 7.601, very close to the target duration.

Exhibit 50 A Less Extreme Barbell

Bond	Nominal	Market Value (millions)	Coupon	Maturity	Price	Yield to Maturity	Effective Duration
1	2 year	17.66	0.875	30 Nov 2017	99.828	0.964	1.939
2	3 year	12.65	1.250	15 Dec 2018	99.891	1.287	2.946
3	5 year		1.625	30 Nov 2020	99.672	1.694	4.785

Exhibit 50 (Continued)

Bond	Nominal	Market Value (millions)	Coupon	Maturity	Price	Yield to Maturity	Effective Duration
4	7 year		2.000	30 Nov 2022	99.656	2.053	6.550
5	10 year	19.35	2.250	15 Nov 2025	99.859	2.266	8.992
6	30 year	10.34	3.000	15 Nov 2045	100.172	2.991	20.364
Portfolio		60.00				1.801	7.601

This four-security portfolio produces a profile much closer to the original benchmark portfolio in terms of yield, effective duration, and effective convexity. Its convexity (1.183) is significantly lower than that of the extreme barbell (1.578).

The performance of this less extreme barbell portfolio under our six yield curve scenarios, shown in Exhibit 51, diverges from the benchmark in a relatively minor way: +14bps to –13bps. Although this less extreme barbell minimizes the magnitude of potential shortfall relative to the benchmark, it also reduces the opportunity to add value relative to the benchmark.

Exhibit 51 Return Comparisons: Less Extreme Barbell Portfolio vs. Benchmark Portfolio

	Less Extreme Barbell Portfolio	Benchmark Portfolio	
Duration	7.601	7.596	
Convexity	1.183	1.134	
Yield Curve Scenario	**Return**	**Return**	**Return Difference**
–100	8.269	8.241	0.028
+100	–7.012	–7.041	0.029
Flatter	2.239	2.125	0.114
Steeper	–2.083	–1.974	–0.109
Less curvature	1.287	1.146	0.141
More curvature	–1.256	–1.124	–0.132

5.6 Comparing the Extreme and Less Extreme Barbell Portfolios

In this section, we compare the two barbell portfolios with each other rather than with the benchmark portfolio to see what insights we can gather from their differences. Exhibit 52 shows the returns.

Exhibit 52 Return Comparisons: Extreme Barbell Portfolio versus Less Extreme Barbell Portfolio

	Extreme Barbell	Less Extreme Barbell	
Duration	7.595	7.601	
Convexity	1.578	1.183	
Yield Curve Scenario	**Return**	**Return**	**Return Difference**
−100	8.517	8.269	0.248
+100	−6.823	−7.012	0.189
Flatter	3.243	2.239	1.004
Steeper	−2.971	−2.083	−0.888
Less curvature	0.107	1.287	−1.180
More curvature	−0.107	−1.256	1.149

- The extreme barbell portfolio has convexity of 1.578 versus that of the less extreme barbell at 1.183.
- As expected given its greater convexity, the extreme barbell outperforms the less extreme barbell slightly in the parallel shifts.
- If the curve flattens, the extreme barbell has the advantage of a large position in the longest bond (30-year Treasury), which results in 100 bps of outperformance.
- That advantage disappears if the yield curve steepens, when the extreme barbell is hurt by that long bond position, lagging the return of the less extreme barbell by 89 bps.
- Under the curvature scenarios, the less extreme barbell portfolio has more "participation" in the middle part of the yield curve (through positions in the 3-year and 10-year Treasury notes).
  - If there is less curvature (a relative rally in the middle of the curve), then the less extreme barbell outperforms the extreme barbell by 118 bps.
  - If there is an increase in curvature, that same exposure to the inside of the yield curve causes the less extreme barbell portfolio to underperform the extreme barbell portfolio by about 115 bps.

As illustrated in these examples, convexity is valuable, but in order to reap its rewards, the portfolio manager must be willing to add a meaningful degree of convexity. The change in convexity will often be accomplished by changing the portfolio structure to become more barbelled, and this new structure introduces its own risks and rewards. With this barbell, the portfolio manager runs the risk of underperformance if she incorrectly forecasts the direction of the yield curve change. This is a good example of the tradeoffs that must be made in positioning a bond portfolio for anticipated changes in the yield curve.

Exhibit 53 provides a recap of the relative performance of bullet and barbell portfolios under various yield curve scenarios.

Exhibit 53 Relative Performance of Bullets and Barbells under Different Yield Curve Scenarios

Yield Curve Scenario		Barbell	Bullet
Level change	Parallel shift	Outperforms	Underperforms
Slope change	Flattening	Outperforms	Underperforms
	Steepening	Underperforms	Outperforms
Curvature change	Less curvature	Underperforms	Outperforms
	More curvature	Outperforms	Underperforms
Rate volatility change	Decreased rate volatility	Underperforms	Outperforms
	Increased rate volatility	Outperforms	Underperforms

EXAMPLE 4

Positioning for Changes in Curvature and Slope

Heather Wilson, CFA, works for a New York hedge fund managing its US Treasury portfolio. Her role is to take positions that profit from changes in the curvature of the yield curve. Wilson's positions must be duration neutral, and the maximum position that she can take in 30-year bonds is $100 million. On-the-run Treasuries have the characteristics shown in the following table:

Maturity	Coupon	Price	Yield to Maturity	Duration	PVBP/$ Million
2 Year	1.0%	100	1.0	1.98	198
5 Year	1.5%	100	1.5	4.80	480
10 Year	2.5%	100	2.5	8.80	880
30 Year	3.0%	100	3.0	19.72	1,972

If Wilson takes the maximum allowed position in the 30-year bonds and all four positions have the same (absolute value) money duration, what portfolio structure involving 2s, 5s, 10s, and 30s will profit from a decrease in the curvature of the yield curve?

Solution:

To profit from a decrease in yield curve curvature, Wilson should structure a condor: short 2s, long 5s, long 10s, and short 30s. If the curvature decreases, the short positions in the 2s and 30s will profit as rates at either end of the curve rise, and the long positions in 5s and 10s will maintain their value. If curvature decreases as a result of a decline in intermediate (5s and 10s) yields, the long positions at the intermediate maturities are likely to profit while the short positions in the 2s and 30s maintain their value.

To determine the portfolio positioning:

- 100 million 30-year bonds have a money duration of 100 × 1,972 = 197,200 (the maximum allowed position).
- To establish the remaining positions, each with the same money duration:
  - The 10s position should be 197,200/880 = 224.09 or 224 million (long).
  - The 5s position should be 197,200/480 = 410.83 or 411 million (long).
  - The 2s position should be 197,200/198 = 995.96 or 996 million (short).

Wilson's position should be short 996 million 2s, long 411 million 5s and long 224 million 10s, short 100 million 30s. Details of the portfolio positioning are shown in the following table:

Treasury Instrument	2s	5s	10s	30s
PVBP (per $1 million)	198	480	880	1,972
Position constraint ($)	NA	NA	NA	100,000,000
$ Duration constraint	NA	NA	NA	197,200
Direction	Short	Long	Long	Short
$ Positions	(995,959,596)	410,833,333	224,090,909	(100,000,000)
$ Durations	(197,200)	197,200	197,200	(197,200)
$ Duration (2s and 5s versus 10s and 30s)	0		0	

6 A FRAMEWORK FOR EVALUATING YIELD CURVE TRADES

Using an expanded version of the expected return decomposition model, we can develop an understanding of the relative contributions of the various components of return to the success or failure of the strategy.

Expected returns using the full model can be decomposed as follows:

$$\begin{aligned} E(R) \approx\ & \text{Yield income} + \text{Rolldown return} \\ & + E(\text{Change in price based on investor's views of yields and yield spreads}) \\ & - E(\text{Credit losses}) + E(\text{Currency gains or losses}) \end{aligned}$$

where $E(..)$ indicates the analyst's expectations based on his forecast. The following scenarios demonstrate the model's application for the purpose of analyzing yield curve portfolio strategies.

Victoria Lim Victoria Lim is a fixed-income portfolio manager in the Singapore office of a large US wealth management company. Her company's clients are mostly US high-net-worth individuals. Lim specializes in yield curve strategies on the short end of the curve using Asia-Pacific Emerging Market sovereign securities. Her investment horizon is one year, and she is considering two strategies: (1) buy and hold and (2) riding the yield curve. The buy and hold strategy consists of buying a portfolio of baht-denominated, one-year, zero-coupon notes issued by the Thai government (currently yielding 1.0%). The alternative strategy of riding the yield curve consists of buying a portfolio of two-year zero-coupon Thai government notes and selling them in one year. The two-year zero-coupon notes are also denominated in baht (currently yielding 2.0%). The baht proceeds under each yield curve strategy will be converted into US dollars at the end of the one-year investment horizon. Her company's economic forecasting unit has published its 12-month forecast, which projects that the yield curve for Thai government securities will be stable and that the baht will appreciate relative to the US dollar by 1.5%. Exhibit 54 summarizes the key information for the two yield curve strategies Lim is considering.

Exhibit 54 Assumptions for Stable Yield Curve

Portfolio Strategies	Buy-and-Hold Portfolio	Ride the Yield Curve Portfolio
Investment horizon (years)	1.0	1.0
Bonds maturity at purchase (years)	1.0	2.0
Coupon rate	0.00%	0.00%
Yield to maturity	1.00%	2.00%
Current average bond price for portfolio	99.0090	96.1169
Expected average bond price in one year for portfolio	100.00	99.0090
Expected currency gains or losses	1.5%	1.5%

The expected return for Lim's portfolio under each of the yield curve strategies can be determined using the foregoing model.

Because the securities being considered for purchase are baht-denominated zero-coupon notes, the expected returns on the portfolio include expected currency gains and losses, as shown in Exhibit 55.

Exhibit 55 Expected Return for Stable Yield Curve Strategies

Return Component	Formula	Portfolio Performance	
		Buy and Hold	Ride the Yield Curve
Yield income	Annual coupon payment ÷ Current bond price	0	0
+ Rolldown return	$\frac{(\text{Bond price}_{\text{End-of-horizon}} - \text{Bond price}_{\text{Beginning-of-horizon}})}{\text{Bond price}_{\text{Beginning-of-horizon}}}$	(100.00 – 99.009) ÷ 99.009 = 1.00%	(99.0090 – 96.1169) ÷ 96.1169 = 3.01%
= Rolling yield	Yield income + Rolldown return	0 + 1.00% = 1.00%	0 + 3.01% = 3.01%
+ *E*(currency gains or losses)	Given	+ 1.50%	+ 1.50%
= Total expected return		= 2.50%	= 4.51%

Note: Formulas are provided for reference; details and explanations can be found in the reading "Introduction to Fixed-Income Portfolio Management."

The expected return from simply riding the yield curve is higher than the expected return from the buy-and-hold strategy. This results from the greater price appreciation (rolldown return) of the two-year zero-coupon note over the investment horizon (3.01% for the two-year zero versus 1.00% for the one-year zero) as its time to maturity shortens to one year and its yield declines from 2.0% to 1.0%.

Why does the ride-the-yield-curve strategy so significantly outperform the buy-and-hold strategy in a stable interest rate environment? From the information given earlier, we can compute the implied one-year rate, one year forward:

$$(1.02)^2 / 1.01 - 1 = 3.01\%$$

The one-year rate one year forward implied by the current yield curve is 3.01%. Thus, the yield curve contains an expectation that one-year rates will rise over the 12-month horizon. Contrast this information with the bank's forecast for a 1% one-year rate one year from now. The implicit assumption in the bank's forecast is a decline in rates relative to the expectations embedded in the yield curve. Thus, the two-year zero-coupon note will experience price appreciation as a result of the implicit decline in rates. (Simply put, if the forecast ending yield on a particular bond is lower [higher] than the forward rate, then it can be expected to earn a return greater than [less than] the one-period rate.)

The next scenario shows expected returns for bond portfolios when the government yield curve is expected to change over the investment horizon. In addition to the rolldown return, now the investor's yield curve view results in a value effect on the portfolio—in this case, an expected capital loss due to the expected yield increase.

Lamont Cranston Lamont Cranston is a trader on the government securities desk of a US investment bank. He has a view on interest rates and thinks the US Treasury security zero-coupon yield curve will experience an upward shift by 50 bps in the next 12 months. Cranston is considering two strategies for the year ahead: a bullet portfolio and a barbell portfolio. The bullet portfolio would have 100% of its funds invested in five-year Treasury zero-coupon notes, currently priced at 94.5392. The barbell portfolio would have 62.97% of its funds invested in two-year Treasury zero-coupon notes, priced at 98.7816, and the remaining 37.03% of funds invested in 10-year Treasury zero-coupon bonds, priced at 83.7906. In addition, he uses other key assumptions summarized in Exhibit 56.

Exhibit 56 Assumptions for Bullet and Barbell Portfolio Strategies

	Bullet	Barbell
Investment horizon (years)	1.0	1.0
Average bond price for portfolio currently	94.5392	92.6437
Average bond price for portfolio in one year (assuming stable yield curve)	96.0503	94.3525
Current modified duration for portfolio	4.97	4.93
Expected effective duration for portfolio (at the horizon)	3.98	3.98
Expected convexity for portfolio (at the horizon)*	17.82	32.57
Expected change in US Treasury zero-coupon yield curve	0.50%	0.50%

* We said earlier that there is no single convention for how convexities are scaled. The numbers shown in this exhibit are the "raw" convexity numbers and, as such, the scale is different than that used throughout the rest of this reading. We show the raw numbers here because they are the numbers used in the return estimation formula.

The objective is to find the expected return over the one-year investment horizon for each of the portfolios he is considering.

The effect of the trader's interest rate view on the total expected return of the portfolio can be estimated using the portfolios' modified durations and convexities. The higher convexity of the barbell portfolio should mitigate the capital loss. With an expectation of a 50 bp upward shift at all points along the curve, we can calculate the expected loss from the increase in rates as follows.

$$[-\text{MD} \times \Delta\text{Yield}] + [\tfrac{1}{2} \times \text{Convexity} \times (\Delta\text{Yield})^2]$$

$$\text{Bullet portfolio: } (-3.98 \times 0.005) + [1/2 \times 17.82 \times (0.005)^2] = -1.9677\%$$

Barbell portfolio: $(-3.98 \times 0.005) + [1/2 \times 32.57 \times (0.005)^2] = -1.9493\%$

Combining the sources of expected returns for each portfolio gives us the total expected return for each strategy. Because both portfolios contain only zero-coupon bonds, there is no yield income. We calculate the rolldown return as follows:

$$\frac{(\text{Bond price}_{\text{eh}} - \text{Bond price}_{\text{bh}})}{\text{Bond price}_{\text{bh}}}$$

where the subscript *bh* indicates the bond price at the beginning of the horizon and the subscript *eh* indicates the bond price at the end of the horizon.

Bullet portfolio: $(96.0503 - 94.5392) \div 94.5392 = 1.5984\%$

Barbell portfolio: $(94.3525 - 92.6437) \div 92.6437 = 1.8444\%$

The total expected return over the one-year investment horizon for the bullet portfolio is therefore –0.369%, and the expected return for the barbell portfolio is –0.105%. The derivation of the expected return is summarized in Exhibit 57.

Exhibit 57 Expected Return for Bullet and Barbell Strategies

		Portfolio Performance	
Return Component	**Formula**	**Bullet**	**Barbell**
Yield income	Annual coupon payment ÷ Current bond price	0	0
+ Rolldown return	$\frac{(\text{Bond price}_{\text{eh}} - \text{Bond price}_{\text{bh}})}{\text{Bond price}_{\text{bh}}}$	= 1.5984%	= 1.8444%
= Rolling yield	Yield income + Rolldown return	= 1.5984%	= 1.8444%
+ E(Change in price based on yield view)	$[-\text{MD}_{eh} \times \Delta\text{Yield}] + [\frac{1}{2} \times \text{Convexity} \times (\Delta\text{Yield})^2]$	= –1.9677%	= –1.9493%
= Total expected return		**= –0.3693%**	**= –0.1049%**

Note: Formulas are provided for reference.

If the trader's yield view materializes, the barbell portfolio will outperform the bullet portfolio by 26 bps. The greater convexity of the barbell portfolio contributed just under 2 bps of outperformance, whereas the rolldown return contributed nearly 25 bps. The strong rolldown contribution is driven by the stronger price appreciation (under the stable yield curve assumption) of the 10-year zeros (3.4%) in the barbell portfolio relative to the price appreciation of the 5-year zeros (1.6%) in the bullet portfolio as the bonds ride the curve over the one-year horizon to a shorter maturity and a lower yield.

EXAMPLE 5

Components of Expected Returns

In Section 4.1, we introduced Hillary Lloyd, a fixed-income portfolio manager at AusBank, and demonstrated how she might choose to position her portfolio in anticipation of a 60 bp parallel upward shift in the yield curve. Recall that she has a strong conviction that interest rates will increase. Comparing the implied forward rates with the expected yields and returns on the bonds in her portfolio

given her interest rate forecast, she concludes the best expected return will be earned with a portfolio invested 100% in the two-year bonds. We now look to evaluate that decision.

Exhibit 58 provides information on the characteristics of Lloyd's ending portfolio under such a scenario. Information is also shown for her initial portfolio (with no restructuring) assuming it is held over the investment horizon given both a stable yield curve and the +60 bp curve shift.[23]

Using the return decomposition framework provided, calculate the expected return for each portfolio and discuss the factors that contribute to the differences.

Exhibit 58 Characteristics of Hillary Lloyd's Beginning and Ending Portfolios

		Yield Curve Shift	
	Initial Portfolio	Initial Portfolio	Revised Portfolio
Investment horizon (years)	1.0	1.0	1.0
Average annual coupon rate for portfolio	2.01%	2.01%	1.91%
Average beginning bond price for portfolio	100.00	100.00	100.00
Average ending bond price for portfolio (assuming roll-down and stable yield curve)	100.46	100.46	100.40
Expected effective duration for portfolio (at the horizon)	1.313	1.305	0.979
Expected convexity for portfolio (at the horizon)	0.9	0.9	0
Expected change in government bond yield curve	—	0.60%	0.60%

Exhibit 59 shows the decomposition of the portfolios' expected returns into yield income, rolldown return, and expected price change based on yield view. The initial portfolio holds all six (short- to intermediate-term) bonds. The ending portfolio holds only the two-year bonds, the ones with the highest expected holding-period return.

23 Practically speaking, if Lloyd were to hold the portfolio of 100% two-year bonds for the full one-year horizon, she would fall below the lower bound of the duration constraint within the first three to four months of the year.

Exhibit 59 Expected Return for Hillary Lloyd's Initial and Revised Portfolios

Return Component	Formula	Initial Portfolio (stable yield curve)	Initial Portfolio (+ 60 bps)	Revised Portfolio (+ 60 bps)
Yield income	Annual coupon payment ÷ Current bond price	2.01/100.00 = 2.01%	2.01/100.00 = 2.01	1.91/100.00 = 1.91%
+ Rolldown return	(Bond price$_{eh}$ – Bond price$_{bh}$) ÷ Bond price$_{bh}$	(100.463 – 100.00) ÷ 100.00 = 0.463%	(100.463 – 100.00) ÷ 100.00 = 0.463%	(100.404 – 100.00) ÷ 100.00 = 0.404%
= Rolling yield	Yield income + Rolldown return	= 2.473%	= 2.473%	= 2.314%
+ E(change in price based on yield view)	[–MD × ΔYield] + [½ × Convexity × (ΔYield)^2]	—	[–1.305 × 0.006] + [½ × 0.9 × (0.006)^2] = –0.7814%	[–0.979 × 0.006] + [½ × 0 × (0.006)^2] = –0.5874%
= Total expected return		**= 2.47%**	**= 1.69%**	**= 1.73%**

Under Lloyd's rising interest rate scenario, the revised portfolio generates a total expected return of 1.73% versus the initial portfolio's expected return of 1.69%.

The portfolio holding only two-year bonds gave up 10 bps of yield income and 6 bps of rolldown return in exchange for 19 bps of price protection from the shorter duration, resulting in 3 bps of outperformance relative to the initial portfolio.

Yield income is 2.01% for the initial portfolio and 1.91% for the revised portfolio. This difference is the result of the higher coupon income from the six-bond portfolio, because it holds the intermediate-maturity, higher-coupon bonds.

The rolldown return for the initial portfolio is 0.463%, slightly higher than the 0.404% rolldown return for the revised portfolio. The intermediate-term bonds in the initial portfolio contribute to this portfolio's higher rolldown return—these intermediate-maturity bonds experience a larger price increase than the shorter-term bonds (2s), which are the only bonds in the revised portfolio.

The price change attributable to the yield view is –0.5874% for the revised portfolio, versus –0.7814% for the initial portfolio. Due primarily to the revised portfolio's shorter duration (0.979) relative to the initial portfolio (1.305), its losses are more moderate than those of the initial portfolio.

Taken together, these components explain the revised portfolio's outperformance of 4 bps under the anticipated rise in interest rates.

Using Structured Notes in Active Fixed-Income Management

There is a class of fixed-income securities that can provide highly customized exposures to alter a portfolio's sensitivity to yield curve changes. These securities fall under the broad heading of structured notes. Among the many types of structured notes used in fixed-income portfolio management are the following:

- Inverse floaters
- Deleveraged floaters

- Range accrual notes
- Extinguishing accrual notes
- Interest rate differential notes
- Ratchet floaters

Structured notes can offer significantly lower all-in costs compared with traditional financing. When used by sophisticated investors, structured notes allow the packaging of certain risks or bets. Some structured notes can be extremely complicated, with complex formulas for coupon payments and redemption values. For example, consider the following:

- Inverse floaters have coupons that rise as the index rate to which the coupons are linked declines (and vice versa), and many of these are "levered" in that the coupon changes by a multiple (2×, 3×, etc.) of the index rate change.
- The coupon of the deleveraged floater floats with the change in its reference rate, but the change applied to the coupon is based on a multiplier that is less than one.
- Range accrual notes specify a daily accrual (coupon) rate within a set of pre-defined constraints. For example, the accrual occurs only if the reference rate, such as three-month Libor, is within a pre-determined range for that day. If the reference rate is outside of that range, then no accrual occurs.
- Extinguishing accrual notes cancel all future accruals if the reference rate trades outside the specified range. This feature is beneficial if interest rates decline but creates a drag on returns if rates move up. The investor is compensated by receiving a higher "floor" or minimum interest rate.
- Interest rate differential notes pay a coupon based on the difference between the rates from two different points on the yield curve.
- Ratchet floaters are floating-rate notes that typically include a provision preventing the coupon from ever declining.
- Dual-currency notes are denominated in one currency but pay interest in a different currency. A version of this note was a "power-reverse dual" note—inverse floaters (sold when rates were close to zero and seemingly could only rise) that paid coupons in one currency and principal in another currency.

Most of these structures focus on the front end of the yield curve.

Structured notes can be complicated and often lack liquidity. Thorough due diligence and a high level of investment expertise are essential to effectively invest in these securities. Many unsophisticated investors have purchased these securities without truly understanding their idiosyncratic characteristics and risks. The Orange County debacle of 1994 is one notable example.

The county had issued debt securities and used those proceeds to increase the size of an investment pool it managed on behalf of area schools—a fund that was promoted as a low-risk investment. The investment pool then pledged those securities in the repo market, using the proceeds of the repo loan to buy structured notes with complicated coupon formulas, many of which were predicated on a forecast of flat to declining interest rates. As the Federal Reserve raised interest rates throughout 1994, the county's losses mounted. The fund lost $1.5 billion out of its $7.5 billion portfolio and, in December 1994, Orange County, California declared bankruptcy, largely as a result of the losses on its investment portfolios.

SUMMARY

This reading focused on the strategies a fixed-income portfolio manager may use to position his portfolio in anticipation of the future state of yield curves.

- Macaulay duration is a weighted average of time to receive the bond's cash flows.
- Modified duration is the Macaulay duration statistic divided by one plus the yield to maturity per period. It provides an estimate of the percentage price change for a bond given a 100 bps change in its yield to maturity.
- Effective duration is the sensitivity of the bond's price to a change in a benchmark yield curve, as opposed to the price response to a change in the bond's own yield. It is similar to modified duration, but its calculation is flexible to allow for its use in cases when the bond has an embedded option.
- Key rate duration is a measure of a bond's sensitivity to a change in the benchmark yield curve at a specific maturity point or segment. Key rate durations help identify a portfolio's sensitivity to changes in the shape of the benchmark yield curve.
- The money duration of a bond is a measure of the bond's price change in units of the currency in which the bond is denominated.
- The price value of a basis point scales money duration so that it can be interpreted as money gained or lost for each basis point change in the reference interest rate.
- The three primary yield curve movements of importance to the fixed-income manager are changes in level, slope, or curvature of the yield curve.
- Curvature of the yield curve can be measured using the butterfly spread, which describes the relationship between yields at short, intermediate, and long maturities.
- Duration management is the primary tool used by fixed-income portfolio managers.
- Convexity supplements duration as a measure of a bond's price sensitivity for larger movements in interest rates. Convexity can be an important portfolio management tool.
- Adding convexity to a portfolio using physical bonds typically requires a give-up in yield.
- For two portfolios with the same duration, the portfolio with higher convexity has higher sensitivity to large declines in yields and lower sensitivity to large increases in yields.
- Interest rate derivatives can be used effectively to add convexity to a portfolio.
- The four major strategies used when the yield curve is expected to remain stable are buy and hold; ride the yield curve; sell convexity; and the carry trade.
- The major strategies used when changes are expected in the level, slope, or curvature of the yield curve are duration management; buying convexity; and bullet and barbell structures.
- Selling convexity can be accomplished by selling calls on bonds owned, selling puts on bonds one would be willing to own, or buying securities with negative convexity, such as callable bonds or mortgage-backed securities.
- The carry trade buys a higher-yielding security, financing it with a lower-yielding security.

- Duration should not be extended or shortened without considering the manner in which the changed duration will be distributed throughout the portfolio. The same duration change can be effected with any number of trades, each of which has its own sensitivity to changes in the curve.
- Portfolio duration can be modified using futures, options, or leverage.
- A bullet portfolio holds securities targeting a single segment of the curve, with the bonds clustered around the portfolio's duration target. A bullet is typically used to take advantage of a steepening yield curve.
- A barbell portfolio combines securities with short and long maturities (and fewer intermediate maturities) compared with the duration target. A barbell is typically used to take advantage of a flattening yield curve.
- A barbell portfolio structure has higher convexity than a bullet portfolio structure.
- Key rate durations can be used to estimate a bond or portfolio's sensitivity to changes in the shape of the yield curve as well as to identify bullets and barbells.
- A butterfly trade combines a bullet and a barbell in a duration-neutral long–short structure. (This trade is distinct from the butterfly spread measure used to determine curvature.)
- A butterfly long in the wings and short in the body is long (has positive) convexity and benefits from volatile interest rates. This butterfly also benefits from a yield curve flattening (unrelated to its convexity).
- A butterfly short in the wings and long in the body is short convexity and benefits from stable interest rates. This butterfly also benefits from a yield curve steepening (unrelated to its convexity).
- Comparing forward yields (implied yield change) with a manager's yield forecast (forecast yield change) can help determine which bonds are likely to perform the best over the forecast horizon.
- Options can be used to add or reduce convexity in a portfolio.
- The expected return of a fixed income portfolio can be estimated using the following formula:

$$\begin{aligned} E(R) \approx\ & \text{Yield income} + \text{Rolldown return} \\ & + E(\text{Change in price}) - E(\text{Credit losses}) + E(\text{Currency gains or losses}) \end{aligned}$$

Relative Performance of Bullets and Barbells under Different Yield Curve Scenarios

Yield Curve Scenario		Barbell	Bullet
Level change	Parallel shift	Outperforms	Underperforms
Slope change	Flattening	Outperforms	Underperforms
	Steepening	Underperforms	Outperforms
Curvature change	Less curvature	Underperforms	Outperforms
	More curvature	Outperforms	Underperforms
Rate volatility change	Decreased rate volatility	Underperforms	Outperforms
	Increased rate volatility	Outperforms	Underperforms

PRACTICE PROBLEMS

The following information relates to Questions 1–6

Amy McLaughlin is a fixed-income portfolio manager at UK-based Delphi Investments. One year ago, given her expectations of a stable yield curve over the coming 12 months and noting that the yield curve was upward sloping, McLaughlin elected to position her portfolio solely in 20-year US Treasury bonds with a coupon rate of 4% and a price of 101.7593, with the expectation of selling the bonds in one year at a price of 109.0629. McLaughlin expected the US dollar to depreciate relative to the British pound by 1.50% during the year. McLaughlin chose the 20-year Treasury bonds because they were on the steepest part of the yield curve.

McLaughlin and Michaela Donaldson, a junior analyst at Delphi, are now discussing how to reposition the portfolio in light of McLaughlin's expectations about interest rates over the next 12 months. She expects interest rate volatility to be high and the yield curve to experience an increase in the 2s/10s/30s butterfly spread, with the 30-year yield remaining unchanged. Selected yields on the Treasury yield curve, and McLaughlin's expected changes in yields over the next 12 months, are presented in Exhibit 1.

Exhibit 1 Current Treasury Yield Curve and Forecasted Yields

Maturity (years)	Starting Yield (Current)	Forecasted Change in Yield	Ending Yield
2	1.01%	+0.04%	1.05%
5	1.55%	+0.40%	1.95%
10	2.75%	+0.50%	3.25%
30	3.50%	+0.00%	3.50%

Based on these interest rate expectations, McLaughlin asks Donaldson to recommend a portfolio strategy. Donaldson considers the following three options.

Bullet portfolio: Invest solely in 10-year Treasury government bonds

Barbell portfolio: Invest solely in 2-year and 30-year Treasury government bonds

Laddered portfolio: Invest equally in 2-year, 5-year, 10-year, and 30-year Treasury government bonds

After recommending a portfolio strategy, McLaughlin tells Donaldson that using a duration-neutral, long/short structure may be a better strategy for attempting to enhance portfolio return. McLaughlin suggests that Donaldson consider a butterfly trade or a condor trade using some combination of 2-year, 5-year, 10-year, and 30-year bonds.

© 2017 CFA Institute. All rights reserved.

Donaldson suggests they also consider altering the portfolio's convexity to enhance expected return given McLaughlin's interest rate expectations. Donaldson tells McLaughlin the following.

Statement 1 Portfolios with larger convexities often have higher yields.

Statement 2 If yields rise, a portfolio of a given duration with higher convexity will experience less of a price decrease than a similar-duration, lower-convexity portfolio.

1 The portfolio strategy implemented by McLaughlin last year is *mostly likely* to be described as:

A a carry trade.

B a barbell structure.

C riding the yield curve.

2 At the start of last year, the expected return on the portfolio strategy implemented by McLaughlin was *closest* to:

A 9.61%.

B 9.68%.

C 12.61%.

3 Using the yield curve forecast shown in Exhibit 1, which portfolio strategy should Donaldson recommend for the year ahead?

A The bullet portfolio

B The barbell portfolio

C The laddered portfolio

4 Given McLaughlin's interest rate expectations over the next 12 months, which long/short structure would be most appropriate?

A Condor: short wings, long body

B Butterfly: short barbell, long bullet

C Butterfly: long barbell, short bullet

5 Given McLaughlin's interest rate expectations over the next 12 months, one way that Donaldson and McLaughlin could alter convexity to enhance expected return would be to:

A sell call options on bonds held in the portfolio.

B buy call options on long-maturity government bond futures.

C sell put options on bonds they would be willing to own in the portfolio.

6 Which of Donaldson's statements is correct?

A Only Statement 1

B Only Statement 2

C Both Statements 1 and 2

SOLUTIONS

1 C is correct. Last year, McLaughlin expected the yield curve to be stable over the year. Riding the yield curve is a strategy based on the premise that, as a bond ages, it will decline in yield if the yield curve is upward sloping. This is known as "roll down"; that is, the bond rolls down the (static) curve. Riding the yield curve differs from buy and hold in that the manager is expecting to add to returns by selling the security at a lower yield at the horizon. This strategy may be particularly effective if the portfolio manager targets portions of the yield curve that are relatively steep and where price appreciation resulting from the bond's migration to maturity can be significant. McLaughlin elected to position her portfolio solely in 20-year Treasury bonds, which reflect the steepest part of the yield curve, with the expectation of selling the bonds in one year.

2 A is correct. The expected return on the strategy (riding the curve) is calculated as follows.

$E(R)$	≈	Yield income	(equal to Annual coupon rate/Current bond price)
	+	Rolldown return	[equal to (End bond price – Begin bond price)/Begin bond price]
	+	E(Change in price based on investor's views of yields and yield spreads)	
	–	E(Credit losses)	
	+	E(Currency gains or losses)	

Return Component	Formula*	Portfolio Performance
Yield income	Annual coupon payment/Current bond price	4/101.7593 = 3.93%
+ Rolldown return	$\frac{\left(\text{Bond price}_{\text{End-of-horizon}} - \text{Bond price}_{\text{Beginning-of-horizon}}\right)}{\text{Bond price}_{\text{Beginning-of-horizon}}}$	(109.0629 – 101.7593)/101.7593) = 7.18%
+ E(Change in price based on investor's views of yields and yield spreads)		0%
= Rolling yield	Yield income + Rolldown return	3.93% + 7.18% = 11.11%
– E(Credit losses)	N/A	–0%
+ E(Currency gains or losses)	Given	–1.50%
= Total expected return		= 9.61%

In this case, the E(Change in price based on investor's views of yields and yield spreads) term is equal to zero because McLaughlin expects the yield curve to remain stable.

3 B is correct. McLaughlin expects the yield curve to experience an increase in the butterfly spread, with the 30-year yield remaining unchanged, which implies that the yield curve will increase its curvature, pinned at the 30-year yield, as shown in Exhibit 1. The barbell portfolio, consisting of 2-year and 30-year bonds, would be expected to perform best. Although the two-year rate is expected to increase, the effective duration of two-year bonds is quite small, resulting in minimal price impact. Similarly, the 30-year yield is expected

to remain constant, resulting in minimal price impact as well. Relative to the barbell portfolio, the laddered portfolio has greater exposure to the expected increases in the 5-year and 10-year yields, and the bullet portfolio has greater exposure to the expected increase in the 10-year yield. Therefore, the barbell portfolio would be expected to perform best given McLaughlin's interest rate expectations.

4 C is correct. McLaughlin expects interest rate volatility to be high and the yield curve to experience an increase in the butterfly spread, with the 30-year yield remaining unchanged. Given these expectations, a long barbell (2s and 30s, short bullet [10s] butterfly trade would be most appropriate. The two-year yield is expected to slightly increase by 0.04%, resulting in minimal price impact given the relatively low duration of two-year bonds. Similarly, the 30-year yield is expected to remain constant, resulting in minimal price impact as well. The 10-year yield (+0.50%) is expected to increase by more than the 5-year yield (+0.40%), and with its higher effective duration, the 10-year would be appropriate for the short bullet part of the butterfly trade.

5 B is correct. McLaughlin expects interest rate volatility to be high and the yield curve to experience an increase in the butterfly spread, with the 30-year yield remaining unchanged. To increase the portfolio's expected return, Donaldson and McLaughlin should buy call options on long-maturity government bond futures to increase convexity.

6 B is correct. Statement 2 is correct: If yields rise, a portfolio of a given duration with higher convexity will experience less of a price decrease than a similar-duration, lower-convexity portfolio. Statement 1 is incorrect, as portfolios with larger convexities often have lower yields. Investors will be willing to pay for increased convexity when they expect yields to change by more than enough to cover the sacrifice in yield.

READING

24

Fixed-Income Active Management: Credit Strategies

by Campe Goodman, CFA, and Oleg Melentyev, CFA

Campe Goodman, CFA, is at Wellington Management (USA). Oleg Melentyev, CFA (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe risk considerations in investment-grade and high-yield corporate bond portfolios;
☐	**b.** compare the use of credit spread measures in portfolio construction;
☐	**c.** discuss bottom-up approaches to credit strategies;
☐	**d.** discuss top-down approaches to credit strategies;
☐	**e.** discuss liquidity risk in credit markets and how liquidity risk can be managed in a credit portfolio;
☐	**f.** describe how to assess and manage tail risk in credit portfolios;
☐	**g.** discuss considerations in constructing and managing portfolios across international credit markets;
☐	**h.** describe the use of structured financial instruments as an alternative to corporate bonds in credit portfolios.

INTRODUCTION

1

This reading covers strategies used in the construction and management of credit portfolios. A credit portfolio consists primarily of securities for which credit risk is an important consideration. The credit market is the component of the fixed-income market that includes both publicly traded debt securities (such as corporate bonds, sovereign and non-sovereign government bonds, supranational bonds, and commercial paper) and non-publicly traded instruments (such as loans and privately placed securities). The credit market also includes structured financial instruments—such as mortgage-backed securities, asset-backed securities, and collateralized debt obligations—that may be traded publicly or non-publicly.

© 2017 CFA Institute. All rights reserved.

Corporate bonds are the largest portion of the credit market. Section 2 compares investment-grade and high-yield corporate bonds and highlights implications of differences in these bonds for portfolio construction and management. Section 3 describes basic measures used to evaluate credit securities, including credit spread measures and excess returns from credit securities. Section 4 discusses two main approaches to credit strategy—bottom-up and top-down—used in constructing and managing credit portfolios. Section 5 discusses examines how to manage two important non-credit risks—liquidity risk and tail risk—in credit portfolios.

When managing international credit portfolios, portfolio managers need to consider various global implications. Section 6 discusses issues and risks that are particularly relevant for international credit portfolios. In addition to corporate bonds, credit investors may consider structured financial instruments such as mortgage-backed securities, asset-backed securities, collateralized debt obligations, and covered bonds. Section 7 covers the use of structured financial instruments in credit portfolios. The final section summarizes the reading.

2 INVESTMENT-GRADE AND HIGH-YIELD CORPORATE BOND PORTFOLIOS

More than half of the global credit market, represented by the Bloomberg Barclays Global Aggregate Index, consists of corporate bonds. As of 31 December 2015, the amount of corporate debt outstanding was almost US$7.4 trillion, or about 54% of the global credit universe.[1]

Corporate bond investors draw an important distinction between investment grade and high yield. *Investment-grade corporate bonds* have higher credit ratings than high-yield corporate bonds, and they typically have lower credit and default risk as well as lower yields. *High-yield corporate bonds* have lower, speculative-grade credit ratings, higher credit and default risk, and higher yields compared with investment-grade corporate bonds.[2]

In this reading, we reference credit ratings to distinguish between investment-grade and high-yield bonds. In practice, credit portfolio managers and analysts do not rely exclusively on ratings issued by the credit rating agencies when evaluating the creditworthiness of bond issuers. Rather, they typically conduct their own analysis and make independent assessments of the creditworthiness of issuers. Portfolio managers and analysts may consider the "four Cs" of credit analysis—capacity, collateral, covenants, and character—or the extended "five Cs," which includes capital, and use credit models to evaluate credit worthiness. In doing so, portfolio managers and analysts may use a ratings methodology similar to that of the rating agencies.

When assessing the suitability of bonds for their portfolios, credit portfolio managers must sometimes invest within certain ratings categories. For example, a portfolio manager's investment guidelines may prohibit investing in debt rated below investment grade by one or more of the credit rating agencies.

---

1 The global corporate debt universe is represented here by the Bloomberg Barclays Global Corporate Index, and the global credit universe is represented by the Bloomberg Barclays Global Aggregate Index.

2 In this reading, "investment-grade bonds" and "high-yield bonds" both refer to corporate bonds unless indicated otherwise. "High yield" is the term most commonly used by investors in this asset class. Credit rating agencies often refer to high yield as "speculative grade," and this reading occasionally uses this term. Moody's Investors Service defines bonds rated from Aaa to Baa3 as investment grade and bonds rated below Baa3 as speculative grade. Both Standard & Poor's and Fitch Ratings define bonds rated from AAA to BBB– as investment grade and bonds rated below BBB1 as speculative grade. The financial press often uses the term "junk bonds."

2.1 Credit Risk

Credit risk is the risk of loss caused by a counterparty's or debtor's failure to make a promised payment. Credit risk has two components: (1) **default risk**, which is the probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security; and (2) **loss severity** (also called **loss given default**), which is the amount of loss if a default occurs.

Although investment-grade and high-yield bonds are defined primarily by their credit risk, in practice they differ in other ways, including their sensitivity to interest rate changes. Differences in credit and default risk, in interest rate sensitivity, and in liquidity have implications for credit portfolio construction.

Credit and default risk and credit loss rates are historically much lower for investment-grade bonds than for high-yield bonds. A *credit loss rate* represents the percentage of par value lost to default for a group of bonds. The credit loss rate is equal to the bonds' default rate multiplied by the loss severity. Because loss severity can be no more than 100%, the credit loss rate is less than or equal to the default rate.

Exhibit 1 shows annual credit loss rates from 1983 through 2015 for all corporate bonds rated by Moody's Investors Service. During this period, the largest credit loss rate for investment-grade bonds is 0.42%, and the average loss rate is only 0.06%. For high-yield bonds, the average credit loss rate is 2.55%, and there are multiple years, usually around economic recessions, in which default losses exceed 5%.

Exhibit 1 Annual Credit Loss Rates for Corporate Bonds, 1983–2015*

	Investment Grade	High Yield
Average	0.06%	2.55%
Standard deviation	0.10%	1.96%
Maximum	0.42%	7.61%
Minimum	0.00%	0.42%

* Based on issuer-weighted average default rates and issuer-weighted senior unsecured bond recovery rates.
Source: Moody's Investors Service.

As Exhibit 1 makes clear, the credit loss rate on high-yield bonds is substantially higher—on average more than 40 times larger—*and* more variable than on investment-grade bonds.

The higher credit loss rate means that credit risk is usually the most important consideration for high-yield portfolio managers. In contrast, for investment-grade portfolio managers, other risks inherent in corporate bonds—credit migration (or credit downgrade) risk, spread risk, and in particular, interest rate risk—are typically the most relevant considerations.

2.2 Credit Migration Risk and Spread Risk

Although credit losses on investment-grade bonds are small compared with high-yield bonds, credit risk is still an important driver of investment-grade bond returns. Investment-grade bonds can experience deterioration in their credit quality—called *credit migration risk*—and as they become riskier, their credit spreads typically widen (or increase). In addition, if a company's bonds are downgraded to below investment grade by one or more of the credit rating agencies, portfolio managers owning these bonds may be forced to sell them if their portfolios are not permitted to hold high-yield bonds. Forced sales can result in losses to a portfolio.

Because credit spread volatility—as opposed to outright credit default loss—is more relevant for investment-grade bonds, the risk in a portfolio of investment-grade bonds is typically measured in terms of **spread duration**.

Spread duration is a useful measure for determining a portfolio's sensitivity to changes in credit spreads. Duration indicates the percentage price effect of an interest rate change on a bond, and spread duration measures the effect of a change in *spread* on a bond's price. Spread duration provides the approximate percentage *increase* in bond price expected for a 1% *decrease* in credit spread (or vice versa).

For example, about two weeks after it was issued in May 2016, a bond issued by the Australian bank Westpac with a coupon of 2.10% and a maturity date of 13 May 2021 had both a modified duration and spread duration of approximately 4.70 years. The bond trades at a price of 99.60, which equates to a credit spread of 0.80%, or 80 bps. If this bond's credit spread decreases (narrows) by 20 bps, to 60 bps, and interest rates are unchanged, then its price will increase to approximately $100.54 = 99.60 \times \{1 + [-4.70 \times (0.0060 - 0.0080)]\}$.

For non-callable, fixed-rate corporate bonds, spread duration is generally very close to modified duration. In other words, interest rate changes and spread changes have almost identical effects on non-callable, fixed-rate corporate bonds. For floating-rate bonds (also called floaters) and some other types of bonds, however, the spread duration can differ substantially from the modified duration.

For example, Westpac also has a floater maturing on the same date as the fixed-rate bond, 13 May 2021. This bond also has a spread duration of 4.70 years, but its modified duration is only 0.21. The floater trades at a price of 100.55 with a credit spread of 88 bps. If its credit spread narrows by 20 bps, as in the above example, then its price increases to approximately $101.50 = 100.55 \times [1 + (-4.70 \times -0.0020)]$. The price increases by a percentage similar to the percentage price increase on the fixed-rate bond.

If, however, *interest rates* decrease by 20 bps (and spreads remain unchanged), then the floater's price increases to only $100.59 = 100.55 \times [1 + (-0.21 \times -0.0020)]$. The floater experiences almost no price change as a result of the change in interest rates because of the bond's short modified duration. In contrast, because its modified duration is equal to its spread duration, the Westpac 2.10% fixed-rate bond experiences an identical price change if interest rates decrease by 20 bps or if the credit spread narrows by 20 bps.

This example illustrates that the spread risk in an investment-grade portfolio consisting of floating-rate bonds should be measured by spread duration, not modified duration.

The much higher credit loss rate experienced on high-yield bonds compared with investment-grade bonds results in an emphasis on credit risk and market value of the position to evaluate high-yield risk. The reason for the emphasis on a position's market value is that all bonds with the same seniority ranking in an issuer's capital structure will typically be treated equally in the event of default—and therefore all experience the same loss severity—regardless of their maturity or spread duration. Consequently, in the event of default, an investor likely cares only about the *size* of her position rather than its spread duration. Given identical seniority and the same issuer, a €1,000,000 position with low spread duration will experience the same loss as a €1,000,000 position with much longer spread duration.

It is prudent for investment-grade and high-yield credit portfolio managers to be aware of both spread risk and default risk, as well as to understand both market value–based and spread duration–based risk measures. Investment-grade bonds do occasionally experience defaults, so large concentrated positions in these bonds can be imprudent. As an extreme example, consider a portfolio that holds only one investment-grade bond. Such a portfolio has binary exposure to default risk: Either it will experience no default loss or, if its single holding does default, it will experience a loss much larger than most investors would expect from a typical investment-grade bond portfolio. Also note that high-yield bonds, as with investment-grade bonds, do experience meaningful spread changes even in the absence of default. Therefore, high-yield portfolio managers should still be aware of their portfolios' spread durations.

2.3 Interest Rate Risk

High-yield portfolios usually have greater exposure to credit risk than investment-grade portfolios do, but investment-grade portfolios have more exposure to interest rate risk than high-yield portfolios. To understand why exposure to interest rate risk is greater in investment-grade portfolios, we revisit the concept of duration.

In theory, a change in interest rates has the same effect on a risk-free bond (a bond assumed to have no default risk) as it does on a risky bond. A bond's yield can be viewed as a default risk-free interest rate plus a spread. The spread is equal (or close) to zero for a riskless security and typically positive for a security with credit risk. A change in the risk-free rate has no theoretical effect on spread, so all else being equal, changes in risk-free rates should have exactly the same effects on the yields of both risk-free and risky bonds.

In practice, however, credit spreads tend to be negatively correlated with risk-free interest rates. One important reason for this phenomenon is that key macro factors, such as economic growth, default rates, and monetary policy, usually have opposite effects on risk-free rates and spreads. For example, a better economic environment generally leads to *higher* risk-free rates and *narrower* credit spreads, whereas a weaker economic environment generally results in *lower* risk-free rates and *wider* credit spreads. As a result of the typically negative correlation between risk-free rates and credit spreads, changes in risk-free rates tend to generate smaller changes in corporate bond yields than theoretical measures of duration suggest. This reduced effect is even more pronounced for securities with high credit risk and large credit spreads—that is, bonds with comparatively large credit spreads have less sensitivity to interest rate changes than bonds with smaller credit spreads. As a result, the price behavior of bonds with high credit risk often more closely resembles that of equities rather than fixed income.

Empirical duration is a measure of interest rate sensitivity that is determined from market data. A common way to calculate a bond's empirical duration is to run a regression of its price returns on changes in a benchmark interest rate. For example, the price returns of a 10-year euro-denominated corporate bond could be regressed on changes in the 10-year German bund or the 10-year Euribor swap rate.

Exhibit 2 shows two measures of interest rate sensitivity, effective duration and empirical duration, for US corporate bonds across the Moody's credit rating spectrum.[3] The investment-grade bonds are those rated Baa and above.[4] For all credit ratings, empirical duration is smaller than the theoretically based effective duration. The difference between effective and empirical duration is largest for the high-yield categories (bonds rated Ba, B, and Caa). Notably, Ba rated and B rated bonds have almost no empirical sensitivity to interest rate changes, and Caa rated bonds actually have *negative* empirical durations. This finding indicates that when risk-free interest rates fall (or rise), credit spreads on Caa rated bonds rise (or fall) by *more* than the magnitude of the change in interest rates.

Exhibit 2 Effective Duration and Empirical Duration by Rating Category

Source: Barclays Capital and Wellington Management.

Because investment-grade corporate bonds have meaningful interest rate sensitivity, investment-grade portfolio managers usually manage their portfolio durations and yield curve exposures closely. In contrast, high-yield portfolio managers are less likely to focus on interest rate and yield curve dynamics but rather focus on credit risk. It is important for high-yield investors to keep in mind, however, that when default losses are low and credit spreads are relatively tight, high-yield bonds tend to behave more like investment-grade bonds—that is, with greater interest rate sensitivity.

3 Effective duration for each rating category represents the average of Bloomberg Barclays' month-end values of "modified adjusted duration" from August 1997 through February 2016. Empirical duration for each rating category represents the regression of Bloomberg Barclays' monthly returns on changes in the US 10-year Treasury yield based on month-end data for the same period.

4 Technically, Baa3 is Moody's lowest investment-grade rating. Because of data availability, this exhibit uses broad rating categories.

Exhibit 3 shows the relationship between option-adjusted spread (OAS) levels and empirical duration derived from regression results of 20 years of US corporate bond data. A widely used measure of credit spread, OAS is discussed in more detail later in this reading. The exhibit demonstrates that corporate bonds with low credit spreads tend to have greater empirical duration. This relationship between credit spreads and empirical duration is consistent with the relationship between credit ratings and empirical duration previously seen in Exhibit 2. Highly rated bonds, which typically have lower credit spreads, have greater empirical duration.

Exhibit 3 Empirical Duration versus OAS

Source: Barclays Capital and Wellington Management.

Exhibit 4 shows the OAS of global investment-grade and high-yield bonds from 2001 through 2015, using the Bloomberg Barclays Global Aggregate–Corporate and Bloomberg Barclays Global High Yield indexes as representatives of these sectors.

Exhibit 4 History of OAS for Global Corporate Bonds, 2001–2015

Source: Barclays Capital.

As Exhibit 4 shows, since 2001 the average credit spread on investment-grade bonds has typically been below 200 bps and exceeded 400 bps only during the 2008–2009 global financial crisis. Individual investment-grade bonds may trade at spreads significantly wider than the average, but investment-grade bond spreads overall are almost always well below 400 bps.

Exhibit 4 also illustrates the earlier point that high-yield bonds, on average, have much wider spreads and greater volatility than investment-grade bonds. It is interesting to note that the average credit spread on the high-yield index was at or below 400 bps for the four years before the 2008–2009 global financial crisis. The low average credit spread of the four years reflected a strong economic environment that resulted in lower perceived risk among bond investors. During periods when spreads in the high-yield market approach those in the investment-grade market, high-yield investors ignore interest rate risk at their peril.

All investors in credit markets should remember that the observed relationships between interest rates and credit spreads are, by definition, *empirically* derived and not theoretical truths. During some periods, credit spreads have been positively correlated with interest rates. For example, on 22 May 2013, the Federal Reserve announced that it would begin to reduce its mortgage and Treasury bond purchase programs. This announcement began a period (often called the "Taper Tantrum") lasting about one month in which interest rates rose and credit spreads widened substantially. During this period, many credit securities exhibited empirical durations that were in *excess* of their theoretical durations.

2.4 Liquidity and Trading

Liquidity is defined as the ability to purchase or sell an asset quickly and easily at a price close to fair market value. The bid–ask (or bid–offer) spread is a frequently referenced measure of liquidity in the bond market. A smaller bid–ask spread indicates greater liquidity. An individual bond's liquidity tends to be positively correlated with both the bond's issue size and the size of the market in which the bond is traded. The investment-grade market is larger than the high-yield market, and the average

investment-grade issue size is larger than the average high-yield issue size. These two characteristics are important factors that help to explain why investment-grade issues are, on average, more liquid than high-yield issues.

Bond dealers are another factor in bond market liquidity. Liquidity tends to be positively correlated with inventory size: Bonds that are held in larger size in dealers' inventories are usually more liquid. For both regulatory and risk management reasons, dealers tend to hold larger inventories of bonds that are less volatile and that have higher credit ratings. As a result, dealers generally hold smaller inventories of high-yield bonds than of investment-grade bonds. This situation contributes to the relative illiquidity of high-yield bonds compared with investment-grade bonds.

The differences in liquidity between high yield and investment grade have implications for portfolio management. Bid–offer spreads are larger for high-yield bonds than for investment-grade bonds of similar maturity, and consequently turnover in high-yield bond portfolios is more costly than in investment-grade portfolios. Credit securities are traded mainly in over-the-counter markets, and it is typically challenging to buy and sell many outstanding bonds, even if they are constituents of major bond indexes. These transaction difficulties are particularly pronounced in the high-yield market: Many high-yield bonds do not trade frequently at all and can be very difficult to buy or sell. A high-yield portfolio manager who funds a new high-yield portfolio may not be able to buy the same bonds that are held in other portfolios and may need to locate substitutes. This lack of bond availability also arises at times in the investment-grade market, particularly in longer-term bonds.

How bonds are quoted differs between the investment-grade and high-yield markets. Investment-grade bonds are usually quoted as spreads over benchmark government bonds. This quoting convention essentially shows investment-grade bonds as risk-free bonds with credit spreads. High-yield bonds, which tend to behave more like equities than investment-grade bonds, are usually quoted in price terms. These different quoting practices reflect the relative sensitivity of investment-grade bonds to spread changes, as well as the relative importance of default losses for high-yield bonds.

EXAMPLE 1

Investment-Grade and High-Yield Bond Portfolios

Compared with an investment-grade bond portfolio manager, a high-yield bond portfolio manager will *most likely* put greater emphasis on:

A credit risk.

B spread risk.

C interest rate risk.

Solution:

A is correct. Credit risk is usually the most important consideration for high-yield portfolio managers because of the higher credit risk and credit loss rate in high-yield portfolios compared with investment-grade portfolios. For investment-grade portfolio managers, interest rate, spread, and credit migration (downgrade) risks are typically the most relevant considerations.

3 CREDIT SPREADS

In constructing credit portfolios, portfolio managers are often interested in separating their analysis of interest rate risk from their analysis of other risks such as credit spread risk, credit migration risk, default risk, and liquidity risk. These other risks are referred to as credit-related risks. In particular, portfolio managers find it useful to compare the portion of return and risk associated with assuming credit-related risks. This section focuses on credit spreads, including a discussion of some key measures of credit spread and a discussion of excess returns, which are the returns resulting from assuming credit-related risks.

3.1 Credit Spread Measures

Credit spread is perhaps the single most important measure that investors use in credit security selection. Credit spread measures provide a quick way to judge the return compensation that an investor will receive for assuming credit-related risks. As a key input in the selection and pricing of securities, a bond's credit spread is a function of several factors, including its likelihood of default, its probable loss given default, its credit migration risk, and its market liquidity risk. Credit spread measures also play an important role in the construction of credit portfolios and in investors' expectations of portfolio risk and return.

3.1.1 *Benchmark Spread and G-Spread*

A simple way to calculate a credit spread is to subtract the yield on a security with little or no credit risk (benchmark bond) from the yield on a credit security with a similar duration. This measure is called the **benchmark spread**. Typically, the benchmark bond is an on-the-run government bond. An on-the-run bond is defined as the most recently issued benchmark-size security of a particular maturity.[5]

A problem with benchmark spread is the potential maturity mismatch between the credit security and the benchmark bond. Unless the benchmark yield curve is perfectly flat, using different benchmark bonds will produce different measures of credit spread.

The G-spread is often used when the benchmark bond is a government bond. **G-spread** is the spread over an actual or interpolated government bond. When no government bond exists that has the same maturity as the credit security, a linear interpolation of the yields on two on-the-run government bonds is used as the benchmark rate. The yields of the two government bonds are usually weighted so that their weighted average duration matches the credit security's duration. Simplicity is a key advantage of the G-spread: It is easy to calculate and understand, and different investors usually calculate it the same way.

From a portfolio construction perspective, the G-spread is useful because the calculation indicates a way to hedge the credit securities' interest rate risk. An investor can hedge the interest rate risk of a credit security by selling the duration-weighted amounts of the two benchmark government bonds out of his portfolio (or by selling them short if they are not owned).

The G-spread is also useful for estimating yield and price changes for fixed-rate credit securities that do not have optionality. This feature is helpful because, as mentioned previously, many credit securities trade infrequently and lack regularly posted prices. For small changes in interest rates, the G-spread provides a good estimate of the likely yield change in a credit security. A change in the yield(s) of the benchmark

5 The issue size that an investor deems "benchmark size" varies by market and changes over time, and it may even differ among investors.

government bonds changes the interpolated yield. The change in the interpolated yield is assumed to represent the change in the yield on the credit security. The assumed change in the yield based on changes in the interpolated yield and the duration of the credit security can be used to estimate the credit security's new price.

EXAMPLE 2

Using G-Spread to Calculate Interest Rate Hedges and Price Changes

On 31 March 2016, a portfolio manager gathers information for the following bonds:

1. Citigroup 3.75% due 16 June 2024
2. US Treasury 1.5% due 31 March 2023 (on-the-run 7-year Treasury note)
3. US Treasury 1.625% due 15 February 2026 (on-the-run 10-year Treasury note)

Price, yield, and effective duration measures for the three bonds are as follows:

	Price	Yield	Effective Duration
Citigroup 3.75% due 16 June 2024	103.64	3.24%	7.0
US Treasury 1.5% due 31 March 2023	99.80	1.53%	6.7
US Treasury 1.625% due 15 February 2026	98.70	1.77%	9.1

Later, the portfolio manager observes that the 7-year Treasury note's yield falls from 1.53% to 1.43% while the 10-year Treasury note yield remains unchanged.

Based on the interest rate changes, what is the portfolio manager's estimate of the price change in the Citigroup bond?

Solution:

- A weighting of 87.5% = [(9.1 – 7.0)/(9.1 – 6.7)] of the 7-year Treasury note and 12.5% = [(7.0 – 6.7)/(9.1 – 6.7)] of the 10-year Treasury note matches the duration of 7.0 = [0.875(6.7) + 0.125(9.1)] of the Citigroup bond.
- The linearly interpolated yield from the two government bonds is 1.56% = [0.875(1.53%) + 0.125(1.77%)]. The linearly interpolated yield can also be calculated using duration, 1.56% = [(7.0 – 6.7)/(9.1 – 6.7) × (1.77% – 1.53%) + 1.53%].
- The G-spread on the Citigroup bond is 1.68% = 3.24% – 1.56%, or 168 bps, which is the difference between its yield and the interpolated yield.
- To hedge the Citigroup bond, the portfolio manager sells or sells short the 7-year Treasury note and the 10-year Treasury note, using weightings of 87.5% and 12.5%, respectively.
- The portfolio manager estimates the new yield on the interpolated Treasury to be 1.47% = [0.875(1.43%) + 0.125(1.77%)] or = [(7.0 – 6.7)/(9.1 – 6.7) × (1.77% – 1.43%) + 1.43%]. The interpolated Treasury yield has fallen by 0.09%, or 9 bps, from 1.56% to 1.47%. Therefore, she assumes that the yield of the Citigroup bond has fallen by 0.09% as well.

The portfolio manager estimates that the price on the Citigroup bond has risen from 103.64 to 104.29 = 103.64 × [1 + (7 × 0.09%)], representing an absolute increase of 0.65 or a percentage increase of 0.63%.

3.1.2 *I-Spread*

The **I-spread**, or interpolated spread, is a measure that is conceptually very similar to the G-spread. Instead of using yields on government bonds as benchmark rates, the I-spread normally uses swap rates that are denominated in the same currency as the credit security.

For a credit investor, a key advantage of using swap rates over yields on government bonds is that swap curves may be "smoother" (less disjointed) than government bond yield curves. Government bond yield curves are sometimes affected by supply and demand for specific government bonds, especially on-the-run issues. Exhibit 5 shows the relative smoothness in the US dollar swap curve (solid line), which is based on Libor, compared with the US Treasury yield curve (dotted line) on 13 April 2016.

Exhibit 5 US Treasury and Swap Yield Curves on 13 April 2016

Source: Bloomberg

Credit investors should keep two points in mind when evaluating the G-spread and the I-spread. First, a benchmark rate is usually most helpful when it represents a credit risk-free rate. If the market perceives credit risk in either a country's government bonds or its banks, then yields on government bonds or interbank rates do not necessarily provide a good representation of the risk-free rate.

Second, credit investors sometimes hedge interest rate exposure using benchmark bonds. If an investor calculates a bond's I-spread but uses government bonds to hedge his exposure, then his realized spread will likely differ from his calculated spread. For an investor who is hedging interest rate exposure, the choice of hedging instrument should correspond to the choice of spread measure used.

3.1.3 *Z-Spread and Option-Adjusted Spread*

Benchmark spread, the G-spread, and the I-spread are particularly useful for pricing and hedging credit securities, but investors generally use two other measures—Z--spread and option-adjusted spread—when they want to compare relative value across credit securities.

The **Z-spread**, or zero-volatility spread, is the yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. For bonds without embedded options, such as non-callable fixed-rate bonds, the Z-spread is a good measure of the bond's credit spread.

The **option-adjusted spread** (OAS) is a more generalized version of the Z-spread. The OAS is the constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price. For credit portfolio managers, OAS provides the spread measure that is most useful for comparing bonds with different features, such as embedded options.

The main shortcoming of OAS is that it depends on assumptions regarding future interest rate volatility. Also, a bond with an embedded option is unlikely to realize the spread implied by the bond's OAS; the realized spread will either be more or less than the OAS, depending on whether the option is actually exercised. For these reasons, OAS is a rather theoretical measure of credit spread. Despite these shortcomings, OAS is the most widely accepted measure of credit spread for comparing bonds with optionality and other features that generate uncertainty in the bonds' cash flows.

EXAMPLE 3

Using Credit Spread Measures

The Charter Communications 5.75% bond issue due 15 January 2024 has the following call schedule:

Callable on or after	At a Price of
15 July 2018	102.875
15 July 2019	101.917
15 July 2020	100.958
15 July 2021	100

On 11 April 2016, the bond issue is trading at a price of 104. Spread measures are as follows:

G-Spread	367
I-Spread	369
Z-Spread	371
OAS	297

Based on the information given, explain why the OAS differs from the other spreads, what the difference in spread implies, and why OAS is the best measure of relative value for the Charter Communications bond.

Solution:

Because the bond is trading significantly above the price at which it can be called, the probability of the bond being called on the next call date is reasonably high. A call option on a bond is effectively "sold" by the investor to the issuer. The issuer is likely to exercise the option only when the exercise is favorable for the issuer.

The bond's OAS of 297 bps is lower than its G-spread, I-spread, or Z-spread because of the call option on the bond. The difference between the OAS and the other spread measures implies that the value of the call option is about 70 bps.

The option-adjusted spread is the best measure of the value of the Charter Communications bond compared with the other spread measures because it reflects the value of the embedded option.

3.1.4 *Credit Spread Measures in a Portfolio Context*

Credit spread measures can also be considered in a portfolio context. Most diversified portfolios include bullet bonds (entire payment of principal occurs at maturity) and bonds with embedded options. It is challenging to apply the G-spread, I-spread, or Z-spread to a diversified portfolio of credit securities because none of these spread measures reflects optionality in relevant bonds. The most appropriate measure for a portfolio-level spread is the OAS. To calculate a portfolio OAS, each bond's OAS is weighted by its market value.

EXAMPLE 4

OAS of a Portfolio

A portfolio consists of investments in two bond issues, Bond A and Bond B. The following table shows relevant information on the bonds in this portfolio. Calculate the portfolio's OAS.

	Face Value (US$)	Price[a]	Accrued Interest[a]	OAS (bps)
Bond A	1 billion	95	1.5	125
Bond B	2 billion	97	2.0	150

[a] Price and accrued interest are per 100 of par value.

Solution:

Market value of investment in Bond A = \$1 billion × (0.95 + 0.015)
= \$965 million

Market value of investment in Bond B = \$2 billion × (0.97 + 0.02)
= \$1.980 billion

Portfolio market value = \$965 million + \$1.98 billion
= \$2.945 billion

Portfolio weight for Bond A = \$965 million/\$2.945 billion
= 32.8%

Portfolio weight for Bond B = \$1.980 billion/\$2.945 billion
= 67.2%

OAS of portfolio = (0.328 × 125 bps) + (0.672 × 150 bps) ≈ 142 bps

3.2 Excess Return

Credit investors often choose to evaluate and manage interest rate risk and credit-related risks separately. In addition to the credit spread measures discussed earlier, a useful tool for evaluating and managing credit-related risks is excess return. In the context of credit securities, excess return is the return of a bond after interest rate risk has been hedged.

Excess return can be thought of as the compensation that a bond investor receives for assuming credit-related risks. That is, excess return is the additional return that an investor receives for purchasing a credit security instead of a security with similar interest-rate sensitivity but with no credit risk.

When credit portfolio managers use excess return as a tool for security selection and portfolio construction, they typically manage the interest rate risk of their portfolios separately from their credit-related risks. This separation occurs because excess return does not, by definition, account for the return or risk from interest rate changes.

A bond's credit spread is related to its expected excess return. Credit spread is equal to excess return if there is no change in the security's yield or in interest rates, and if the security does not default during the holding period. Changes in credit spreads, however, usually cause a bond's excess returns to deviate from its spread.

Equation 1 approximates the excess return on a credit security:

$$\text{XR} \approx (s \times t) - (\Delta s \times \text{SD}) \quad (1)$$

where XR is the holding-period excess return, s is the spread at the beginning of the holding period, t is the holding period expressed in fractions of a year, Δs is the change in the credit spread during the holding period, and SD is the spread duration of the bond.

Equation 1 assumes no default losses. Default is a binary event—either it occurs or it does not—and this aspect means that it is difficult to represent *realized* excess return in Equation 1. The possibility of future default losses, however, can be incorporated into *expected* excess return (EXR), according to Equation 2:

$$\text{EXR} \approx (s \times t) - (\Delta s \times \text{SD}) - (t \times p \times L) \quad (2)$$

where p is the annualized expected probability of default and L is the expected loss severity. Note that the term $(p \times L)$ is the *expected annual credit loss.*

EXAMPLE 5

Calculating Excess Return

A corporate bond has a spread duration of five years and a credit spread of 2.75% (275 bps).

1. What is the approximate excess return if the bond is held for six months and the credit spread narrows 50 bps to 2.25%? Assume the spread duration remains at five years and that the bond does not experience default losses.
2. What is the instantaneous (holding period of zero) excess return if the spread rises to 3.25%?
3. Assume the bond has a 1% annualized expected probability of default and expected loss severity of 60% in the event of default. What is the expected excess return if the bond is held for six months and the credit spread is expected to fall to 2.25%?

Solution to 1:

Using Equation 1, the excess return on the bond is approximately 3.875% = (2.75% × 0.5) – [(2.25% – 2.75%) × 5].

Solution to 2:

Using Equation 1, the instantaneous excess return on the bond is approximately –2.5% = (2.75% × 0) – [(3.25% – 2.75%) × 5].

Solution to 3:

Using Equation 2, the expected excess return on the bond is approximately 3.575% = (2.75% × 0.5) – [(2.25% – 2.75%) × 5] – (0.5 × 1% × 60%).

4 CREDIT STRATEGY APPROACHES

Credit strategies normally establish return and risk parameters. A credit strategy is typically designed to achieve a constrained objective, such as "construct and manage a portfolio that maximizes return within a set of risk limits," or "construct and manage a portfolio that outperforms a given benchmark by x% using only investment-grade bonds." In most of the following discussion, assume that the investor's objective is to outperform a given benchmark, such as the Bloomberg Barclays US Credit Index, the Bloomberg Barclays Euro Corporate Index, or the BofA Merrill Lynch US High Yield Master II Index.

This section discusses two important credit strategy approaches. Each is an active management approach. Section 4.1 discusses the **bottom-up approach**, which involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features (usually the same industry and often the same country of domicile). Section 4.2 discusses the **top-down approach**, which involves the investor formulating a view on major macroeconomic trends, such as economic growth and corporate default rates, and then selecting the bonds that the investor expects to perform best in the expected environment.

4.1 The Bottom-Up Approach

The bottom-up approach to credit strategy is sometimes called a "security selection" strategy. The key feature of the bottom-up approach is the assessment of the relative value of individual issuers or bonds. This approach is most appropriate for analyzing companies that have comparable credit risk, as opposed to those companies whose credit risk varies considerably (for example, investment-grade and high-yield companies).

4.1.1 *Dividing the Credit Universe*

An investor's initial step in a bottom-up approach is establishing her universe of eligible bonds and then dividing the universe of eligible bonds into industry sectors, such as telecommunications and capital goods. The investor may divide each sector even further: For example, telecommunications companies may be segmented into wireless and wireline communications, or into Asian, European, and US companies. Within each sector, she can use relative value analysis to determine the bonds that are the most attractively valued.

An investor's typical starting point for identifying industry sectors is the sector classifications provided by the vendor of the benchmark. An astute investor, however, can add value by perceiving where these classifications are overly broad or incorrect.

For example, oil and gas pipeline companies, now called the "midstream" sector in Bloomberg Barclays bond indexes, were largely classified by Bloomberg Barclays as utilities until mid-2014. When oil and gas prices fell, the pipeline companies underperformed traditional utility companies substantially.

There is no clear rule about whether a benchmark classification is too broad or too fine, but the investor typically wants each sector to contain a set of companies for which she expects company-level risks, rather than industry or macro risks, to be the dominant factors. For example, the "global banking" sector may be too broad. Banks often have heterogeneous business models; they are subject to different regulatory regimes; and their credit quality is frequently tied to the prevailing economic environment in which they do business.

In a portfolio that is not managed against a benchmark, the investor will divide the universe into sectors without reference to benchmark classifications. The investor still must decide whether she will compare relative value across relatively broad or narrow sectors.

EXAMPLE 6

Dividing the Credit Universe

An investor is conducting a relative value analysis on bond issuers in the retail sector. He is trying to decide whether the global clothing retail sector is a sufficiently granular (narrowly defined) sector for his analysis. Through his research, he has determined the following:

- Large clothing retailers are diversified across Europe, Asia, and the Americas.
- Small clothing retailers tend to sell into only one of these three regions.
- Clothing retailing is a cyclical business, and the three regions differ substantially in their economic growth cycles.

Describe considerations that the investor may use in determining how to divide the retail sector.

Solution:

The investor typically wants each sector to contain a set of companies for which he expects company-level risks, rather than industry or macro risks, to be the dominant factors. Based on the investor's analysis, smaller clothing retailers differ meaningfully from larger retailers. Smaller retailers sell in only one region, whereas larger retailers sell in many regions globally.

The investor may want to divide the global retail clothing sector into larger and smaller companies. Larger clothing retailers may be reasonably viewed as a single sector, because they are diversified across the world. He may want to consider European, Asian, and American small retailers as three separate sectors, however, because their macroeconomic trends differ.

4.1.2 *Bottom-Up Relative Value Analysis*

Once the credit universe has been divided into sectors, the investor identifies the bonds with the "best" relative value within each sector. The key to relative value decisions in credit portfolio management is weighing the *compensation* for credit-related risks (that is, the expected excess return) against the expected *magnitude* of the credit-related risks. As a reminder, credit-related risks include credit spread risk, credit migration risk, default risk, and liquidity risk.

If the investor decides that two issuers have *similar* credit-related risks, then she will typically compare credit spread measures and buy bonds of the issuer with the higher spread because those bonds likely have a higher potential for excess returns. For issuers with *different* credit-related risk, the investor must decide whether the additional spread is sufficient compensation for the additional credit risk taken. Useful considerations in comparing issuers with different credit-related risks include the following:

- Historical default rate information based on credit rating categories can help the investor decide how much compensation is needed for additional default risk.
- Information on the average spread level for each sector and credit rating is also useful. For example, if the investor identifies a BBB rated pharmaceutical company whose bonds trade at wider credit spreads than the average spread on bonds of other BBB rated pharmaceutical companies, the investor may want to investigate further why the market is demanding additional compensation for the company's bonds. In a similar manner, an investor may want to analyze the spread difference between a BBB rated pharmaceutical company and an A rated pharmaceutical company.

Recall Equations 1 and 2, the equations for excess returns and expected excess returns, respectively. These two equations are useful in analyzing a bond's credit-related risk. Note that in Equation 1, credit spread, holding period, and spread duration can be determined by the investor; however, the change in credit spread is unknown in advance and the investor must form expectations for this variable. If credit spreads do not change during the holding period, the second term in Equation 1 is zero. This possibility is important to consider if the investor is deciding between bonds of similar maturity and plans to hold a bond to maturity. If an investor plans to hold a bond to maturity, the change in credit spread throughout the holding period is effectively zero. If the investor's holding period is shorter than the bond's maturity, or if the investor is comparing bonds with different maturities, then the expected change in the credit spread is an additional factor to consider.

In the case of unchanged spreads, credit relative value analysis is essentially about weighing the unknown prospect of default losses and/or credit ratings migration against the known compensation provided by credit spreads. If an investor examines two bonds and assigns a similar default loss expectation to each one, then he will generally prefer to buy the bond with the greater spread. When facing a choice between two bonds of similar spread, the investor will assess which bond he expects to have lower default losses. Bonds with larger risk of default loss will generally have greater credit spreads, because the spread provides compensation for the default risk.

Although a credit investor may select the securities on which her excess return expectations are the highest, the investor sometimes favors bonds for which her excess return expectations are lower. Liquidity, portfolio diversification, and risk are all important considerations in security selection decisions. For example, if two bonds differ significantly in their riskiness or liquidity, then the investor may prefer the lower-risk bond, even if she anticipates a lower excess return.

Another instance can arise if an investor is not hedging interest rate risk, or if he is not separating the management of interest rate and credit risk. In this case, the investor may choose to buy a bond based on his expectations of total return, rather than excess return, when comparing securities.

EXAMPLE 7

Using Expected Excess Return in Relative Value Analysis

An investor has gathered the following information on four bonds she is considering for purchase:

Bond	Spread Duration	Yield	Z-Spread (bps)	Credit Rating
W	2	3.5%	200	Baa2
X	5	4.0%	100	A2
Y	5	5.5%	225	Ba2
Z	5	6.5%	350	B2

She uses the following historical information on annual default rates to estimate the probability of default. She assumes a 40% recovery rate on any defaults (that is, a 60% expected loss severity).

Credit Rating	Average Annual Default Rates
A1	0.24%
A2	0.27%
A3	0.31%
Baa1	0.36%
Baa2	0.43%
Baa3	0.61%
Ba1	1.20%
Ba2	1.28%
Ba3	2.37%
B1	2.93%
B2	3.19%
B3	3.65%

The investor has a six-month holding period.

1. Based on expected excess return, determine which bond the investor is most likely to buy if she expects that spreads will remain unchanged.
2. If the investor expects that spreads will narrow by 50 bps during the holding period, determine which bond the investor is most likely to buy. If the choice of bond has changed from Question 1, explain why.
3. Explain why an investor considers factors other than expected excess return in relative value decisions.

Solution to 1:

The expected annual default probability for each of the four bonds based on their respective rating category is as follows:

Bond	Credit Rating	Annual Expected Probability of Default
W	Baa2	0.43%
X	A2	0.27%
Y	Ba2	1.28%
Z	B2	3.19%

Equation 2 is used to calculate the expected excess return for each bond. For Bond W, the expected excess return is 0.87% = (2% × 0.5) – (0 × 2) – (0.5 × 0.43% × 60%). The following table summarizes the relevant information for all four bonds:

Bond	Credit Rating	Annualized Expected Probability of Default (p)	Spread Duration (SD)	Z-Spread in bps (s)	Expected Loss Severity (L)	Expected Excess Return (EXR)
W	Baa2	0.43%	2	200	60%	**0.87%**
X	A2	0.27%	5	100	60%	**0.42%**
Y	Ba2	1.28%	5	225	60%	**0.74%**
Z	B2	3.19%	5	350	60%	**0.79%**

Based on the expected excess returns, the investor will most likely purchase Bond W. Despite having the lowest yield among the four bonds, Bond W has the highest expected excess return.

Solution to 2:

The expected excess return calculation now incorporates a change in the bonds' spreads. For Bond W, the expected excess return is 1.87% = (2% × 0.5) – (–0.5% × 2) – (0.5 × 0.43% × 60%). The following table summarizes the relevant information for all four bonds:

Bond	Credit Rating	Annualized Expected Probability of Default (p)	Spread Duration (SD)	Z-Spread in bps (s)	Expected Spread Change, in bps (Δs)	Expected Loss Severity (L)	Expected Excess Return (EXR)
W	Baa2	0.43%	2	200	–50	60%	1.87%
X	A2	0.27%	5	100	–50	60%	2.92%
Y	Ba2	1.28%	5	225	–50	60%	3.24%
Z	B2	3.19%	5	350	–50	60%	3.29%

Based on the expected excess returns, the investor will most likely purchase Bond Z. The choice of bond differs from the previous question because, as a result of Bond W's shorter spread duration, the spread narrowing had a smaller effect on it compared with the other bonds.

Solution to 3:

A credit investor may select the securities on which her excess return expectations are the highest, but other considerations, such as liquidity, portfolio diversification, and risk, also play a role. Bonds are chosen and managed in the context of an overall portfolio. Because bonds vary in their riskiness, liquidity, and correlation with other portfolio assets, an investor may prefer a bond with lower risk or greater liquidity, or a bond that provides better portfolio diversification, even if she anticipates a lower average return.

In Question 2, Bond Z was selected based on its superior expected excess return compared with the other three bonds. Bond Z, however, has a lower credit rating than the other bonds, implying higher credit risk and possibly lower liquidity than the other bonds. As a result, the investor may prefer Bond Y, which has a higher credit rating than Bond Z, even if she anticipates a slightly lower average return for Bond Y. She may even prefer Bond X, which has the highest credit rating, even though according to her analysis it has lower expected excess return than Bond Y or Bond Z.

4.1.3 *Spread Curves*

The key decision in relative value analysis within a specific sector is to identify the issuers that have the best relative value. The equation for expected excess return is useful because it provides a way to summarize and understand the tradeoff among spread, default loss, and spread changes.

Many issuers have several bond issues, each of which typically has a different maturity and duration. To reflect the various maturities, a **spread curve** can be developed for each issuer and may be useful in conducting relative value analysis. A spread curve is the fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Exhibit 6 plots the Z-spread versus the spread duration for bonds of two telecommunications companies, Verizon (VZ) and AT&T (T), on 4 December 2015.

Exhibit 6 Spread Curves, Verizon and AT&T

Source: Wellington Management

For a given duration, the spreads of the two issuers across the spread curves are very close: For most maturities, AT&T bonds have slightly wider spread than Verizon bonds. If an investor believes that both issuers' bonds have similar market liquidity, then he may believe that the market perceives AT&T's credit risk to be slightly higher than that of Verizon.

If the investor also believes that AT&T is actually more creditworthy than Verizon, he can take a variety of actions based on his relative value view. The actions depend on his portfolio's objective and constraints. If his objective is to outperform a benchmark, and he cannot use derivatives or take short positions, then he can maintain an *overweight* position in AT&T bonds and an *underweight* or *zero weight* in Verizon bonds relative to the benchmark. If his objective is to generate positive absolute returns, underweighting or avoiding Verizon bonds is not appropriate because these actions are meaningful only in the context of a benchmark. If permitted, he can express his relatively negative view on Verizon by purchasing default protection through credit default swaps (CDS), by buying put options, or by shorting Verizon bonds.

A few bonds of both AT&T and Verizon have spreads that are significantly above or below the fitted spread curves. An investor may view these bonds as potentially attractive, but he should investigate the bonds further before taking action. These bonds may have substantially different risk or liquidity characteristics compared with the other bonds because of differences in the bonds' features. Risk or liquidity differences may cause the spreads to vary considerably from their respective spread curves. For example, bonds could be issued by different subsidiaries or have different levels of seniority. It is important to understand each bond's structural features before concluding that the bond is attractive or unattractive based on spread alone.

4.1.4 *Other Considerations in Bottom-Up Relative Value Analysis*

In addition to analyzing excess returns and spread curves, other considerations in bottom-up relative-value analysis include the following:

- *Bond structure*. In performing relative value analysis, an investor must be careful to consider the features of the bonds and their priority in the capital structure. For example, subordinated debt normally offers more credit spread than senior debt. As another example, callable debt often has a larger option-adjusted spread than otherwise comparable non-callable debt.
- *Issuance date*. Bonds that have been recently issued by entities with frequent bond issues tend to have narrower bid–offer spreads and greater daily transaction volume. If an investor expects to have a short holding period, then she may prefer to transact in these more liquid "benchmark bonds." Benchmark bonds have some shortcomings, however. A benchmark issue often trades at a narrower credit spread and provides less compensation to an investor than "off-the-run" (existing older) issues of the same issuer. A benchmark issue may not remain highly liquid for its entire term; eventually the issuer may borrow again, and the newer bond may become the issuer's benchmark bond. Even if the issuer does not borrow again, the newly issued bond will age and may lose some liquidity. The investor should consider his holding period and need for liquidity in his choice to buy or avoid benchmark bonds.
- *Supply*. When an issuer announces a new corporate bond issue, the issuer's existing bonds often decline in value, and their spreads widen. This price decline and spread widening is often explained by market participants as an effect of increased supply. A related explanation for spread widening among existing bonds is that because demand is not perfectly elastic, new issues are often given a price concession to entice borrowers to buy the new bonds. This

price concession may result in all existing bonds of an issuer to reprice based on the relatively wider spread in the new issue. A third explanation is that more debt issuance may signal an increase in an issuer's credit risk.

- *Issue size*. Issue size and its effects on credit valuation can vary. Bonds with larger issue sizes may be more frequently traded and held by a greater number of market participants. These factors may increase the bonds' liquidity and value and reduce their spread compared with bonds having smaller issue size. The popularity of different fixed-income benchmarks may also interact with issue size to produce differing effects on bond valuations. Most traditional bond indexes are weighted by the amount of debt outstanding. This weighting methodology helps to create demand for large debt issuers, because some credit portfolio managers do not deviate too far from benchmark weights. However, larger issue sizes do not always lead to tighter spreads. In some cases, very large corporate issuers may find that their debt actually trades at a *wider* spread compared with the debt of comparably rated issuers. Investors should be aware that the relationship between issue size and spread is not always clear.

EXAMPLE 8

Using Spread Curves in Relative Value Analysis

At the end of 2016, an analyst is about to conduct a relative value analysis of the following bonds issued by a single company. All of these bonds are available in the market at the time he is conducting his analysis:

Bond	Coupon	Maturity	Time to Maturity (years)	Credit Ratings	Issue Size	Duration	Price	Yield	Credit Spread (bps)
A	2.40%	12/31/2018	2	A2/A	2,000,000,000	2.0	100	2.40%	40
B	3.50%	12/31/2021	5	A2/A	1,500,000,000	4.6	100	3.50%	50
C	8.00%	9/30/2022	5.7	Ba1/BB+	50,000,000	4.7	109.5	6.02%	299
D	5.00%	12/31/2046	30	A2/A	1,000,000,000	15.8	100	5.00%	100

1 Evaluate whether the analyst should include Bond C in the relative value analysis.

The company is issuing a new 10-year bond with the following features:

Bond	Coupon	Maturity	Time to Maturity (years)	Credit Ratings	Issue Size	Duration	Price	Yield	Credit Spread (bps)
E	4.00%	12/31/2026	10	A2/A	3,000,000,000	8.2	100	4.00%	80

2 Explain how the analyst may compare the relative value of the company's new issue with that of the outstanding bonds.

Solution to 1:

Bond C has a much higher spread than the company's other bonds. The analyst should try to identify the cause(s) of this difference before including Bond C in the relative value analysis. Bond C's higher coupon and lower credit rating suggest that it is riskier than the other bonds. Bond C may be subordinated in the company's capital structure. Bond C also has a much smaller issue size, indicating that the bond may be less liquid than the company's other bonds.

Relatively illiquid bonds often carry greater spreads to compensate investors for this disadvantage. Finally, Bond C's higher price means that the loss in the event of default is likely to be larger. To summarize, it is most likely unsuitable to include Bond C in the relative value analysis.

Solution to 2:

The company has no outstanding bonds maturing around 2026. The spread for a bond maturing in 2026 can be roughly interpolated, however, using issues already in the market. The spread should be somewhere between the spreads of Bonds B and D. Using the bonds' durations to interpolate, we find the interpolated spread to be approximately 66 = 50 + {[(8.2 – 4.6)/(15.8 – 4.6)] × (100 – 50)}. The new issue, with a spread of 80 bps, appears to be attractively valued in the context of the company's outstanding issues.

4.1.5 *Bottom-Up Portfolio Construction*

In bottom-up portfolio construction, the investor may identify a model portfolio with ideal position sizes according to both sector and individual bonds. The investor then buys the bonds that most closely represent the appropriate risk exposures in the model portfolio.

Because the investor divided the universe into sectors as part of a bottom-up approach, the weightings of these sectors provide a reasonable guide to position sizing. The simplest metric to use for sizing positions is *market value*. Therefore, within each sector allocation, the investor may choose to buy positions of equal market value. Alternatively, she may aim for larger positions in the bonds that she views as most attractively valued.

Another metric commonly used in sizing positions is *spread duration*, which we discussed in Section 2.

As an example of using spread duration, suppose a portfolio manager is considering two investment-grade bonds that he expects to have similar credit spread volatility. Bond A has 5 years of spread duration, and Bond B has 10 years of spread duration. He may consider a 2% portfolio-weighted position in Bond A to have nearly the same risk as a 1% portfolio-weighted holding in Bond B. That is, if he holds a 2% position in Bond A and a 1% position in Bond B, then a 1% (100-bp) increase in the credit spread of either bond will contribute about –0.10% to the portfolio's returns: 1% × 2% × –5 = 1% × 1% × –10 = –0.10%.

Bottom-Up Portfolio Construction

Suppose that one sector in an investor's benchmark consists of European retail companies. If the European retail sector constitutes 8% of the investor's benchmark based on market value, then she may target an 8% weighting in those European retailers that she has determined to be most attractively valued. If the portfolio has a market value of £50,000,000, then an 8% weighting will imply purchasing £4,000,000 worth of European retailers.

Now suppose that the portfolio's benchmark has a weighted-average spread duration of 4.0, and the European retailers in the benchmark have a weighted-average spread duration of 5.0. Then, measured by spread duration, the European retailers constitute 10% [(5.0 × 8%)/4.0] of the benchmark. Using this spread duration metric, the investor would target a 10% weighting in European retailers.

When deciding whether to use market value or spread duration as the portfolio sizing metric, a key factor is the relative importance of default loss risk versus credit spread risk. If default losses are a significant concern, then market value is a better measure of risk. If defaults are unlikely and spread change is the more relevant risk, then spread duration is usually a better measure. This distinction tends to relate back to the difference between investment-grade and high-yield bond portfolios: Spread duration is more commonly used for investment grade, and market value is more commonly used for high yield.

In determining the position sizes in a portfolio, a portfolio manager may strictly adhere to the sector weightings in the benchmark and the portfolio. Bottom-up portfolio managers often find in their relative value analysis, however, that some sectors seemingly have many attractively valued bonds whereas other sectors have fewer. Bottom-up portfolio managers sometimes buy more bonds or larger position sizes in the bonds of those sectors where opportunities are more abundant. Portfolio managers can therefore implement sector weightings that differ from the benchmark weights.

Because obtaining desired bonds can be challenging, investors typically use several alternatives to deal with this difficulty:

- *Substitution.* The second (or third, and so on) most attractively valued security in a sector may be a reasonable substitute for an investor's most preferred bond.
- *Indexing.* Constructing a portfolio to mirror the performance of a specified index is called **indexing**. Benchmark bonds, total return swaps on the benchmark index, credit default swap index derivatives, and exchange-traded funds are some relatively liquid instruments that investors use to obtain market exposure until desired bonds become available.
- *Cash.* If the investor expects that his desired bonds will soon be available, then holding cash as a substitute may be a useful option. Cash can negatively affect returns during longer periods, however, particularly among portfolios that focus on long-maturity bonds or high-yield debt.

4.2 The Top-Down Approach

The bottom-up approach to credit strategy focuses on individual bonds and issuers. By contrast, the top-down approach to credit strategy focuses on macro factors; that is, factors that affect most sectors and individual issuers and bonds. Macro factors that are important to credit investing primarily include the following: economic growth; overall corporate profitability; default rates; risk appetite; changes in expected market volatility; changes in credit spreads; interest rates; industry trends; and currency movements.

A portfolio manager using a top-down approach typically determines which sectors of the credit market have attractive relative value based on her view on macro factors. The portfolio manager then overweights those sectors by purchasing bonds in those sectors. In contrast, the manager underweights (or perhaps takes short positions in) bonds belonging to those sectors with a relatively unfavorable macro outlook.

An important distinction between the top-down and bottom-up approaches is that sector divisions used by a top-down investor are often broader than those used by a bottom-up investor. For example, a top-down investor who expects credit spreads to narrow may view high-yield bonds as having better relative value than investment-grade bonds. Grouping all investment-grade bonds together or all high-yield bonds together is not consistent with a bottom-up approach, but it is not unusual for a top-down approach.

4.2.1 *Credit Quality*

An important decision for many top-down credit investors is determining the desired credit quality of their portfolios. This decision is similar to an equity investor's choice of portfolio beta. An equity portfolio with a beta greater than one tends to outperform the market when stock prices rise and underperform when stock prices fall. Similarly, a credit portfolio that holds more low-quality bonds than a credit market benchmark will usually outperform the benchmark when credit spreads narrow and when default rates are lower or declining. Likewise, a higher-quality credit portfolio usually outperforms a market benchmark when credit spreads widen and when default rates are higher or rising.

Two key components of an investor's credit quality decision are expectations for the *credit cycle* and expectations for *credit spread changes*. Expectations for the credit cycle are reflected in variations of the default rate over time. Credit spread changes and the credit cycle are both heavily influenced by macro factors. Exhibit 7 shows global speculative-grade default rates (left axis) and the real GDP growth rate (right axis) in seven major economies—Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States—from 1976 through 2015. Real GDP growth is plotted on an inverted scale to better visualize the correlation between the two data series. The graph shows that sharp declines in growth often result in sizable increases in the default rate. By extension, the business cycle and the credit cycle seem to be correlated during certain periods, although not perfectly so.

Exhibit 7 Global Speculative-Grade Default Rate and Real GDP Growth Rate, 1976–2015

Sources: Moody's, OECD, and Haver Analytics.

A portfolio manager or analyst may decide to use the relationship between default rates and real GDP growth in his investment decision-making process; for example, he may have an above-consensus view on real GDP growth and conclude that defaults are likely to be lower than market expectations.

As Exhibit 7 demonstrates, default rates and real GDP growth are reasonably correlated. The correlation between default rates and credit spreads is even higher, as shown in Exhibit 8. The exhibit graphs the global speculative-grade default rate and

US high-yield spreads (measured by the OAS of the Bloomberg Barclays US High Yield Index) from 1995 through 2015. Exhibit 8 indicates that changes in credit spreads are usually a good predictor of changes in default rates one year ahead.

Exhibit 8 Global Speculative-Grade Default Rate and US High-Yield Spread, 1995–2015

Sources: Moody's and Bloomberg Barclays.

Exhibit 8 suggests that an investor seeking to outperform the market will likely need a forecast horizon longer than one year. If the investor has an above-consensus forecast of GDP growth extending beyond one year, he may conclude that credit spreads will narrow and may position his portfolio accordingly.

4.2.1.1 Measuring Credit Quality in a Top-Down Approach After determining the desired credit quality of their portfolio, portfolio managers find it useful to assess the credit quality of their portfolio. Portfolio managers commonly use one or more of the following approaches to assess the portfolio credit quality:

Average credit rating. Under this approach, a numerical weighting of each credit rating category is assigned, as in Exhibit 9. The choice of weighting methodology is an important decision. An issue with the use of arithmetic weighting is that many bond risks (notably default risk) do not change in a linear manner across credit rating categories. Default risk, for example, typically increases more quickly as an issuer's credit rating declines. The use of non-arithmetic weightings is a way to handle the non-linear relationship of bond risks.

Exhibit 9 Numerical Weighting Approach to Credit Ratings

Moody's	S&P	Fitch	Arithmetic Factor	Moody's Rating Factor
Aaa	AAA	AAA	1	1
Aa1	AA+	AA+	2	10
Aa2	AA	AA	3	20
Aa3	AA–	AA–	4	40
A1	A+	A+	5	70

(continued)

Exhibit 9 (Continued)

Moody's	S&P	Fitch	Arithmetic Factor	Moody's Rating Factor
A2	A	A	6	120
A3	A–	A–	7	180
Baa1	BBB+	BBB+	8	260
Baa2	BBB	BBB	9	360
Baa3	BBB–	BBB–	10	610
Ba1	BB+	BB+	11	940
Ba2	BB	BB	12	1,350
Ba3	BB–	BB–	13	1,766
B1	B+	B+	14	2,220
B2	B	B	15	2,720
B3	B–	B–	16	3,490
Caa1	CCC+	CCC+	17	4,770
Caa2	CCC	CCC	18	6,500
Caa3	CCC–	CCC–	19	8,070
Ca	CC	CC	20	10,000

Source: Wellington Management and Moody's.

An example comparing the measurement of a portfolio's average credit quality using arithmetic versus non-arithmetic weightings can show the effects of weighting choice. Using arithmetic weighting (the "arithmetic factor" column in Exhibit 9), a portfolio in which 50% of the bonds are rated A1/A+ and the other 50% are rated Ba3/BB– has an average credit quality score of 9 = (50% × 5) + (50% × 13). Referring to Exhibit 9, this score of 9 corresponds to an average credit rating of Baa2/BBB. Using a non-arithmetic weighting (the "Moody's Rating Factor" column in Exhibit 9), the portfolio's average credit quality score is 918 = (50% × 70) + (50% × 1,766). The score of 918 corresponds most closely to an average credit rating of Ba1/BB+. The average credit rating using non-arithmetic weightings is two levels (notches) below the rating using arithmetic weighting.

In summary, using arithmetic weighting to assess a portfolio's average credit quality is likely to overestimate its credit quality and underestimate its credit risk when the bonds in the portfolio span a broad range of the credit spectrum. Using non-arithmetic weighting, a portfolio consisting of bonds in the same rating category will have *less* credit risk than a portfolio with the same rating category on an arithmetically weighted basis. For example, a portfolio consisting of only Baa2/BBB bonds has a Moody's rating factor of 360, whereas a portfolio consisting equally of Baa1/BBB+ bonds and Baa3/BBB– bonds has a factor of 435 = (50% × 260) + (50% × 610).

Average OAS. A portfolio's credit quality can also be estimated using OAS. To calculate a portfolio's average OAS, each bond's individual OAS is weighted by its market value.

Average Spread Duration. Average OAS is a reasonable representation of portfolio credit quality, but it does not fully account for the risk of credit spread volatility. For example, a portfolio composed of 30-year corporate bonds with an average OAS of 100 will be more sensitive to changes in credit spreads compared with a portfolio of two-year bonds having the same average OAS. A weighted-average spread duration can account for the risk of credit spread volatility.

Duration Times Spread. Duration times spread (DTS) is a measure of credit quality that attempts to account for both average OAS and average spread duration. A bond's DTS is simply its duration multiplied by its OAS. By extension, a portfolio's DTS is a weighted average of the DTS of its individual bonds. DTS is more comprehensive than average OAS or average spread duration, but it is also somewhat less intuitive than either of those measures.

4.2.1.2 Excess Returns in a Top-Down Approach A portfolio manager using a top-down approach can apply her expectations for default losses and credit spread changes to compute the portfolio's expected excess return. To compute the approximate expected excess return, we refer back to Equation 2, repeated here:

$$\text{EXR} \approx (s \times t) - (\Delta s \times \text{SD}) - (t \times p \times L)$$

EXAMPLE 9

Top-Down Excess Returns

An investor has gathered information and formed expectations for four bond indexes. Each index contains bonds within a single, unique rating category.

Index Rating Category	Current OAS in bps (s)	Expected OAS in One Year, in bps	Expected Credit Loss Rate ($p \times L$)	Spread Duration (SD)
A	244	118	0.00%	5.6
Baa	334	206	0.04%	6.1
Ba	571	370	0.08%	4.4
B	736	510	0.31%	3.9

The investor has a one-year holding period. He intends to purchase bonds of a single rating category and is choosing among the categories represented by the four indexes. Based on expected excess return, determine which rating category the investor is most likely to choose. (Assume that the spread duration does not change during the one-year holding period.)

Solution:

The following table summarizes the approximate expected excess returns (EXR) for each of the four rating categories:

Rating	Excess Return (approximate)
A	$(0.0244 \times 1) - [(0.0118 - 0.0244) \times 5.6] - (1 \times 0) = 0.0950 \approx$ **9.5%**
Baa	$(0.0334 \times 1) - [(0.0206 - 0.0334) \times 6.1] - (1 \times 0.0004) = 0.1111 \approx$ **11.1%**
Ba	$(0.0571 \times 1) - [(0.0370 - 0.0571) \times 4.4] - (1 \times 0.0008) = 0.1447 \approx$ **14.5%**
B	$(0.0736 \times 1) - [(0.0510 - 0.0736) \times 3.9] - (1 \times 0.0031) = 0.1586 \approx$ **15.9%**

Based on the investor's expectations for default losses and credit spread changes, the Ba rated and B rated bonds are expected to outperform the more highly rated A and Baa bonds. Based only on expected excess return, the investor is most likely to choose B rated bonds. The investor must weigh these return expectations against the more volatile, less liquid nature of lower-quality bonds and construct a portfolio accordingly.

4.2.2 *Industry Sector Allocation*

Industry sector allocations (or weightings) are an important part of a top-down approach to credit strategy. A top-down approach to sector allocation is largely based on a portfolio manager's macro views. For example, an economic slowdown in China and other emerging markets caused a substantial decline in the price of oil and major industrial metals from 2013 through 2015, negatively affecting the bond valuations of producers of those commodities. As another example, default rates on US high-yield energy bonds increased substantially from 2% in 2014 to 20% in early 2016, resulting in spreads on these bonds as a group widening to more than 1,000 bps. A portfolio manager's decision to underweight oil or energy bonds in the early stage of these respective periods may have resulted in material outperformance versus a passive benchmark.

A portfolio manager may use quantitative tools, such as regression analysis, in making industry allocation decisions. For example, the average spread of the high-yield bonds in a particular industry sector could be regressed against the average spread of the investment-grade bonds in the same industry sector. As another example, the average spread of bonds within an individual industry sector and rating category could be compared with the average spread of the bonds that are in that same rating category but exclude the chosen industry sector. Exhibit 10 compares spreads of BB rated, US-dollar denominated media bonds in developed markets against the spreads of BB rated bonds (excluding the bonds in the media industry sector) for the period from 2011 through April 2016. The exhibit shows that in April 2016, the average spread of BB rated media bonds was approximately 60 bps tighter than the average spread of the BB rated bond universe (excluding media bonds). This level was the tightest in the five-year period shown.

Exhibit 10 Regression of Sector Spreads, 2011–2016

Source: Deutsche Bank.

A portfolio manager may use information on spreads in an industry sector and other considerations, such as her view on credit fundamentals, in deciding whether to take an overweight, underweight, or equal-weight position in an industry sector relative to its weighting in a benchmark. For example, the portfolio manager may interpret that tight relative spreads on media bonds reflect a market view that the credit quality of BB rated bonds in the media industry sector is superior to the credit

quality of the average BB rated bond. However, if the portfolio manager believes that the credit quality of media bonds is no better than that of other BB rated bonds, then she may choose to take an underweight or short position in media bonds compared with the weighting in a benchmark.

A portfolio manager may also use financial ratio analysis in industry sector allocation. For example, a manager could compare sector spreads and sector leverage, whereby leverage may be defined as total or net debt as a multiple of EBITDA (earnings before interest, taxes, depreciation, and amortization) for the sector as a whole. Generally speaking, higher leverage should imply higher credit risk and thus wider spreads. A portfolio manager could compare sectors on a spread-versus-leverage basis to identify relative value opportunities.

4.2.3 *Interest Rate Measurement and Management in a Top-Down Strategy*

Interest rate changes are an important factor in returns for investment-grade and, to a lesser extent, high-yield bonds. A portfolio manager who uses a bottom-up approach generally tries to mitigate the portfolio's exposure to interest rate movements. A portfolio manager who uses a top-down approach, however, may actively manage the portfolio based on expectations of future changes in interest rates and future interest rate volatility.

4.2.3.1 Measuring Interest Rate Exposure Interest rate exposure in a credit portfolio is typically monitored and managed using effective duration, which accounts for optionality in a portfolio's credit securities. If, for example, a portfolio manager expects that yields will decline by more than what the market is pricing, then he may position his portfolio so that its effective duration is greater than the benchmark duration (or greater than zero, for an absolute return portfolio). Conversely, he may position his portfolio so that its effective duration is less than the benchmark duration (or less than zero, for an absolute return portfolio) if he expects that yields will rise by more than what the market is pricing.

Effective duration provides a useful measure of a portfolio's exposure to parallel shifts in the yield curve, but it does not fully measure the risk of non-parallel yield curve shifts. To measure a portfolio's exposures to non-parallel yield curve changes, a portfolio manager uses *key rate durations* (that is, durations at key points along the yield curve). If, for example, a portfolio manager wishes to express a view that the yield curve will flatten—although not in a parallel manner— beyond what is priced into markets, she is likely to structure her portfolio to be more sensitive to changes in long-term interest rates and less sensitive to changes in short-term interest rates. The portfolio's key rate durations will likely exceed the benchmark's key rate durations in longer maturities (typically those greater than 5 to 10 years) and will be below the benchmark's key rate durations in shorter maturities.

A credit portfolio manager may also want to monitor the portfolio's exposure to interest rate volatility, particularly if the portfolio contains bonds with embedded options, such as callable corporate bonds or agency mortgage-backed securities. *Effective convexity*, which measures how much a bond or portfolio's duration changes as interest rates change, is commonly used by credit portfolio managers to manage exposure to interest rate volatility.

If a portfolio manager expects that interest rate volatility will be *high*, then the manager may structure the portfolio to have *greater* convexity than that of the benchmark. In this manner, the portfolio will benefit from interest rate shifts: The portfolio's duration will lengthen as rates fall and will shorten as rates rise. If the portfolio manager expects that interest rate volatility will be *low*, the manager may structure the portfolio to have *lower* convexity than the benchmark. The portfolio with lower

convexity than the benchmark will respond adversely to interest rate changes, although additional spread income from holding bonds with low (or negative) convexity may more than compensate for the assumed interest rate risk.

4.2.3.2 Managing Interest Rate Exposure Portfolio managers manage interest rate exposure in a portfolio using a variety of approaches.

Maturity management. The portfolio manager may select appropriate credit securities in order to obtain his targeted effective duration and key rate durations. The main advantage of this approach is that it can be accomplished without the use of derivatives. This approach has several disadvantages, however, including the following:

- Credit curve management and credit security selection decisions cannot be disentangled from duration and yield curve management. For example, it is impossible to buy long corporate bonds for their typically higher spreads without having exposure to long interest rates as well.
- Because desired corporate bonds are not available in all maturities, it may be difficult to match key rate durations closely. For example, a portfolio manager forming a new portfolio may find it expensive or nearly impossible to buy bonds other than those that are recently issued.
- A manager of an absolute return portfolio may want the portfolio to have low or zero interest rate exposure. This target is almost impossible to achieve without using derivatives, unless the portfolio consists exclusively of bonds with very short maturities or floating-rate notes.

Derivatives. A portfolio manager may buy the corporate bonds she finds most attractive on a spread basis and then use derivatives such as futures or interest rate swaps to manage the portfolio's effective duration and key rate durations.

The main advantages of this approach are that key rate durations can be controlled independently of credit spread curve exposures, and the liquidity of the interest rate derivatives markets allows exposures to be easily changed. The main disadvantage of this approach is that not all investors are willing or able to use derivatives. Using derivatives is particularly impractical for smaller portfolios.

Volatility Management. A portfolio's exposure to interest rate volatility can be managed with credit securities or with derivatives. To manage interest rate volatility with credit securities, a manager may use callable bonds or agency pass-through mortgages. To manage interest rate volatility with derivatives, options are often used.

4.2.4 *Country and Currency Exposure*

Credit portfolio managers may invest beyond their own country or in credit instruments denominated in other than their own currency. In doing so, portfolio managers can benefit from higher return potential but may also be subject to additional risk. Currency and/or country views are often implemented using a top-down approach, through the use of credit securities or derivatives.

If an investor believes that the interest rate differential between two countries will change, then he can buy credit securities in the currency in which he expects yields to fall and sell credit securities in the currency in which he expects yields to rise. Unless he can hedge currency risk, his portfolio will be exposed to currency fluctuations as well as changes in interest rates. An investor can also express a currency view and assume currency risk in his portfolio by purchasing bonds in a currency other than the benchmark currency (or by taking an overweight or underweight position in bonds issued in a particular currency if the portfolio benchmark contains multiple currencies).

It is more common for investors to use forwards and futures, rather than credit securities, to express country or currency views, or to manage currency exposures. These instruments are generally highly liquid and enable investors to manage currency risk separately from other portfolio exposures. For example, suppose that an investor believes that European corporate bonds will outperform Japanese corporate bonds on a currency-hedged basis, and she does not want to express a currency view. In a portfolio managed against a global bond benchmark, she may choose to overweight European corporate bonds and underweight Japanese corporate bonds. Because European corporate bonds are primarily issued in euros and Japanese corporate bonds are issued in yen, she may sell euros forward and buy yen forward to hedge her portfolio's unwanted currency exposure.

4.2.5 *Spread Curves in Top-Down Approach*

Spread curves can be constructed for a larger credit segment, such as an industry, currency, or index, in a top-down approach. There are a number of different possible views on spread curves that an investor using a top-down approach may wish to express in his portfolio. These include views that a particular credit spread curve will flatten or steepen, or that two spread curves will converge or diverge.

For example, in April 2016, an investor examines the relative value between (1) spreads of BB rated bonds with 10 years to maturity and (2) BB rated bonds with 3 years to maturity. Exhibit 11 shows the spread differences between these two BB rated segments from 2010 through April 2016. It should be noted that Exhibit 11 excludes the energy sector from both spread curves from 2014 through April 2016 as a way of reducing the effect of distressed valuation levels in the energy sector during this period. In April 2016, average spreads of 10-year BB rated bonds were around 100 bps wider than three-year BB rated bonds—approximately the widest level during the period shown. A portfolio manager may decide to use this information to overweight 10-year BB rated bonds or underweight 3-year BB rated bonds in his portfolio. It should be noted that the portfolio manager would need to consider the sector composition of the spread curves being evaluated, such as the case in Exhibit 11 whereby the energy sector was excluded for a component of the spread curve.

Exhibit 11 Spread Curve between 10-Year and 3-Year BB Bonds

Source: Deutsche Bank.

4.3 Comparing the Bottom-Up and Top-Down Approaches

Investors can construct a portfolio using a top-down approach, a bottom-up approach, or a combination of the two. Each approach has different advantages and disadvantages.

The main advantage of the bottom-up approach is that investors may find it easier to gain an informational advantage in individual companies or bonds rather than the overall market. In this regard, an investor can closely examine a small set of companies and seek to identify risks that the market may have overlooked. Because a sizable portion of credit returns can be attributed to macro factors, however, it can be difficult to earn substantial returns from bottom-up security selection without exposing the portfolio (intentionally or unintentionally) to macro factors, using leverage or taking short positions. If an investor views the most attractive bonds among issuers in a single industry or country, she may experience disappointing returns if that country's or industry's macro factors perform poorly relative to other countries or industries. Many investors are constrained from using leveraged credit strategies, and leverage itself obviously carries financial risk.

The main advantage of a top-down approach is that a sizable portion of credit returns can be attributed to macro factors. However, a top-down approach may be difficult to implement because expectations for interest rates, economic cycles, and other macro influences are closely examined by market participants and, in many cases, reasonably reflected in credit market prices. As a result, it can be difficult for an investor to gain an informational advantage in a top-down approach.

In practice, investors often combine top-down and bottom-up approaches. For example, an investor may begin with top-down portfolio decisions that focus on a particular industry and region, such as European financial sector bonds. Then he can restrict his bottom-up relative value analysis to bonds issued by European financial companies. Alternatively, an investor with a bottom-up focus may choose to monitor and manage the portfolio's exposure to major top-down factors, so that individual security selection will be the major driver of portfolio returns. For example, an investor who wants to focus on bottom-up analysis may strive to minimize her portfolio's exposure to changes in the credit cycle by keeping important portfolio risk statistics, such as credit quality, duration, and credit spread, equal to those of the investor's benchmark.

EXAMPLE 10

Choosing a Credit Strategy

A credit investor has conducted extensive research on the European chemicals and consumer staples industries. He is constructing a portfolio of bonds issued by companies in these industries. The investor seeks to outperform a benchmark consisting of bonds issued by European chemicals and consumer staples companies.

Evaluate whether a top-down or bottom-up approach is most appropriate for this investor.

Solution:

A bottom-up approach is more appropriate than a top-down approach for this investor. The key aspect of the bottom-up approach to credit strategy is assessing the relative value of individual bonds or issuers. The investor has conducted extensive research on companies within the industries. By contrast, a top-down approach first determines which sectors have attractive relative value and then selects bonds within those sectors. More broadly, a top-down approach involves taking views on macro factors.

4.4 ESG Considerations in Credit Portfolio Management

Some fixed-income mandates include a requirement that the portfolio consider environmental, social, and governance (ESG) factors in the investment process. ESG factors are particularly relevant to the credit component of fixed-income portfolio mandates. Credit portfolio management may incorporate ESG considerations in one or more of the following ways.

Relative value considerations. Companies and industries with poor ESG practices may have more credit risk for several reasons. Some examples are as follows:

- Major polluters risk environmental lawsuits and fines.
- Companies with poor labor practices may be vulnerable to frequent strikes or work stoppages, boycotts, or lawsuits. They may lose profitability if they are forced to adhere to strict labor regulations.
- Companies with weak board oversight (poor governance) may have a high risk of aggressive or outright fraudulent accounting.

Guideline constraints. Some portfolios' investment policy statements include prohibitions on purchasing bonds issued by entities that engage in certain activities. Examples include the following:

- Companies that derive a significant percentage of revenues (typically at least 5%–10%) from controversial products or activities, such as tobacco.
- Governments with weak human rights protections or other poor social records. Credit portfolios are a means for investors to express views on a government's ESG policies.

Portfolio-level risk measures. A credit portfolio manager may choose to incorporate ESG into the portfolio management process in several different ways:

- *Monitoring of exposures to ESG-related risk factors.* For example, a portfolio manager may limit or avoid exposure to the subprime lending industry because of business practices demonstrated by certain lenders. This exposure could include corporate debt issued by subprime lenders, asset-backed securities for which the collateral is subprime auto loans, and even counterparty exposure to banks that derive a significant percentage of revenue from subprime lending.
- *Targeting an average ESG portfolio score.* A portfolio manager may derive an issuer's ESG ratings (or scores) either internally or by using an external vendor that provides ESG ratings or scores. In this manner, a portfolio manager may consider constructing a portfolio with an average ESG rating that meets or exceeds a certain target. She may buy some bonds with lower ESG ratings if the bonds' other relative value characteristics are sufficiently attractive, and she may compensate by buying other bonds with high ESG ratings. The portfolio manager may also choose to avoid bonds issued by companies that do not meet a certain ESG rating.

Positive impact investing opportunities. ESG mandates are not restricted to just avoiding bonds with negative ESG-related factors. A portfolio manager can aim to invest a certain percentage of his portfolio in bonds of issuers that are generating a positive social or environmental impact. Green bonds are one of the most commonly cited examples of a positive impact bond. Green bonds fund projects that have positive benefits for the environment or climate. Bonds issued by not-for-profit hospitals and low-income housing projects are other types of bonds that may have a positive social impact.

5 LIQUIDITY RISK AND TAIL RISK IN CREDIT PORTFOLIOS

In this section, we discuss liquidity risk in credit markets and how investors can manage liquidity risk in practice. We also discuss tail risk in credit portfolios, including how such risk can be assessed and managed.

5.1 Liquidity Risk

Liquidity is an important consideration in credit investing. Compared with sovereign bonds in large developed markets (such as US Treasuries, German bunds, and Japanese government bonds), corporate bonds are relatively illiquid. Market data, including price data and data necessary to evaluate liquidity, are readily available for sovereign bonds in most major markets. By contrast, market data to evaluate corporate bond liquidity are more limited and less readily available. TRACE (Trade Reporting and Compliance Engine) is a commonly used system for US corporate bond investors but still has limitations in pricing consistency.

Concerns among credit investors about liquidity risk have increased subsequent to the 2008–2009 global financial crisis. The introduction of new regulatory constraints resulted in many broker/dealers substantially reducing their holdings (inventories) of corporate bonds. Because broker/dealer holdings of corporate bonds support trading in secondary markets, the reduction of holdings decreased liquidity in credit markets.

On the positive side, the growth of electronic trading platforms (ETPs) has potentially improved credit market liquidity. These platforms represent an attempt to shift the credit market from a dealer-dominated market to a more open, competitive market. The success of ETPs in shifting credit market dynamics remains to be seen, however.

5.1.1 *Measures of Secondary Market Liquidity in Credit*

Liquidity in secondary credit markets can be evaluated using a variety of measures, including trading volume, spread sensitivity to fund outflows, and bid–ask spreads.

In this section, US data, which are readily available, are used to evaluate liquidity. Data may be less available in other markets, which can affect liquidity risk for credit portfolios within those markets and for credit portfolios managed across international markets.

Trading Volume As broker/dealers have reduced their corporate bond holdings, trading volume in credit markets has declined subsequent to the 2008–2009 global financial crisis. Exhibit 12 shows trading volumes in the US high-yield and investment-grade corporate bond markets from 2006 through June 2016, expressed as a percentage of each market's size (total market value). The graph shows the average daily trading (on a 12-month trailing basis) for investment-grade and high-yield corporate bonds as a percentage of each market's total size. On average for 2015 in the US high-yield market, daily trading volume was 0.7% of the total size of the US high-yield market and the comparable proportion for the US investment-grade market was slightly more than 0.4%. In 2006, two years before the global financial crisis, the proportions were 1.2% in the US high-yield market and just under 1.0% in the US investment-grade market.

Exhibit 12 US High-Yield and Investment-Grade Trading Volume as a Percentage of Market Size, 2006–June 2016

Source: Deutsche Bank and TRACE.

US credit markets and US Treasury markets are often correlated, and trading volumes have also decreased in US Treasuries. Average daily trading volume relative to market size for US Treasuries was around 4% in 2015, down from around 13% in 2006. It is important for investors to properly understand the liquidity environment in credit markets, as well as its implications. Although many investors perceive high-yield liquidity as poor, as shown in Exhibit 12, the change in liquidity in US high yield has been relatively small compared with the higher-quality US investment-grade market.

Spread Sensitivity to Fund Outflows Another measure used to evaluate liquidity is spread sensitivity to large withdrawals by investors from credit funds. A large withdrawal is likely to require a fund to sell assets. In Exhibit 13, the graph shows the effect on US high-yield and investment-grade credit spreads following large withdrawals from US credit funds from 2004 through 2016. Spread sensitivity in this graph is measured as *spread widening*, in bps, divided by the *percentage outflow* from US high-yield and investment-grade funds. Percentage outflow, in turn, is defined as total US dollars withdrawn from high-yield or investment-grade funds, divided by the funds' assets under management (AUM). The high-yield scale is on the left-hand side of Exhibit 13, and the investment-grade scale is on the right. The magnitude of the scales indicates that for a given percentage outflow, there is typically a greater effect on high-yield prices and spreads than on investment-grade prices and spreads. In other words, the high-yield market appears less liquid than the investment-grade market based on this measure.

Exhibit 13 Spread Sensitivity to Fund Outflows

Source: Deutsche Bank and EPFR.

A key takeaway from Exhibit 13 is that spread sensitivity is not constant: It is affected by economic conditions. In both the high-yield and the investment-grade markets, the increase in spread relative to percentage outflow was greatest during the global financial crisis and in its immediate aftermath. Other financial "shocks" have also been shown to affect credit spreads.

Bid–Ask Spreads Bid–ask spreads can also be used to assess liquidity in credit markets. Exhibit 14 shows bid–ask spreads (12-week averages) for US high-yield and investment-grade markets from 2010 through 2016, measured in dollar price for high yield (left-hand side) and basis points of spread in investment grade (right-hand side). As we discussed in Section 2, quoting conventions differ between the investment-grade and high-yield markets: High-yield bonds are usually quoted in price terms, whereas investment-grade bonds are usually quoted as a spread over a benchmark government bond.

Exhibit 14 Secondary Market Bid–Ask Spreads in US High Yield and Investment Grade, 2010–2016

Source: Deutsche Bank and Thomson Reuters.

Generally speaking, bid–ask data should be analyzed cautiously because such information is stable only when markets, in turn, are stable. More-volatile market conditions often have a negative effect on bid–ask spreads. This effect is often temporary and suggests that bid–ask levels tend to stabilize after a brief period of volatility.

5.1.2 *Structural Industry Changes and Liquidity Risk*

The credit market experienced substantial structural changes following the 2008–2009 global financial crisis. Participants in the credit market depend on the dealer community to provide market liquidity in credit securities. Following the crisis, the cost of capital for dealers increased substantially, and the ability and willingness of dealers to maintain large bond positions on their balance sheets decreased significantly. These changes occurred for two reasons. First, new regulations (such as the Volcker Rule in the United States) restricted dealers' ability to take risk, hold inventories, and engage in some trading activities that may have helped to support credit market liquidity in the past. Second, dealers generally became more risk averse and opted to reduce risk and balance sheet size, even beyond what is required by regulators.

Not all structural changes in credit markets have reduced liquidity and therefore increased liquidity risk. Exhibit 15 shows the percentage of total US high-yield and investment-grade assets under management held in the 10 largest funds. Exhibit 15 shows that the concentration of US high-yield and investment-grade assets under management in the 10 largest funds decreased from 2007 through 2014. With AUM more widely dispersed among credit investors, the reduced concentration potentially increases liquidity in credit markets. That is, a larger number of independent market participants may result in differences in market views and varying interest in issuers and individual securities.

Exhibit 15 Top 10 Largest Funds, US High Yield and Investment Grade Credit, 2007–2014

Source: Deutsche Bank.

5.1.3 *Management of Liquidity Risk*

In an environment of decreased liquidity and increased liquidity risk, liquidity management has become increasingly important for credit portfolio managers. Ways to manage liquidity include holding cash; managing position sizes; holding liquid, non-benchmark bonds; and making use of credit default swap (CDS) index derivatives and exchange-traded funds (ETFs).

As the most liquid asset, cash is an important consideration in liquidity management among credit portfolio managers. In many cases, credit portfolio managers have increased the percentage of cash in their portfolios. Preceding the 2008–2009 global financial crisis, cash levels typically approximated 2% to 3% of credit portfolios. In many cases, cash levels increased following the crisis to as much as 5% to 7%.

Position sizes are selected in the context of liquidity. Typically, more-liquid credit securities are given greater portfolio weight, all else being equal. Holding greater weights of liquid credit securities and cash may decrease expected credit portfolio returns, but the liquid nature of these assets may be an increasingly important consideration among portfolio managers.

Liquid credit securities that are outside portfolio managers' benchmarks may also be used as cash surrogates. For example, a high-yield portfolio manager could use liquid investment-grade bonds as a cash surrogate, or an investment-grade investor could use Treasuries as a cash surrogate. Such positions typically provide some incremental yield over cash and can be liquidated relatively easily to raise cash for portfolio management needs.

Portfolio managers may manage liquidity risk using CDS index derivatives, such as CDX and iTraxx. The market for CDS derivatives is relatively more active than credit markets. For example, in 2015, the average daily trading volume in CDX indexes of US high-yield and US investment-grade bonds was US$7 billion and US$25 billion, respectively.[6] By comparison, in 2015, the average daily trading volume for US corporate bonds totalled US$8 billion in high yield and US$15 billion in investment

6 Source: The Depository Trust & Clearing Corporation (DTCC).

grade.[7] Put another way, the single CDX index for US high-yield bonds traded nearly as much as all US high-yield bonds in the "cash" bond market, and the CDX index for US investment-grade bonds traded significantly more than all US investment-grade bonds in the "cash" bond market.

Having grown substantially following the global financial crisis, ETFs offer another alternative for portfolio managers to manage liquidity risk. As of 31 March 2016, the total market value of high-yield and investment-grade credit ETFs was US$40 billion and US$90 billion, respectively, up from virtually zero prior to the financial crisis. Credit ETFs enable investors to more quickly obtain diversified exposure in the credit markets, although at the expense of reduced ability to actively select individual credit securities. One concern among some credit investors is that because ETFs are easy to trade, the funds may experience unusual market movements during periods of high credit volatility, and their prices may deviate from their net asset values.

5.2 Tail Risk

Tail risk is the risk that there are more actual events in the tail of a probability distribution than probability models would predict. As an example of tail risk, consider that during a 25-year period ending in August 2008, monthly total returns for the widely used Bloomberg Barclays US Corporate Index had a standard deviation of 2.1%. During the last four months of 2008, however, the monthly total returns of the Bloomberg Barclays Corporate Index were –7.8%, –6.4%, 4.1%, and 6.8%, sequentially. The absolute values of these monthly returns, respectively, were 3.7, 3.0, 2.0, and 3.2 standard deviations from the mean of the preceding 25-year period. With a normal distribution, it would have been almost impossible for a risk model based on historical returns to foresee the possibility of such a return pattern.

Tail risk events are difficult to model and virtually impossible to predict in advance. Such events do occur in credit markets, however, and often result in unexpectedly large negative and positive portfolio returns. It is important for credit investors to manage for the possibility of tail risk events.

5.2.1 *Assessing Tail Risk in Credit Portfolios*

Tail risk is, by definition, poorly measured by risk models that seek to extrapolate past behavior of securities prices to future returns. Tail risk assessment requires tools that allow for unusual patterns of returns.

5.2.1.1 Scenario Analysis A common tool for assessing tail risk in credit portfolios is **scenario analysis**, which is a risk assessment technique that examines portfolio performance under specific situations. The primary purpose of scenario analysis is to test the portfolio's performance under plausible but unusual circumstances. Scenario analysis in credit portfolios often involves projecting portfolio returns when there are large moves in corporate bond prices (because small price changes are not unusual) or large changes in spreads, and it may include scenarios based on actual historical or hypothetical events.

5.2.1.2 Historical and Hypothetical Scenario Analysis Past periods when securities prices demonstrated unusual behavior are good candidates for historical scenario analysis of tail risk. Examples include the prolonged default cycle in high-yield bonds from 2000 through 2002 and the 2008–2009 global financial crisis. Periods when defaults were concentrated in a sector, such as the telecommunication industry in the early 2000s or the housing sector in 2008, are also useful for historical scenario analysis.

7 Source: FINRA.

Because tail risk is ultimately the risk of extremely unusual events, one useful approach is envisioning events that have not occurred but might cause large moves in security prices. Hypothetical scenarios may include large moves in interest rates, exchange rates, credit spreads, or the price of oil or other commodities.

5.2.1.3 Correlations in Scenario Analysis Scenario analysis in credit often involves assessing potential changes in *correlations* between security prices. Such changes in correlations can be important because many portfolios depend on diversification as a source of risk management. During periods of financial crisis, correlations tend to move closer to 1.0.

When correlations increase significantly, a portfolio that had appeared well diversified may be subject to unexpected price movements. For example, during the 2008–2009 global financial crisis, defaults were widespread across the US residential real estate sector, and other sectors of the credit market also experienced significant losses. Returns for some sectors, such as commercial mortgage-backed securities, were 10 or more standard deviations from the mean monthly return that one could have estimated based on widely available historical data. As a result, many investors found that their portfolios were less diversified than their risk models had predicted.

As we have discussed, most credit securities are somewhat illiquid. During financial crises, securities that are somewhat illiquid can become even less liquid. Exposure to financial crises can therefore be assessed as a form of liquidity risk. Liquidity "tiers" or liquidity "scores" are tools credit investors use to measure portfolio exposure to this form of tail risk.

5.2.2 *Managing Tail Risk in Credit Portfolios*

Once an investor has identified potential tail risk events in his credit portfolio, she can attempt to manage these tail risks. Investors often use portfolio diversification and tail risk hedges to manage against tail risk events.

5.2.2.1 Portfolio Diversification A *portfolio diversification* strategy offers one way to protect against tail risk. For example, an investor's portfolio has a substantial overweight position in oil producers compared with its benchmark, and the investor is concerned that portfolio returns will suffer if oil prices fall substantially. A potential solution is to overweight positions in sectors that typically benefit from lower oil prices, such as airlines and consumer goods.

A key advantage of using a diversification strategy as a tail risk hedge is that the strategy may have only a modest incremental cost. If the investor in the preceding example believes that airlines and consumer goods are attractively valued sectors, adding overweight positions in these two sectors may improve his portfolio's risk characteristics and gain exposure to sectors in which he sees attractive value.

Portfolio diversification in tail risk management has potential limitations. An investor may find it difficult to identify attractively valued investment opportunities that can protect against every tail risk that the investor foresees. Also, the use of portfolio diversification as tail risk protection may not fully achieve an investor's objectives. Referring back to the oil price example, airlines and consumer goods companies may not have the same sensitivity to changes in oil prices that oil producers do. If oil prices fall, airlines and consumer goods may not provide the loss protection against declining oil prices that the investor expects.

5.2.2.2 Tail Risk Hedges A *tail risk hedge* strategy involves using securities or derivatives that act as "insurance" in tail event scenarios. The use of tail risk hedges gives an investor increased ability to manage the most concerning risks.

The most commonly used instruments in a tail risk hedge strategy are CDS and options. Consider again the example of a portfolio with an overweight allocation to oil producers. The investor may consider buying put options on oil futures contracts.

Alternatively, he may buy CDS or credit spread options on the bonds of the oil producers he finds least attractively valued. These choices allow the investor to specifically hedge against oil price movements or against default in oil producing issuers.

The primary drawback of tail risk hedging is that, like insurance, it typically has a cost and therefore lowers portfolio returns if the tail risk event does not occur. Not surprisingly, tail risk hedges tend to be most expensive when the tail risk event seems most likely to occur. Investors must therefore carefully consider the costs and benefits of tail risk protection. If the investor determines that the probability of an adverse event occurring is sufficiently high, he may be willing to pay for protection against that possibility—even if it does not improve the portfolio's expected return.

Investors who cannot use derivatives face an additional challenge in hedging tail risk. Derivatives are often the most inexpensive and capital-efficient tail risk hedges in the credit market, and those investors who cannot use derivatives may be unable to hedge certain tail risks.

INTERNATIONAL CREDIT PORTFOLIOS

6

Many credit portfolios include bonds issued in multiple countries and currencies, and as a result, credit portfolio managers often need to consider global implications in their portfolios. At the end of 2015, the Bloomberg Barclays Global Credit Index comprised more than 15,000 securities denominated in 14 currencies, with issuers domiciled in 114 countries.

Even portfolio managers who focus exclusively on bonds issued in a single country and denominated in that country's currency must be aware that international implications exist for those bonds. For many companies, particularly large ones, a sizable portion of their revenues come from outside their home countries. Also, many companies purchase or produce a significant portion of their products outside of their home countries. For example, US-based Apple Inc. generated more than 60% of its 2015 revenues outside the United States and had significant operations outside of the United States.

6.1 Relative Value in International Credit Portfolios

Credit portfolio managers can sometimes identify relative value opportunities when country or regional differences arise in credit cycles, credit quality and sector composition, or market factors.

Credit cycles typically affect the entire global credit universe, but to varying degrees across regions. For example, in 1997 and 1998, a high level of corporate defaults was largely confined to emerging markets; a few years later, in 2001 and 2002, corporate default levels were high in the United States and Europe but relatively low in emerging markets. Defaults during the 2008–2009 global financial crisis were concentrated in US credit markets, but a few years later, Europe experienced elevated default levels amid a sovereign debt crisis. In general, determining the timing and location of credit cycle weakening is an important top-down relative value consideration for global credit portfolio managers.

The credit quality of issuers typically differs by region. For example, European high-yield indexes have a higher concentration of BB rated bonds, whereas US high-yield indexes have a higher concentration of CCC rated bonds. Given this regional difference in ratings, investors may expect that in a bullish market environment, the US high-yield market will outperform the European high-yield market.

Sector composition also differs by region. For example, the energy industry has a higher representation in US credit market indexes than in European credit market indexes (both in investment grade and high yield). This difference in sector composition contributed to the outperformance of European credit markets relative to US markets during 2014 and 2015, when oil prices sharply declined.

Market factors, including both supply and demand factors, often vary globally with respect to corporate bonds. For example, in the United States, new issuance of investment-grade corporate bonds reached an all-time high in 2015. This high supply of corporate bonds in the US market partly contributed to the underperformance of the US investment-grade credit market compared with other global credit markets (where corporate bond issuance was not as strong) during 2015. Demand for corporate bonds may differ because of the composition of investor type. Some investors (such as pension funds) often prefer, or are mandated by law, to invest in their own country's assets or markets. Demand may also differ as a result of investor preferences. For example, the negative interest rate climate in Europe during 2015 and early 2016 resulted in many investors favoring European credit securities over sovereign bonds for better yield opportunities in the region. This increase in European credit investment resulted in significant valuation differences compared with US credit markets.

Exhibit 16 provides evidence of the valuation difference between the US and European (designated as "EU") high-yield credit markets from 2011 through 2016. The graphs in the exhibit show the average monthly spread difference (in basis points) between the US and European high-yield health care sectors and between the US and European high-yield automotive markets, based on Deutsche Bank indexes. The credit spread levels of these two industry sectors are reasonably aligned from 2013 through 2015 but sometimes demonstrate significant valuation differences (in both directions) when market dynamics vary widely in the US and European credit markets. These valuation differences could reflect varying macro trends, sector credit quality, and investor flows across regions.

Exhibit 16 Sector Spread Differences in US and European High Yield, 2010–2016

Panel A

Exhibit 16 (Continued)

Panel B

Source: Deutsche Bank.

6.2 Emerging Markets Credit

The growth of the emerging market credit universe has created additional investment opportunities for credit investors. According to Deutsche Bank indexes, from 2005 to 2015, the size of the emerging market corporate bond universe increased from US$210 billion to US$1.25 trillion. As of 2015, the size of the emerging market corporate bond universe was approximately the size of the US high-yield credit market.

Several differences exist between credit markets in emerging market countries and credit markets in developed countries, including the following:

- *Concentration in commodities and banking*. Commodity producers and banks represent a much higher proportion of emerging market indexes than of developed market indexes. Because loan portfolios of emerging market banks are often highly exposed to the commodity sector, the effect of commodities, either directly or indirectly, on emerging markets can be even more pronounced.
- *Government ownership*. Many emerging market bond issuers are government owned or have a controlling or partial stake owned by their local government. When a government owns or controls a company, a primary advantage for credit investors is the potential for explicit or implicit support in the event of a perilous financial situation for the company. A primary disadvantage for credit investors is uncertainty in the contractual rights and interests of non-domestic bondholders as part of a debt restructuring. Historically, recovery rates for emerging market bonds in default, on average, are lower than in developed markets. Moody's estimates that between 1982 and 2013, the average recovery rate for senior unsecured bonds issued by Latin American companies was 34%, compared with 42% for senior unsecured bonds issued by US companies.
- *Credit quality*. Compared with that of developed markets, the emerging market credit universe has a high concentration in both the lower portion of the investment-grade rating spectrum and the upper portion of high yield. This concentration of credit ratings largely reflects the sovereign ratings of emerging markets. Rating agencies typically apply a "sovereign ceiling" to corporate issuers globally, implying that (with few exceptions) a company is normally rated no higher than the sovereign credit rating of its domicile.

6.3 Global Liquidity Considerations

Liquidity has important implications for global credit portfolios. All credit markets tend to have liquidity issues, but the level of illiquidity varies across countries and regions. The US credit market is one of the most liquid, reflecting its market value; number of issuers, dealers, and investors; and size and frequency of new bond issuance compared with the credit markets in most other countries and regions. In addition, trade reporting systems such as TRACE in the United States, which provides transparency of information, are virtually non-existent elsewhere in the world. In contrast to the United States, liquidity conditions in emerging markets tend to be particularly constrained. In emerging markets, a relatively small number of bonds trade regularly, which typically results in investors demanding higher premiums for holding emerging market credit securities. In general, credit portfolio managers need to recognize global illiquidity issues when seeking to expand their portfolios to global credit markets, including effects on valuation.

6.4 Currency Risk in Global Credit Portfolios

Non-domestic currency movements represent a major risk of investing in global credit markets. Currency risk can be particularly relevant when interest rates are very low. If investment-grade credit returns in the local currency are modest, a non-domestic credit investor's expected return can easily be erased by currency movements. A practical way of dealing with currency risk in credit portfolios is to hedge foreign exchange exposures. Global credit portfolio managers often use currency swaps to hedge foreign exchange exposures, if such swaps are available and cost-effective. Pegged (or tightly managed) currencies, such as the Chinese yuan and the Hong Kong dollar, can provide geographical diversification while limiting foreign exchange volatility and the need for hedging.

6.5 Legal Risk

Global differences in regulations and laws, such as bankruptcy laws, are an additional source of risk for international credit portfolio managers. Nearly all countries have complex bankruptcy laws, and investors who lack a full understanding of these laws could face a lower-than-expected recovery rate in the event of a corporate bond default. Credit investors face a single federal bankruptcy law in the United States, but the situation differs in regions such as the European Union, where each country has its own unique bankruptcy laws. In some less developed markets, creditors must sometimes face legal systems that are influenced by government officials and equity holders.

7 STRUCTURED FINANCIAL INSTRUMENTS

Structured financial instruments are securities that are supported (backed) by collateral, or pools of assets, and in turn repackage risks. Common types of structured financial instruments include mortgage-backed securities (MBS), asset-backed securities (ABS), collateralized debt obligations (CDOs), and covered bonds. The terminology regarding structured financial instruments varies by jurisdiction. Notably, MBS are a form of ABS that represent rights to receive cash flows from portfolios of mortgage loans. The distinction between MBS and other types of ABS is common in the United States.

Investors can benefit from using structured financial instruments in credit portfolios. One such benefit for investors is the potential for higher portfolio returns compared with traditional fixed-income securities. Many structured financial instruments are

divided into multiple tranches with different risk and return profiles (and accompanying different credit ratings). Under this structure, a risk-averse investor may elect to purchase a senior tranche that provides lower potential risk and return, whereas a risk-tolerant investor may elect to purchase a mezzanine tranche with higher potential risk and return. Another benefit for investors who use structured financial instruments is the potential for relative value opportunities. Such opportunities may exist because corporate credit securities and structured financial instruments often differ in their features, valuation, and risk exposures. If an investor wants exposure to a specific market or macroeconomic factor such as real estate, interest rate volatility, or consumer credit, the structured finance market provides investment opportunities that may be more difficult to implement through corporate credit.

Another benefit of using structured financial instruments is improved portfolio diversification. As an example, during the 10-year period from 2006 through 2015, the Bloomberg Barclays Global Corporate Index had an annualized total return of 4.3% with an annualized standard deviation (volatility) of 7.0%. A portfolio that invested 75% of its assets in the Bloomberg Barclays Global Corporate Index and 25% in the Bloomberg Barclays Global Securitized Index would have had almost identical returns, but volatility would have been almost 1% (or 100 bps) lower per year. The types of collateral pools that can support structured finance securities are quite heterogeneous and may have very different fundamental drivers of value than corporate or government bonds.

Because the US structured finance market is the largest in the world, the discussion and examples in this section often refer to the United States. However, many non-US investors hold US structured financial instruments in their portfolios, notably MBS.

7.1 Mortgage-Backed Securities

MBS, in particular residential MBS (RMBS), constitute a significant portion of the structured finance sector. In addition to the potential for portfolio diversification, MBS may provide other advantages relative to corporate bonds:

1. *Liquidity*. Agency RMBS, which are securities backed by a US government agency (Ginnie Mae, or the Government National Mortgage Association) or by either of the US government-sponsored enterprises Fannie Mae (the Federal National Mortgage Association) or Freddie Mac (the Federal Home Loan Mortgage Corporation), are often an attractive alternative to corporate bonds. Agency RMBS may provide similar returns and better liquidity than high-quality corporate bonds. The US agency mortgage market is one of the most liquid credit markets in the world. According to a 2014 Federal Reserve study, average trading volumes in the most liquid US agency mortgages were between $10 billion and $80 billion per day in the preceding two years, similar to volumes in the US Treasury market and many times the average trading volume of the 100 most liquid US corporate bonds ($15 million to $40 million).[8]
2. *Exposure to real estate*. MBS can be used to more directly express investment views on real estate markets, in both residential properties (through RMBS) and commercial properties (through commercial MBS, or CMBS), compared with corporate bonds. Although corporate bonds issued by certain types of

8 https://www.federalreserve.gov/econresdata/notes/feds-notes/2014/measuring-agency-mbs-market-liquidity-with-transaction-data-20140131.html. US Treasury volume was measured as daily interdealer nominal trading volume of on-the-run 10-year US Treasury bonds. Agency MBS volume was measured as daily averages of trading volume of 3.0%, 3.5%, and 4.0% coupon, 30-year, To-Be-Announced MBS issued by Fannie Mae. US Corporate volume was measured as daily trading volume per bond of 100 of the most frequently traded investment-grade bonds.

companies such as property developers, real estate investment trusts (REITs), and certain banks may offer exposure to real estate, MBS can be used to express targeted or levered investment views on the real estate sector.

3 *Exposure to expected changes in interest rate volatility*. Agency MBS have low default risk because their interest and principal payments are guaranteed by either a US government agency or a US government-sponsored enterprise. A primary risk of agency MBS is prepayment risk, which is the uncertainty that the timing of the actual cash flows from the MBS will differ from and occur earlier than the scheduled cash flows as a result of interest rate decreases. Agency MBS are also subject to extension risk, which is the uncertainty that the timing of the actual cash flows will differ from and occur *later* than the scheduled cash flows because of interest rate *increases*. The performance of agency MBS is thus closely linked to expectations for interest rate volatility. If an investor wants to express a view that market expectations of interest rate volatility will decrease, she can buy agency MBS in her portfolio. Corporate bonds with optionality also have meaningful sensitivity to expectations of changes in interest rate volatility, but they typically have less liquidity and more default risk than agency MBS.

MBS are a useful tool for investing based on views of the credit cycle and the real estate cycle. These cycles can behave differently in response to economic conditions. For example, partly in response to concerns about global growth and falling commodity prices, corporate bond spreads widened from July 2014 through the end of 2015. During the same period, US commercial real estate prices stayed relatively stable, and securitized assets such as CMBS backed by US-based properties performed relatively well. Exhibit 17 displays the price behavior during this period, illustrated by OAS for both US CMBS and US corporate bonds from 2013 through 2015. As the exhibit shows, CMBS spreads were significantly more stable than corporate spreads during this period. An investor who recognized the divergent fundamental trends in the corporate and commercial real estate markets in 2013 or early 2014 could have improved portfolio returns and lowered portfolio volatility by selling (or underweighting) US corporate bonds and buying (or overweighting) US CMBS.

Exhibit 17 US CMBS and US Corporate Bond OAS, 2013–2015

Source: Barclays Capital.

7.2 Asset-Backed Securities

Several types of non-mortgage assets are used as collateral for ABS, including automobile loans, automobile lease receivables, credit card receivables, student (or other personal) loans, bank loans, and accounts receivable.

In addition to possible portfolio diversification and return benefits, ABS may provide a way for investors to express views on consumer credit. At the end of 2015, the credit card and auto loan components of the Bloomberg Barclays US Aggregate Index together had a market value of more than $97 billion, and the Consumer Cyclical Services sector of the index had a market value of about $51 billion. ABS are more-liquid alternatives to corporate bonds for expressing views on some sectors.

7.3 Collateralized Debt Obligations

A collateralized debt obligation is a security backed by a diversified pool of one or more debt obligations. Nearly all CDOs include some form of subordination, also referred to as credit tranching. With subordination, a CDO has more than one bond class or tranche, such as senior bond classes, mezzanine bond classes (bond classes with credit ratings between senior and subordinated bond classes), and subordinated bond classes (often referred to as the residual or equity tranches).

The collateral for a CDO is usually corporate loans or bonds. As a result, CDOs do not provide much diversification benefit compared with corporate bonds, and they do not offer unique exposure to a sector or market factor. There are potential benefits to including CDOs in a credit portfolio, however.

1. *Relative Value.* The valuation of CDOs may vary from the valuation of their underlying collateral. For example, during the global financial crisis, many CDOs were trading at prices well below theoretical levels based purely on the default rate expectations priced into the underlying collateral. All collateralized loan obligations (CLOs)—which are CDOs collateralized by leveraged loans—rated AAA and AA by Standard and Poor's withstood the crisis without experiencing a default or loss of principal. Yet during certain times in this period, spreads of AAA– and AA rated CLOs were comparable to the spreads of high-yield corporate bonds. An investor with a sufficiently long holding period could have taken advantage of this opportunity by selling (or selling short or buying credit default swaps on) investment-grade-rated corporate bonds and purchasing CLO tranches with more spread than the corporate bonds he sold. As the CLOs recovered in price or matured without experiencing default losses, his portfolio would likely have profited.
2. *Exposure to Default Correlations.* The correlation of expected defaults on the collateral of a CDO affects the relative value between the senior and subordinated tranches of the CDO: As correlations increase, the value of mezzanine tranches usually *increases* relative to the value of senior and equity tranches.

   To understand this phenomenon, consider a CDO consisting of a senior tranche, Class A, and a subordinated tranche, Class B, each with issue size of ¥10 billion. Suppose that the collateral pool contains two loans, each of which is also ¥10 billion. Finally, assume that in the event of default, either loan would have zero recovery value.

   If the correlation of expected defaults between these two loans is –1, then one loan will default and the other will not. In this scenario, the subordinated tranche has little value (it may receive a few interest payments but will lose all principal). The senior tranche, however, will receive the entire principal and

thus has much more value. If an investor expects the default correlation to be substantially negative, she can try to profit by selling (or selling short) Class B, the subordinated tranche, and buying Class A, the senior tranche.

On the other hand, if the default correlation between the loans is one, then either both loans will default, or neither will default. In this case, the senior and subordinated tranches have the same chance of receiving their principal. If the junior tranche pays a higher interest rate than the senior tranche, then it may in fact be *more* valuable than the senior tranche. If the investor expects the correlation to be highly positive, she can try to profit by selling (or selling short) Class A and buying Class B.

Although the complexity of the mathematics increases for both less-than-perfect correlations and the addition of credit tranches in a CDO's structure, the basic point remains. The market prices of CDOs are based in part on investors' expectations of credit default correlations, and investors can use CDO tranches to express such views.

3 *Leveraged Exposure to Credit.* Mezzanine and equity tranches of CDOs provide a mechanism for investors to gain additional return if the underlying collateral has strong returns. Conversely, these tranches also face heightened risk of losses in an adverse credit environment. This risk–return trade-off of mezzanine and equity tranches of CDOs thus essentially provide leveraged exposure to the underlying collateral.

7.4 Covered Bonds

Covered bonds constitute another class of structured financial instruments. A covered bond is a debt obligation issued by a financial institution, usually a bank, and backed by a segregated pool of assets called a "cover pool." In the event of default, bondholders have recourse against both the financial institution and the assets in the cover pool. Because of this dual protection for creditors, covered bonds usually carry lower credit risks and offer lower yields than otherwise similar corporate bonds or ABS.

Investors typically view covered bonds as a lower-risk alternative to financial sector bonds. An investor who wants to reduce his portfolio's risk to the financial sector may sell corporate debt issued by banks and buy covered bonds instead. The most common type of covered bonds are Pfandbriefe,[9] which are issued by German banks. The Pfandbrief bond market is the biggest segment of the euro-denominated private bond market in Europe.[10]

EXAMPLE 11

Structured Financial Instruments

Describe how an investor may benefit from adding structured financial instruments to a credit portfolio.

Solution:

In credit portfolios, structured financial instruments may provide several benefits when added to a credit portfolio. One potential benefit is the possibility of higher portfolio returns of structured financial instruments compared with corporate credit securities; potential relative value opportunities may exist for

9 Pfandbriefe is the plural form. One such bond is called a Pfandbrief.
10 "Pfandbrief-Style Products in Europe," Orazio Mastroeni, European Central Bank.

structured financial instruments because of different features, valuation, and risk exposures compared with corporate credit securities. Another benefit of structured financial instruments is the possibility of more-targeted exposure to a certain market or sector. For example, if an investor wants exposure to the real estate sector, structured financial instruments provide investment opportunities that may be more difficult to implement through corporate credit. Finally, structured financial instruments improve the diversification to a credit portfolio.

SUMMARY

This reading covers strategies and risk considerations in the construction and management of credit portfolios. Key points include the following:

- Credit risk is usually the most important consideration for high-yield portfolio managers. For investment-grade portfolio managers, interest rate risk, spread risk, and credit migration (or credit downgrade) risk are typically the most relevant considerations.
- The risk in a portfolio of investment-grade bonds is typically measured in terms of spread duration.
- Credit spreads tend to be negatively correlated with risk-free interest rates.
- When default losses are low and credit spreads are relatively tight, high-yield bonds tend to behave more like investment-grade bonds; that is, with greater interest rate sensitivity.
- High-yield bonds tend to be less liquid than investment-grade bonds because of higher return volatility in the high-yield bond market; smaller inventories of high-yield bonds than of investment-grade bonds held by broker/dealers; and smaller size of the high-yield market compared with the investment-grade market.
- Reflecting differences in liquidity between high-yield and investment-grade bonds, bid–offer spreads are larger for high-yield bonds.
- Credit spread measures include spread over the benchmark, the G-spread, the I-spread, the Z-spread, and option-adjusted spread. Each measure has advantages and disadvantages in use.
- Excess return is the compensation that a bond investor receives for assuming credit risk. When considering excess return, credit portfolio managers typically manage interest rate risk separately.
- A bottom-up approach to credit strategy involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar characteristics (usually the same industry and often the same country of domicile).
- A spread curve is the fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds. A spread curve may be useful in conducting bottom-up relative value analysis.
- A top-down approach to credit strategy involves the investor formulating a view on major macroeconomic trends, such as economic growth and corporate default rates, and then selecting the bonds that she expects to perform best in the expected environment.

- Top-down portfolio managers commonly use several measures to gauge the credit quality of their portfolios: (1) average credit quality; (2) average OAS; (3) average spread duration; (4) duration multiplied by spread.
- In practice, investors often employ a combination of a top-down and bottom-up approach to credit strategy.
- Some fixed-income mandates include a requirement that the portfolio consider environmental, social, and governance factors in the investment process. ESG factors are particularly relevant to the credit component of fixed-income portfolio mandates.
- Liquidity risk is prominent in the credit markets, particularly following the global financial crisis. Measures of secondary market liquidity include trading volume, spread sensitivity to fund outflows, and bid–ask spreads.
- Liquidity management tools used by credit portfolio managers include cash, position sizing, credit default swap index derivatives, exchange-traded funds, and liquid bonds outside the benchmark.
- Scenario analysis is a common tool for assessing tail risk in credit portfolios. Two principal tools that investors use to manage tail risk include portfolio diversification and tail risk hedges.
- Many investors manage bonds that are issued in multiple countries and currencies and therefore need to consider international (global) implications.
- Credit portfolio managers can improve returns through geographic diversification (investing across various countries and regions). Risks of geographic diversification include geopolitical risk, elevated liquidity risk, currency risk, and legal risk.
- Credit investors sometimes use structured financial instruments as alternatives to corporate bonds. Common types of structured financial instruments include mortgage-backed securities, asset-backed securities, collateralized debt obligations, and covered bonds.

REFERENCES

Electronic Bond Trading Report, SIFMAUS Corporate and Municipal Securities, February . 2016 (http://www.sifma.org/issues/item.aspx?id=8589958906)

PRACTICE PROBLEMS

The following information relates to Questions 1–9

Emma Gerber and Juliette Petit are senior and junior credit portfolio managers, respectively, for a European money management firm. They are discussing credit management strategies and preparing for an annual meeting with a major client.

One of their high-yield bond holdings is a 10-year bond issued by EKN Corporation (EKN). The bond has a price of 91.82, a modified duration of 8.47, and a spread duration of 8.47. For this bond, Petit speculates on the effects of an interest rate increase of 20 bps and, because of a change in its credit risk, an increase in the EKN bond's credit spread of 20 bps. Petit comments that because the modified duration and credit spread duration of the EKN bond are equal, the bond's price will not change (all else being equal) in response to the interest rate and credit spread changes.

Gerber explains the concept of empirical duration to Petit and makes the following points.

Point 1: A common way to calculate a bond's empirical duration is to run a regression of its price returns on changes in a benchmark interest rate.

Point 2: A bond's empirical duration tends to be larger than its effective duration.

Point 3: The price sensitivity of high-yield bonds to interest rate changes is typically higher than that of investment-grade bonds.

Exhibit 1 shows information for three BBB rated bonds issued by a large automotive company. Gerber asks Petit to interpret the data in the table and notes that the current interest rate environment is characterized by a positively sloped yield curve.

Exhibit 1 Selected Data for Three BBB Rated Bonds

	Bond 1	Bond 2	Bond 3
Price	99.350	130.054	101.135
Coupon (%)	3.100	7.500	4.300
G-spread (bps)	162.3	228.3	148.6
I-spread (bps)	176.9	242.8	103.3
Z-spread (bps)	178.4	246.9	102.4
OAS (bps)	70.2	234.9	78.8

Petit makes three observations about these bonds.

Observation 1 We should buy Bond 1 because the difference between its Z-spread and OAS is the largest.

Observation 2 We prefer Bond 1 to Bond 3 because Bond 1 has a greater Z-spread.

Observation 3 Bond 2 is a non-callable bond because its option-adjusted spread (OAS) is similar to the bond's other three spread levels.

© 2017 CFA Institute. All rights reserved.

Petit observes that credit spread levels for bonds are currently higher than normal, and she recommends that the firm increase its investment in high-yield bonds. She mentions three reasons for increasing high-yield bond exposure.

- Reason 1: The portfolio's liquidity will improve.
- Reason 2: Defaults on high-yield bonds will be relatively low.
- Reason 3: The firm's view is that economic growth will be greater than the consensus forecast.

Petit develops investment recommendations for a currency-hedged portfolio of US and European corporate bonds. She expects US interest rates to decline relative to European interest rates. Furthermore, the spread curve for US corporate bonds indicates that the average spread of five-year BB bonds exceeds the average spread of two-year BB bonds by +90 bps. Petit expects the difference between average credit spreads for these two sectors to narrow to +50 bps.

Gerber is looking at the high-yield portfolio and investigates secondary market characteristics that would increase the portfolio's liquidity.

On another topic, Gerber is concerned that the scenario analysis models for the credit portfolio underestimate tail risk, and she asks Petit how to address this issue. Petit responds, "We can change the expected correlations between prices in our models to generate more extremely unusual outcomes."

Gerber is preparing for the annual meeting with one of the firm's largest clients. The client wants to explore more international credit investing. Gerber anticipates that the client will ask about differences between investing in emerging markets (EM) credits and developed markets credits. To address this potential inquiry, Gerber plans to emphasize the following differences.

Difference 1:	Commodity producers and banks represent a higher proportion of EM indexes than of developed market indexes.
Difference 2:	Total or partial government ownership of EM issuers is common, which results in a higher average recovery rate for defaulted senior unsecured bonds for EM markets than for developed markets.
Difference 3:	Compared with developed markets, the credit quality of EM issuers tends to be more concentrated at the very high and very low portions of the credit spectrum.

Gerber also is preparing a more general discussion about domestic versus international portfolio management. In Gerber's written report, Petit identifies three statements that she wants to check for accuracy.

Statement 1	Currency risk in global credit portfolios can be mitigated by using currency swaps or by investing in credits denominated in currencies that are pegged or tightly managed by the government.
Statement 2	Liquidity concerns for EM credits are mitigated by their frequency of trading and modest legal risk.
Statement 3	Sectors tend to perform similarly across regions.

1 Is Petit's prediction correct that the EKN bond price will not change in response to the interest rate and credit spread changes, all else being equal?

A Yes

B No, the bond price should decrease.

C No, the bond price should increase.

2 Which of Gerber's points about empirical duration is correct?

A Point 1

B Point 2

C Point 3

3 Which of Petit's observations about the three BBB rated bonds is *most likely* correct?

A Observation 1

B Observation 2

C Observation 3

4 Which reason *best* supports Petit's recommendation to increase the firm's investment in high-yield bonds?

A Reason 1

B Reason 2

C Reason 3

5 Based on Petit's expectations for US and European corporate bonds, which of the following positions relative to the portfolio's benchmark should she recommend?

	US Bonds	European Bonds	US Two-Year BB	US Five-Year BB
A	Overweight	Underweight	Overweight	Underweight
B	Overweight	Underweight	Underweight	Overweight
C	Underweight	Overweight	Underweight	Overweight

6 What secondary market characteristics would *most likely* have Gerber's desired effect on portfolio liquidity?

A Decreased trading volume

B Less spread sensitivity to fund outflows

C A decrease in broker/dealer holdings

7 To address Gerber's tail risk concern, Petit should recommend that expected correlations with their models:

A decrease.

B do not change.

C increase.

8 Which of Gerber's three differences about investing in EM credits compared with developed market credits is most correct?

A Difference 1

B Difference 2

C Difference 3

9 Which of Gerber's statements about international credit management is correct?

A Statement 1

B Statement 2

C Statement 3

The following information relates to Question 10–15

Megan Easton is a portfolio manager with Dynamo Investment Partners (Dynamo) and manages a bond portfolio that invests primarily in investment-grade corporate bonds with a limited amount of US government bonds. Easton meets with John Avelyn, a newly hired analyst, to discuss the structure and management of this investment portfolio, as well as some possible changes to the portfolio composition.

Easton begins the meeting by stating her belief that the credit spread is the single most important measure that investors use when selecting bonds. Among the various credit spread measures, including the G-spread, I-spread, and Z-spread, Easton prefers the G-spread.

Easton and Avelyn next discuss credit strategy approaches. Dynamo uses a bottom-up approach that selects bonds with the best relative value from the universe of bonds with similar characteristics. Avelyn comments on the following considerations in a bottom-up approach.

Comment 1 Callable debt has a smaller option-adjusted spread than comparable non-callable debt.

Comment 2 Benchmark corporate bond issues normally have wider spreads than older bonds of the same issuer.

Comment 3 The announcement of a new corporate bond issue often leads to an increase in the credit spread on the existing bonds.

Dynamo is changing the bond portfolio's investment constraints so that it can invest up to 20% of the assets in high-yield corporate bonds and 20% in structured financial instruments. Easton makes the following statement about these changes:

> Liquidity and trading issues for high-yield bonds, such as investment-grade bonds, will be a key consideration in our security selection. Although both high-yield and investment-grade bonds are quoted as spreads over benchmark government bonds, we must be aware that dealers are likely to hold smaller inventories of high-yield bonds and their bid–offer spreads will be larger.

Avelyn makes the following statements about the differences between investment-grade and high-yield bonds.

Statement 1 When default losses are low and credit spreads are relatively tight, high-yield bonds tend to perform more like investment-grade bonds.

Statement 2 Investment-grade bonds have greater exposure to credit risk than high-yield bonds.

Statement 3 High-yield bonds have more exposure to interest rate risk than investment-grade bonds.

Two of the structured financial instruments that Easton and Avelyn are considering for Dynamo's portfolio are collateralized debt obligations (CDOs) and covered bonds. Easton and Avelyn make the following comments about the securities.

Easton: If the correlation of the expected defaults on the CDO collateral of the senior and subordinated tranches is positive, the relative value of the mezzanine tranche compared with the senior and equity tranches will increase.

Avelyn: Replacing a portion of the corporate bonds with CDOs will provide meaningful diversification to the investment portfolio.

Avelyn: Investing in covered bonds will give us the yield increase we are seeking compared with investing in corporate bonds or asset-backed securities.

10 A benefit of Easton's preferred credit spread measure is that it:

A provides a good measure of credit spread for bonds with optionality.

B uses swap rates denominated in the same currency as the credit security.

C reduces the potential for duration mismatch.

11 Which of the following is *most likely* to be used when selecting securities based on Dynamo's credit strategy approach?

A Macro factors

B Expected excess returns

C Average option-adjusted spread

12 Which of Avelyn's comments regarding considerations in the bottom-up approach is *most* accurate?

A Comment 1

B Comment 2

C Comment 3

13 Which of Easton's statements about the liquidity and trading characteristics of high-yield and investment-grade bonds is *most* correct?

A Dealers generally hold larger inventories of high-yield bonds than investment-grade bonds.

B Both high-yield and investment-grade bonds are quoted as spreads over benchmark government bonds.

C The bid–offer spread of high-yield bonds is normally larger than that of investment-grade bonds with similar maturities.

14 Which of Avelyn's statements about the differences between investment-grade and high-yield bonds is accurate?

A Statement 1

B Statement 2

C Statement 3

15 Which comment regarding CDOs and covered bonds is accurate?

A Easton's comment

B Avelyn's first comment

C Avelyn's second comment

SOLUTIONS

1 B is correct. An increase in interest rates results in a decrease in the bond price. An increase in the credit spread also results in a decrease in the bond price. For the EKN bond, its modified duration shows the effect of the 20 bp increase in interest rates. The approximate percentage price change resulting from the increase in interest rates is $-8.47 \times 0.0020 = -1.694\%$. The spread duration shows the effect of the 20 bp increase in the credit spread. The approximate percentage price change resulting from the increase in the credit spread is $-8.47 \times 0.0020 = -1.694\%$. The combined effect is a total change of –3.388%, or a price decrease of roughly 3.4%.

2 A is correct. A bond's empirical duration is often estimated by running a regression of its price returns on changes in a benchmark interest rate.

3 C is correct. The OAS for Bond 2 is close to the bond's other spread levels and thus indicates that there is little embedded optionality in the bond. As a result, Bond 2 is most likely not callable.

4 C is correct. Better-than-expected economic growth is typically associated with narrower credit spreads and lower default rates for high-yield bonds.

5 B is correct. Petit should recommend markets in which yields are expected to decline relative to other markets. As a result, Petit should recommend overweighting US bonds relative to European bonds and overweighting US five-year BB bonds relative to US two-year BB bonds.

6 B is correct. Spread sensitivity is the effect on credit spreads of large withdrawals by investors from credit funds. Spread sensitivity can be measured as the spread widening (in basis points) divided by the percentage outflow from high-yield funds (funds withdrawn divided by assets under management). A decrease in the spread sensitivity to fund outflows would most likely indicate an increase in liquidity.

7 C is correct. Increasing the correlations would likely increase the number of extremely unusual outcomes and, thereby, increase estimated tail risk. Higher correlations in the model increase the dispersion of outcomes (effectively decreasing diversification).

8 A is correct. EM indexes have a higher proportion of commodity producers and banks than developed market indexes have.

9 A is correct. Global credit managers do use currency swaps and invest in pegged currencies to hedge foreign exchange exposures.

10 C is correct. The G-spread is the spread over an actual or interpolated benchmark (usually government) bond. A benefit of the G-spread is that when the duration of the credit security differs from that of the benchmark bond, the yields of two government bonds can be weighted so that their weighted average duration matches the credit security's duration.

11 B is correct. Analyzing expected excess returns against the expected magnitude of the credit-related risks is key to the bottom-up approach. Once the credit universe has been divided into sectors, the investor identifies the bonds with the best relative value within each sector. If Dynamo decides that two issuers have similar credit-related risks, then it will typically compare credit spread measures and buy the bonds of the issuer with the higher spread because those bonds likely have a higher potential for excess returns. For issuers with different credit-related risk, Dynamo must decide whether the additional spread adequately compensates for the additional credit risk.

12 C is correct. When an issuer announces a new corporate bond issue, the issuer's existing bonds often decline in value and their spreads widen. This dynamic is often explained by market participants as an effect of increased supply. A related reason is that because demand is not perfectly elastic, new issues are often given a price concession to entice borrowers to buy the new bonds. This price concession may result in all of an issuer's existing bonds repricing based on the new issue's relatively wider spread. A third reason is that more debt issuance may signal an increase in an issuer's credit risk.

13 C is correct. Bid–offer spreads are larger for high-yield bonds than for investment-grade bonds of similar maturity.

14 A is correct. Investment-grade corporate bonds have meaningful interest rate sensitivity, and therefore, investment-grade portfolio managers usually manage their portfolio durations and yield curve exposures closely. In contrast, high-yield portfolio managers are more likely to focus on credit risk and less likely to focus on interest rate and yield curve dynamics. When default losses are low and credit spreads are relatively tight, however, high-yield bonds tend to behave more like investment-grade bonds—that is, with greater interest rate sensitivity.

15 A is correct. CDOs typically include some form of subordination. With subordination, a CDO has more than one bond class or tranche, including senior bond classes, mezzanine bond classes (which have credit ratings between senior and subordinated bond classes), and subordinated bond classes (often referred to as residual or equity tranches). The correlation of expected defaults on a CDO's collateral affects the relative value between the senior and subordinated tranches of the CDO. As correlations increase, the values of the mezzanine tranches usually increase relative to the values of the senior and equity tranches.

CUSTOMER SERVICE

68

PORTFOLIO MANAGEMENT
STUDY SESSION

12

Equity Portfolio Management

Because equity securities represent a significant portion of many investment portfolios, equity portfolio management is often an important component of overall investment success. This study session focuses on the role of equities in an investment portfolio, three major approaches (passive, active, and semi-active) used to manage equity portfolios, and the evaluation of equity managers.

READING ASSIGNMENT

Reading 25	Equity Portfolio Management by Gary L. Gastineau, Andrew R. Olma, CFA, and Robert G. Zielinski, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

25

Equity Portfolio Management

by Gary L. Gastineau, Andrew R. Olma, CFA, and Robert G. Zielinski, CFA

Gary L. Gastineau is at ETFconsultants.com, Inc. (USA). Andrew R. Olma, CFA (USA). Robert G. Zielinski, CFA, is at Charlotte Cattle Company (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss the role of equities in the overall portfolio;
☐	**b.** discuss the rationales for passive, active, and semi-active (enhanced index) equity investment approaches and distinguish among those approaches with respect to expected active return and tracking risk;
☐	**c.** recommend an equity investment approach when given an investor's investment policy statement and beliefs concerning market efficiency;
☐	**d.** distinguish among the predominant weighting schemes used in the construction of major equity market indexes and evaluate the biases of each;
☐	**e.** compare alternative methods for establishing passive exposure to an equity market, including indexed separate or pooled accounts, index mutual funds, exchange-traded funds, equity index futures, and equity total return swaps;
☐	**f.** compare full replication, stratified sampling, and optimization as approaches to constructing an indexed portfolio and recommend an approach when given a description of the investment vehicle and the index to be tracked;
☐	**g.** explain and justify the use of equity investment–style classifications and discuss the difficulties in applying style definitions consistently;
☐	**h.** explain the rationales and primary concerns of value investors and growth investors and discuss the key risks of each investment style;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**i.** compare techniques for identifying investment styles and characterize the style of an investor when given a description of the investor's security selection method, details on the investor's security holdings, or the results of a returns-based style analysis;
☐	**j.** compare the methodologies used to construct equity style indexes;
☐	**k.** interpret the results of an equity style box analysis and discuss the consequences of style drift;
☐	**l.** distinguish between positive and negative screens involving socially responsible investing criteria and discuss their potential effects on a portfolio's style characteristics;
☐	**m.** compare long–short and long-only investment strategies, including their risks and potential alphas, and explain why greater pricing inefficiency may exist on the short side of the market;
☐	**n.** explain how a market-neutral portfolio can be "equitized" to gain equity market exposure and compare equitized market-neutral and short-extension portfolios;
☐	**o.** compare the sell disciplines of active investors;
☐	**p.** contrast derivatives-based and stock-based enhanced indexing strategies and justify enhanced indexing on the basis of risk control and the information ratio;
☐	**q.** recommend and justify, in a risk-return framework, the optimal portfolio allocations to a group of investment managers;
☐	**r.** explain the core-satellite approach to portfolio construction and discuss the advantages and disadvantages of adding a completeness fund to control overall risk exposures;
☐	**s.** distinguish among the components of total active return ("true" active return and "misfit" active return) and their associated risk measures and explain their relevance for evaluating a portfolio of managers;
☐	**t.** explain alpha and beta separation as an approach to active management and demonstrate the use of portable alpha;
☐	**u.** describe the process of identifying, selecting, and contracting with equity managers;
☐	**v.** contrast the top-down and bottom-up approaches to equity research.

1 INTRODUCTION

Equities constitute a significant part of many investment portfolios' value. For numerous investors, the decision of how to invest the equity allocation among competing investment approaches ranks second in importance only to the decision of how much of the portfolio to allocate to equities in the first place.

This reading presents a broad overview of equity portfolio management organized as follows: Section 2 summarizes the role of equities in investors' portfolios. Sections 3 through 6 introduce and discuss three broad approaches to equity investing and their subdisciplines. Section 7 discusses managing a portfolio of managers so that the overall equity allocation achieves the investor's purposes. Section 8 presents the important subject of identifying, selecting, and contracting with equity portfolio managers. Section 9 discusses structuring equity research and security selection, and the final section summarizes the reading.

THE ROLE OF THE EQUITY PORTFOLIO

2

Equities represent a significant source of wealth in the world today. As of 31 March 2011, the aggregate market value of the equities in the Morgan Stanley Capital International All Country World Index (MSCI ACWI) was more than $34 trillion, of which more than half represented markets outside the United States.[1] Furthermore, over 10 percent of the $34 trillion total represented emerging markets.

This vast pool of equity assets is held in both individual and institutional portfolios. As an example of the latter, the allocations of pension funds to equities and other assets are shown for seven major markets in Exhibit 1. On average, equities are 47 percent of portfolio allocations, which is a larger allocation that that for bonds, cash, or real estate and alternative assets. However, the allocation to equity varies considerably, from 28 percent of the portfolio in Switzerland to over half the portfolio, 55 percent in the United Kingdom. Pensions in the United Kingdom, United States, and Australia are relatively heavily weighted in equities while Japan, the Netherlands, and Switzerland are relatively lightly weighted in them. These differences reflect, at least in part, differences in investment constraints, risk aversion, and traditions of equity holding.

Exhibit 1 Pensions' Equity Allocations (Selected Major Markets)

	Equity	Bonds	Real Estate and Alternative Assets	Cash
Australia	49%	14%	25%	12%
Canada	41	36	21	2
Japan	37	56	4	3
Netherlands	33	50	16	1
Switzerland	28	35	29	8
United Kingdom	55	35	7	3
United States	49	27	24	0
Average	47	33	19	1

Source: Towers Watson Global Pension Asset Study 2011, available at www.towerswatson.com.

Most investors worry about inflation, and inflation hedging ability is a sought-after characteristic. Informally, an asset is an **inflation hedge** if its returns are sufficient on average to preserve purchasing power during periods of inflation. More formally stated, an inflation hedge's nominal returns tend to be highly correlated with inflation

1 As of May 2011, this index covers 45 developed and emerging markets and represents approximately 98 percent of global equity market value.

rates. As residual real claims on businesses, common equities should offer superior protection against unanticipated inflation compared with conventional bonds. This phenomenon is so because companies' earnings tend to increase with inflation, whereas payments on conventional bonds are fixed in nominal terms. Nevertheless, companies do face challenges in coping with inflation. Reported earnings often overstate their real economic value to varying degrees. Corporate income taxes and capital gains tax rates are typically not inflation indexed, so inflation can cut into investors' after-tax real returns unless share prices fully reflect (through lower prices) the interaction of inflation and taxation. Furthermore, individual equities differ in their sensitivities to inflation because of industry, competitive, and other types of factors. Companies' abilities to raise output prices and revenues to keep pace with increases in input prices vary inversely with the amount of price competition in their markets. Yet the historical record indicates that the very long-run real return on stocks in the United States has been relatively insensitive to realized inflation rates, in contrast to bonds, whose returns have been negatively related to inflation.[2] Evidence from many markets indicates that using long measurement periods (longer than annual), equities on average do have value as an inflation hedge.[3] That fact has been an argument for equity investment not only for investors with general inflation concerns but also for defined-benefit plan sponsors, which may be exposed through the terms of the pension benefit formula to increasing nominal wage and salary costs.

Finally, equities' comparatively high historical long-term real rates of return have been important in establishing the widely held perspective that they play a growth role in a portfolio. Exhibit 2, showing historical real rates of return on equity, is taken from a Dimson, Marsh, and Staunton (2011) survey of capital market returns internationally. Their analysis shows that during the 111 years from 1900 to 2010, the long-term real rates of return to equities have exceeded that of bonds in all 19 countries listed in Exhibit 2.[4]

For all the reasons discussed, many successful long-term investors have had an equity bias in their asset allocation, diversifying with instruments such as bonds to obtain an acceptable level of risk and/or income. In the next sections we discuss how investors approach equity investment.

Exhibit 2 Equity Real Rates of Return, 1900–2010

Country	Geometric Mean	Standard Deviation
Australia	7.7%	18.2%
Belgium	2.5	23.6
Canada	5.9	17.2
Denmark	5.1	20.9
Finland	5.4	30.3
France	3.1	23.5
Germany (excludes 1922–23)	3.1	32.2
Ireland	3.8	23.2
Italy	2.0	29.0

2 See Siegel (2008), p. 199. Siegel examined 30-year holding periods from 1871 to 2006. Equities have not been effective inflation hedges, however, for the short-term (Siegel 2008).

3 See Boudoukh and Richardson (1993), focusing on US data; Ely and Robinson (1997) for an international focus; and Luintel and Paudyal (2006), focusing on UK data. More recently, Bekaert and Wang (2010) find that stocks are poor short-term inflation hedges in industrialized countries, but are better hedges at longer horizons and in high-inflation economies.

4 See Dimson, Marsh, and Staunton (2011) for data on historical bond returns.

Exhibit 2 (Continued)

Country	Geometric Mean	Standard Deviation
Japan	3.8	29.8
The Netherlands	5.0	21.8
New Zealand	5.8	19.7
Norway	4.2	27.4
South Africa	7.3	22.6
Spain	3.6	22.3
Sweden	6.3	22.9
Switzerland	4.2	19.8
United Kingdom	5.3	20.0
United States	6.3	20.3
World	5.5	17.7

Source: Credit Suisse Global Investment Returns Yearbook 2011. Dimson, Marsh, and Staunton (2011).

APPROACHES TO EQUITY INVESTMENT

3

There are a number of different approaches to managing equity portfolios, each of which we will discuss in more detail later in this reading.

In **passive management**, the investor does not attempt to reflect his investment expectations through changes in security holdings. The dominant passive approach is **indexing**, which involves investing in a portfolio that attempts to match the performance of some specified benchmark. Although passive in the sense of not incorporating the investor's expectations concerning securities, indexed portfolios are anything but passive in implementation. When a stock is added to or dropped from an index, or when the weight of a given stock changes because of a corporate action (such as a share buyback, or a **secondary offering**—an offering after the initial public offering of securities), the portfolio must be adjusted. Pioneered in the 1970s, indexing has quickly grown to the point that the United States alone has more than $1 trillion in institutional indexed equities. Today, indexed portfolios often function as the core holding in an investor's overall equity allocation.

Another approach is **active management**, which historically is the principal way that investors have managed equity portfolios. An active manager seeks to outperform a given benchmark portfolio (the portfolio against which the manager's performance will be evaluated). The manager does this by identifying which stocks she thinks will perform comparatively well versus the benchmark portfolio, buying or holding those, and avoiding stocks she believes will underperform the benchmark. Despite indexing's growing popularity during the last few decades, active equity management still accounts for the overwhelming majority of equity assets managed.

The final approach is **semi-active management** (also called enhanced indexing or risk-controlled active management) and is in reality a variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark, as do active managers in general. A semi-active portfolio manager, however, worries more about tracking risk than an active manager does and will tend to build a portfolio whose performance will have very limited volatility around the benchmark's returns.

Exhibit 3 compares the typical expected active return, tracking risk, and information ratio for successful (first-quartile) practitioners of these three different approaches. **Active return** is the portfolio's return in excess of the return on the portfolio's benchmark. **Tracking risk**, the annualized standard deviation of active returns, measures **active risk** (risk relative to the portfolio's benchmark).[5]

The **information ratio** equals a portfolio's mean active return divided by tracking risk and represents the efficiency with which a portfolio's tracking risk delivers active return.[6] What can we infer from Exhibit 3 about how an investor in each of these categories views equity market informational efficiency? Investors who believe that an equity market is efficient will usually favor indexing because they think that equity research will not provide a sufficient increment in return to overcome their research and transaction costs. Active investors believe that the equity market is often inefficient and that good research will allow them to outperform the market net of all costs. Enhanced indexers fall somewhere between the two, believing that they can extract information about companies that has not been embedded in stock prices, but attempting to do so in a way that limits tracking risk.

Exhibit 3 Indexing, Enhanced Indexing, and Active Approaches: A Comparison

	Indexing	Enhanced Indexing	Active
Expected active return	0%	1%–2%	2%+
Tracking risk	<1%	1%–2%	4% + r
Information ratio[a]	0	0.75	0.50

[a] Estimated values expected of first-quartile portfolio managers.
Source: Authors' estimates.

Within any of these three broad investment approaches, the investor needs to define the investment universe from which to select common stock. Considerations such as fund size and investment horizon affect the desired minimal level of holdings' liquidity. Tax concerns particularly concern individual and taxable corporate investors. Social concerns (e.g., corporate performance in matters such as governance and ethics, environment, workplace conditions, product safety and impact, and human rights) may matter to any type of investor. The mandates that clients give their investment managers will reflect these constraints.

4 PASSIVE EQUITY INVESTING

Passive investment philosophy has its roots in the history of equity indexing. The first indexed portfolio, launched in 1971 by Wells Fargo, was created for a single pension fund client. In 1973, Wells Fargo organized a commingled index fund for trust accounts. In 1976, Wells Fargo combined the funds, using capitalization-weighted

5 Tracking risk has also been called tracking error and tracking error volatility.
6 An information ratio (IR) of 0.50 is frequently viewed as distinguishing top-quartile active equity managers. For a summary of empirical results, see Grinold and Kahn (2000), p. 131. Jorion (2002), Table 4, finds that the first quartile of enhanced index funds is close to 0.75. Bossert, Füss, Rindler, and Schneider (2010) find that the IR that distinguishes a top-quartile manager changes over time and across equity style. However, the average threshold IR for equity managers in their Exhibit 2 is 0.36.

S&P 500 Index as the template for the combined portfolios. By 1981, Wells Fargo had established a fund designed to track the broader market of companies outside the S&P 500. By holding these two funds in market cap weights, an investor could effectively capture the return of the US equity market. Indexed investments became available for individual investors too. John Bogle at The Vanguard Group, Inc., launched the first broad-market index fund for retail investors in 1975.

Several early advocates of indexing were influential in establishing indexing as a major investment approach. Burton Malkiel called for "A New Investment Instrument" in the first edition of his best seller, *A Random Walk Down Wall Street* (1973). He wrote, "What we need is a no-load, minimum-management-fee mutual fund that simply buys the hundreds of stocks making up the broad stock-market averages and does no trading from security to security in an attempt to catch the winners." Other early advocates included Paul Samuelson (1974) and Charles D. Ellis in "The Loser's Game" (1975), one of the most widely cited papers in the literature of both finance and tennis. Ellis marshaled some simple facts illustrating that the institutionalization of the equity markets in the 1960s and early 1970s had made it probable that the *average* institutional investment manager would typically underperform the market as measured by a representative index. According to Ellis, the increased institutional share of the market left too little stock in the hands of nonprofessional investors for amateurs to fill the ranks of underperformers by themselves. Given the costs of trading, administrative expenses, and management fees as well, average active institutional investors inevitably would underperform the unmanaged market indexes over time. In his classic article "The Arithmetic of Active Management," William F. Sharpe (1991) explains why the average investor cannot hope to beat a comprehensive equity index. His argument is unassailably clear and simple: "If 'active' and 'passive' management styles are defined in sensible ways, it *must* be the case that:

- before costs, the return on the average actively managed dollar will equal the return on the average passively managed dollar; and
- after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar."

History has generally proven Ellis and Sharpe right. Appropriately designed performance studies have generally found that the *average* active institutional portfolio fails to beat the relevant comparison index after expenses.[7] Frequently, the difference in performance has been found to be close to the average expense disadvantage of active management.[8] Therefore, compared with the average actively managed fund that has similar objectives, a well-run indexed fund's major advantage is expected superior long-term net-of-expenses performance because of relatively low portfolio turnover and management fees (often 0.10 percent of assets or less). For tax-sensitive investors, indexing's often relatively high tax efficiency (i.e., post-tax returns that are close to pre-tax returns) is appealing. That tax efficiency comes from turnover that is usually low compared with active investing.

Indexing has advantages in a broad range of equity market segments. The relatively high informational efficiency of prices in large-cap equity markets favors indexing. In typically less efficient market segments, such as small cap, the supply of active investment opportunities may be larger but transaction costs are higher. Indexing

7 Equity mutual funds have been perhaps the most intensively and rigorously researched institutional equity segment. See Daniel, Grinblatt, Titman, and Wermers (1997) and the references therein for equity mutual funds for empirical findings, as well as Ennis (2005). Lewellen (2011) finds that for institutional investors in general, portfolio managers do not earn significantly positive alpha.

8 See Daniel et al.

is also a logical choice to gain exposure to markets with which an investor may be unfamiliar (e.g., an overseas market), because active investing when one may be at an informational disadvantage is usually ill-advised.

To thoroughly understand the implementation of indexing, we need to discuss the construction and maintenance of equity indexes. The way indexes are created, selected, and used may be passive investing's weakest link.

4.1 Equity Indexes

Investment performance is undeniably important to an equity portfolio manager, whether he takes an active or passive investment approach. It makes little difference how well a manager can identify great companies, make long-term earnings estimates, or forecast the economy if his investment performance is consistently inferior. Equity portfolio managers frequently evaluate their performance against equity benchmark indexes designed to show how the overall stock market or some subsector of the market has performed.[9]

The benchmark is not just about measuring asset-class performance. A well-chosen benchmark index for a portfolio manager also represents that manager's investment "neighborhood." If a manager's benchmark is the S&P 500, he is unlikely to be investing in Russian stocks. Investors find it easier to manage their aggregate portfolios if an index well captures the investment universe of their investment managers, and to compartmentalize managers for the purposes of comparison with peers.

In addition to their role as portfolio management benchmarks, stock indexes are also used to measure the returns of a market or market segment, as the basis for creating an index fund, to study factors that influence share price movements, to perform technical analysis, and to calculate a stock's systematic risk (or beta).

Four choices determine a stock index's characteristics: the boundaries of the index's universe, the criteria for inclusion in the index, how the stocks are weighted, and how returns are calculated. The first choice, the boundaries of the stock index's universe, is important in determining how well the index represents a specific population of stocks. The greater its number of stocks and the more diversified by industry and size, the better the index will measure broad market performance. A narrower universe will measure performance of a specific group of stocks. The second choice, the criteria for inclusion, establishes any specific characteristics desired for stocks within the selected universe. The third, the weighting of the stocks, is usually a choice among price weighting, value (or float) weighting, or equal weighting. The fourth choice, computational method, includes variations such as price only and total return series that include the reinvestment of dividends. Only total return series capture the two sources of equity returns, capital appreciation and dividends.

4.1.1 *Index Weighting Choices*

Probably the greatest differences among indexes covering similar universes lie in how the index components are weighted. The three basic index weighting methods are price weighting, value (or float) weighting, and equal weighting.

- **Price weighted**. In a price-weighted index, each stock in the index is weighted according to its absolute share price. In other words, the index is simply the sum of the share prices divided by the adjusted number of shares in the index (adjustments are for the purpose of ensuring that the index value does not change merely because of stock splits or changes in index components since

9 See the reading on performance evaluation for details and alternative approaches to evaluation.

the base or launch date of the index). *The performance of a price-weighted index represents the performance of a portfolio that simply bought and held one share of each index component.*

- **Value weighted** (or market-capitalization weighted). In a value-weighted index (also called a market-capitalization weighted index or a market capitalization index), each stock in the index is weighted according to its market cap (share price multiplied by the number of shares outstanding). *The performance of a value-weighted index would represent the performance of a portfolio that owns all the outstanding shares of each index component.* A given percentage change in a value-weighted index is equal to the change in the total value of all included companies. A value-weighted index self-corrects for stock splits, reverse stock splits, and dividends because such actions are directly reflected in the number of shares outstanding and price per share for the company affected.

  A subcategory of the value-weighted method involves adjustment of market cap weights for each issue's **floating supply of shares** or free float—the number of shares outstanding that are actually available to investors. The resulting index is called a free float–adjusted market capitalization index, or float-weighted index for short. Float adjustments usually exclude corporate cross-holdings, large holdings by founding shareholders, and government holdings of shares in partly privatized companies.[10] The weight of a stock in a float-weighted index equals its market-cap weight multiplied by a free-float adjustment factor (a number between 0 and 1 representing the fraction of shares that float freely). A float-weighted index is concerned with the *investable* market values of equity issues—the market values actually available to be held by the public. *The performance of a float-weighted index represents the performance of a portfolio that buys and holds all the shares of each index component that are available for trading.* Thus, the (total) return of a float-weighted index will represent the return to the average dollar invested passively in the index's securities (ignoring costs). If the index securities are the manager's investment universe, such a float-weighted index represents a plausible performance benchmark for him. With the changeover of Standard & Poor's principal US indexes (the S&P 500, the S&P MidCap 400 Index, and the S&P SmallCap 600 Index) and the principal Japanese index (TOPIX) to float weighting, all major value-weighted indexes are now free-float adjusted.

  For brevity, in the reading we will use "value-weighted/float-weighted indexes" to refer to value-weighted indexes without float adjustment (sometimes called for emphasis *full* market-cap indexes) and value-weighted indexes with float adjustment as a group.

- **Equal weighted**. In an equal-weighted index, each stock in the index is weighted equally. *The performance of an equal-weighted index represents the performance of a portfolio in which the same amount of money is invested in the shares of each index component.* Equal-weighted indexes must be rebalanced periodically (e.g., monthly, quarterly, or annually) to reestablish the equal weighting, because varying individual stock returns will cause stock weights to drift from equal weights.

These different weighting schemes can lead to a number of biases. A price-weighted index is biased toward the highest-priced share. For example, a stock with a price of €50 will have twice the weight in a price-weighted index as a stock with a price of

10 For instance, in Example 1 given later, two stocks (Wal-Mart and Microsoft) have substantial free-float adjustments. In both cases, substantial shareholdings of founding executives, their heirs, or foundations that they established are expected never to be liquidated.

€25. Therefore, a 10 percent increase in the higher-priced stock will have the same effect on the index as a 20 percent increase in the lower-priced stock. The absolute level of a share price is an arbitrary figure, however, because a company can change its share price through a stock split, a stock dividend, or a reverse split. It makes no sense to invest money merely in proportion to an absolute share price, which is what such an index would dictate. Some price-weighted averages, such as the Nikkei 225 for Japanese equities, systematically reduce the weighting of very high-priced stocks to minimize such arbitrary distortion of the index by very high-priced shares.

A price-weighted index's main advantage lies in the simplicity of its construction. Straightforwardly, the share prices are added up and then divided by the number of shares in the index adjusted to maintain continuity in the series, taking account of stock splits and additions/deletions of components. Stock price data series are also easier to obtain historically than market value series. Consequently, price-weighted index series can go back far into the past. Price-weighted indexes can be created with a rich, if sometimes hypothetical, history. The oldest and most widely followed equity index, the Dow Jones Industrial Average, is calculated this way. When that index was first published in 1896, the weighting choices most index users prefer today were impractical.

A value-weighted index is biased toward the shares of companies with the largest market capitalizations. In other words, a 10 percent share price increase for a large-cap company would affect the index more than would a 10 percent share price increase for a smaller company. Such an index excels at conveying the effect of a change in companies' total value, or aggregate investor wealth. Float adjustments to capitalization weights exclude shares that are unavailable to investors, making float-weighted indexes most representative of the range of securities and weights that public investors as a group can buy and hold. The bias toward large market cap issues in value-weighted/float-weighted indexes, however, means that such indexes will tend to be biased toward:

- large and probably mature companies, and
- overvalued companies, whose share prices have already risen the most.

Arnott (2005) argues that even if pricing errors are random, the largest-cap stocks are more likely to incorporate positive pricing errors than negative pricing errors. Arnott, Hsu, and Moore (2005) have suggested the weighting of component securities by fundamentals (adjusting the market cap of components downward or upward when price-to-fundamentals metrics such as P/Es are high or low, respectively) as a means of addressing such biases.[11] Another criticism of value-weighted/float-weighted indexes is that a portfolio based on such an index may be concentrated in relatively few issues and, hence, less diversified than most actively managed portfolios.[12] Furthermore, because of regulatory or other restrictions on maximum holdings, indexing to some concentrated indexes may be infeasible. Although controversy exists (as on many investment issues), float-weighting is generally regarded as today's gold standard for indexing portfolios because it facilitates the minimization of tracking risk and portfolio turnover, and because it results in indexes that well represent asset-class performance.

In an equal-weighted index, all stocks are treated the same. Small companies have the same weight in the index as very large companies. An equal-weighting methodology introduces a small-company bias because such indexes include many more small companies than large ones. Moreover, to maintain equal weighting, this type of index must be rebalanced periodically. Frequent rebalancing can lead to high transaction

11 More recently, Clark, Hessel, Wang, and Zhang (2010) find superior performance from using portfolios weighted by share repurchases and total payout, relative to other fundamentally weighted portfolios.
12 See Bernstein (2003).

costs in a portfolio tracking such an index. Another limitation of equal-weighted indexes as indexing benchmarks is that not all components in such an index may have sufficiently liquid markets to absorb the demand of indexers.

Example 1 contrasts the various types of indexes.

EXAMPLE 1

A Problem of Benchmark Index Selection

Stephen Alcorn is a portfolio manager at Amanda Asset Management, Inc. (AAM). In March 2010, a wealthy client engaged Alcorn to manage $10,000,000 for one year in an active focused (concentrated) equity style. The investment management contract specified a symmetric incentive fee of $10,000 per 100 basis points (bps) of capital appreciation relative to that of an index of the stocks selected for investment.[13] (*Symmetric* means that the incentive fee will reduce the investment management fee if benchmark-relative performance is negative.) In an oversight, the contract leaves open the method by which the benchmark index will be calculated. Alcorn invests in shares of the Exxon Corporation, McDonald's Corporation, Intel Corporation, Merck & Co., Wal-Mart Stores, and Microsoft Corporation, achieving a 6.5 percent price return for the year. Exhibit 4 gives information on the six stocks.

Exhibit 4 Equity Market Data for the Shares of Six Companies

	Share Price 31–Mar-10	Share Price 31–Mar-11	Price Change	Market Value of Shares 31-Mar-10 (Millions)	Market Value of Shares 31–Mar-11 (Millions)	Free Float Factor
Exxon	$67.00	$84.11	25.5%	$316,231	$396,988	1
McDonald's	66.68	76.13	14.2	71,788	81,962	1
Intel	15.57	20.20	29.7	123,130	159,745	1
Merck	37.43	33.03	–11.8	116,357	102,679	1
Wal-Mart	55.60	52.10	–6.3	209,001	195,844	0.51
Microsoft	29.30	25.40	–13.3	256,865	222,675	0.88
Total				$1,093,372	$1,159,893	

Using only the information given, address the following:

1. For each of the six shares, explain the price-only return calculation on the following indexes for the period 31 March 2010 to 31 March 2011:
   - **i.** price-weighted index
   - **ii.** value-weighted index
   - **iii.** float-weighted index
   - **iv.** equal-weighted index
2. Recommend the appropriate benchmark index for calculating the performance incentive fee on the account and determine the amount of that fee.

13 To simplify the calculations, the problem is stated in terms of capital appreciation. In practice, the incentive fee would usually be stated in terms of total return.

Solution to 1:

i. As Exhibit 5 illustrates, the value of the price-weighted index on 31 March 2010 is found by adding the six share prices as of that date and dividing by 6: 271.58/6 = 45.26. As of 31 March 2011, the value of the index is 290.97/6 = 48.50. Thus the one-year return is (48.50 – 45.26)/45.26 = 0.071, or 7.1 percent. At 31 March 2010, the index gives a 67.00/271.58 = 24.67 percent weight to Exxon and a 66.68/271.58 = 24.55 percent weight to McDonald's, the highest-priced shares.

Exhibit 5 Price-Weighted Index

	Share Price 31-Mar-10	Share Price 31-Mar-11	Price Change	Percentage of index 31-Mar-10	Contribution to Return
Exxon	$67.00	$84.11	25.5%	24.67%	6.30%
McDonald's	66.68	76.13	14.2	24.55	3.48
Intel	15.57	20.20	29.7	5.73	1.70
Merck	37.43	33.03	–11.8	13.78	–1.62
Wal-Mart	55.60	52.10	–6.3	20.47	–1.29
Microsoft	29.30	25.40	–13.3	10.79	–1.44
Total	$271.58	$290.97	7.1%	100%	7.1%
Index	$45.26	$48.50			

ii. A value-weighted index is calculated by multiplying the share price by the number of shares outstanding to arrive at each company's market value, then summing these values to create an index. As Exhibit 6 shows, such an index would have risen by 6.1 percent by March 2011, which is less than the 7.1 percent return for the price-weighted index. This is because the weighting of the stocks is different under the two methods. For example, under the price-weighted index, McDonald's was weighted by 24.55 percent because its price was second highest. Under the value-weighted index, it is weighted the lowest at 6.57 percent. Hence, McDonald's positive return of 14.2 percent is weighted less under the value-weighted index methodology.

Note that for real world value-weighted indexes, if X is the total market values of the index components, the index vendor will normalize X by dividing it by the total market value as of some baseline date, and multiply that result by some value such as 100 to represent the starting index value. In the case of Exhibit 6 data, for example, if 31 March 2010 were chosen as the starting date and 100 as the beginning value, then an index vendor would give the index value as of 31 March 2010 as 100, and its value as of 31 March 2011 as (1,159,893/1,093,372) × 100 = 106.10.

Exhibit 6 Value-Weighted Index

	Market Value of Shares 31-Mar-10 (Millions)	Market Value of Shares 31-Mar-11 (Millions)	Value Change	Percentage of index 31-Mar-10	Contribution to Return
Exxon	$316,231	$396,988	25.5%	28.92%	7.39
McDonald's	71,788	81,962	14.2	6.57	0.93
Intel	123,130	159,745	29.7	11.26	3.35
Merck	116,357	102,679	–11.8	10.64	–1.25
Wal-Mart	209,001	195,844	–6.3	19.12	–1.20
Microsoft	256,865	222,675	–13.3	23.49	–3.13
Index	$1,093,372	$1,159,893	6.1%	100%	6.1%

iii. A float-weighted index is calculated the same way as a value-weighted index, except that the market value is adjusted by a float factor that represents the fraction of shares outstanding actually available to investors. As shown in Exhibit 7, the market values are identical to those given in Exhibit 6 for the value-weighted index except for Wal-Mart and Microsoft, which have free-float factors below 1.0 (provided in Exhibit 4). A free-float index would have risen by 8.0 percent by March 2011, or almost 2 percentage points more than a simple value-weighted index. The pickup results from the fact that the effect of Wal-Mart and Microsoft's relatively poor performance becomes less important because of their smaller weights after adjusting for free float.

Exhibit 7 Float-Weighted Index

	Market Value of Shares 31-Mar-10 (Millions)	Market Value of Shares 31-Mar-11 (Millions)	Value Change	Percentage of index 31-Mar-10	Contribution to Return
Exxon	$316,231	$396,988	25.5%	32.94%	8.41%
McDonald's	71,788	81,962	14.2	7.48	1.06
Intel	123,130	159,745	29.7	12.82	3.81
Merck	116,357	102,679	–11.8	12.12	–1.42
Wal-Mart	106,591	99,881	–6.3	11.10	–0.70
Microsoft	226,041	195,954	–13.3	23.54	–3.13
Index	$960,138	$1,037,208	8.0%	100.00%	8.0%

iv. An equal-weighted index assumes an equal investment in each of the six stocks. Its performance would be the average performance of the six stocks over the year, or 6.35 percent. In Exhibit 8, the base value of each of the six components on 31 March 2010 is 100/6 = 16.67. The value of a component shown for 31 March 2011 is found by multiplying its 31 March 2010 value by 1 plus the return over the year. For example, Exxon's 31 March 2011 value is 16.67(1 + 0.255) = 20.92. The weights of the components would then be rebalanced to 16.67 to reestablish equal weighting.

Exhibit 8 Equal-Weighted Index

	Index 31-Mar-10	Index 31-Mar-11	Price Change	Percentage of Index 31-Mar-10	Contribution to Return
Exxon	16.67	20.92	25.5%	16.67%	4.26%
McDonald's	16.67	19.03	14.2	16.67	2.36
Intel	16.67	21.62	29.7	16.67	4.96
Merck	16.67	14.71	–11.8	16.67	–1.96
Wal-Mart	16.67	15.62	–6.3	16.67	–1.05
Microsoft	16.67	14.45	–13.3	16.67	–2.22
Index	100	106.35	6.35%	100%	6.35%

Solution to 2:

A float-weighted index of the six shares is the recommended benchmark index because it represents the return to the average dollar invested passively in the six stocks, reflecting the supply of shares actually available to the public. Because the portfolio underperformed that index by 150 basis points, AAM management fees should be reduced by (150/100) × $10,000 = $15,000. Exhibit 9 summarizes the dispersion of active returns for the various ways in which the benchmark index might be calculated. The manager just outperformed a value-weighted index and an equal-weighted index of the six shares and underperformed price-weighted and float-weighted indexes.

Exhibit 9 Summary of Weighting Method Results

Weighting Method	Index Return	Active Return to Benchmark
Price-weighted	7.1%	-0.6%
Value-weighted	6.1	0.4
Float-weighted	8.0	–1.5
Equal-weighted	6.4	0.1

4.1.2 *Equity Indexes: Composition and Characteristics of Major Indexes*

A large number of stock price indexes exist for measuring share performance on a global, regional, country, and sector basis. The sector category includes indexes designed to reflect results for large stocks, small stocks, growth stocks, value stocks, and specific industries.

Exhibit 10 compares some of the major stock market indexes. The exhibit first gives facts on indexes within the currently very small group of major price-weighted and equal-weighted equity indexes. The list of important value-weighted/float-weighted indexes is very long: even giving summary facts on them would run to many pages. Exhibit 10 thus covers indexes that are discussed in text examples, examples from six

of the world's largest equity markets (in alphabetical order: Canada, France, Germany, Japan, the United Kingdom, and the United States), and an example of a global index family.

The first entry is the oldest equity index, the Dow Jones Industrial Average. Interestingly, the DJIA consists of only 30 companies, but since its creation in 1896 it has had a total of more than 100 different constituents. As leading companies of their time go into decline, they are routinely taken out of the index. Many disappeared long ago. General Electric is the only one of the original 12 constituents in the DJIA currently in the index, and it has been in and out of the DJIA a few times over the years. One moral of DJIA's story for equity investors is that if an investor holds a single stock long enough, he is about as likely to lose most or all of his money as to accumulate great wealth. The history of changes in the Dow's composition is one of the best arguments for diversification.

An indexer's choice of index to track has important consequences. Committee-determined indexes tend to have lower turnover than those reconstituted regularly according to an algorithm. Thus indexing on the former type of index may have transaction cost and tax advantages. On the other hand, indexes (and index funds based on them) that are not reconstituted regularly may drift away from the market segment they are intended to cover. The indexer should also be aware of liquidity differences among the component securities of the various indexes that cover the same market segment. For example, liquidity and relatively adequate float are criteria for selection to the S&P SmallCap 600 Index but not the Russell 2000 Index. On the other hand, investing in less liquid shares may allow the indexer to capture an illiquidity premium. In choosing the index to replicate, a fund must evaluate the trade-off between differences in transaction costs and differences in return premiums among the indexes.

4.2 Passive Investment Vehicles

Having described the array of equity indexes, in the following sections we describe specific passive investment vehicles. The major choices are:

- investment in an indexed portfolio;
- a long position in cash plus a long position in futures contracts on the underlying index, when such markets are available and adequately liquid; and
- a long position in cash plus a long position in a swap on the index. (That is, in the swap the investor pays a fixed rate of interest on the swap's notional principal and in return receives the return on the index.)

4.2.1 *Indexed Portfolios*

The three most important categories of indexed portfolios are:

- conventional index mutual funds;
- exchange-traded funds (ETFs), which are based on benchmark index portfolios; and
- separate accounts or pooled accounts, mostly for institutional investors, designed to track a benchmark index.

The most obvious difference between conventional index mutual funds and ETFs is that shareholders in mutual funds usually buy shares from the fund and sell them back to the fund at a net asset value determined once a day at the market close.[14] ETF

14 A few funds in the United States and all funds in some countries make more-frequent net asset value calculations: once an hour in some cases, and almost continuously in others.

Exhibit 10 Some Representative Equity Indexes Worldwide

	Representing	Number of Stocks	Weighting of Index	Special Characteristics	Drawbacks/Comments
Dow Jones Industrial Average	US blue chip companies	30	Price-weighted	The oldest and most widely followed US equity index	30 stocks chosen by *Wall Street Journal* editors; large, mature blue chip companies
Nikkei Stock Average	Japanese blue chip companies	225	Modified price-weighted	Originally formulated by Dow Jones & Company, using essentially the same method as the DJIA	Also known as the Nikkei 225. There is a huge variation in share price levels of the component companies, and some high-priced shares are weighted at a fraction of their share price. Some component stocks are illiquid.
Value Line Arithmetic Composite Index	Equities traded in US markets	Approximately 1,700	Equal-weighted	Represents the performance of the stocks covered in the *Value Line Investment Survey*	A well-known equal-weighted index. The Value Line Geometric Composite Index is based on the same stocks but calculates index changes using a geometric rather than arithmetic mean.
S&P TSX Composite	Broad market cap stocks listed on the Toronto Stock Exchange	Varies	Float-weighted	Very comprehensive index	Widely used Canadian equities benchmark
CAC 40	French blue chip companies	40	Float-weighted	Chosen from the 100 largest market cap stocks on the Paris Bourse (Euronext Paris)	
DAX 30	German blue chip companies	30	Float-weighted	Published by the Frankfurt Stock Exchange	Widely used German equities benchmark
TOPIX	All listed companies on the Tokyo Stock Exchange 1st Section	Varies	Value-weighted[a]	Includes all stocks listed on the TSE 1st Section, which represents about 93% of the market value of all equities in Japan	The index contains a large number of very small, illiquid stocks, making it difficult to replicate exactly.
FTSE 100	The 100 largest publicly traded stocks on the London Stock Exchange	100	Float-weighted	A large-cap index, pronounced "Footsie 100"	There are also a FTSE Mid 250 for mid-cap stocks and a small-cap index.
Russell 3000	The 3,000 largest stocks in the United States by market cap	3,000 selected on the last trading day of May. The new composition becomes effective on the last Friday in June.	Float-weighted and value-weighted available	Very comprehensive index	The Russell indexes are reconstituted annually based on market cap data as of the last day of May. Widely used institutional benchmark.

Exhibit 10 (Continued)

	Representing	Number of Stocks	Weighting of Index	Special Characteristics	Drawbacks/Comments
Russell 1000	The 1,000 largest stocks in the Russell 3000	1,000 on the day the new composition is determined	Float-weighted	A large-cap index	Competes with the S&P 500 as a large-cap benchmark.
Russell 2000	The smallest 2,000 stocks in the Russell 3000	2,000 on the day the new composition is determined	Float-weighted	A small-cap index	The many US small-cap index funds tracking this index and the consequent annual reconstitution costs and possible tax consequences make this a relatively high-cost benchmark for a US small-cap index fund.
S&P 500	Predominantly large-cap companies representative of the US stock market	500	Float-weighted	Membership determined by a committee of S&P employees	Its popularity with indexers causes new components to earn average positive abnormal returns on the announcement that they are joining the index.[b]
MSCI Index Family	Separate series for individual developed and emerging markets; regions, world developed markets—MSCI World; and All Country World (developed and emerging markets)—MSCI ACWI	Varies	Float-weighted	Most widely used global index family. The MSCI World ex US, ex Japan (MSCI Kokusai), ex UK, and ex EMU, are some indexes used as benchmarks for nondomestic equities in various markets.	Other major families of global benchmark indexes are published by FTSE, Dow Jones, and S&P/Citigroup.

[a] The TOPIX became float-weighted in three stages: October 2005, February 2006, and June 2006.
[b] See Lynch and Mendenhall (1997) and Malkiel and Radisich (2001), and Zhou (2011) for more information and a discussion of competing explanations for this phenomenon.

shareholders buy and sell shares in public markets anytime during the trading day. Dealers can create and redeem ETF shares with in-kind deposits and withdrawals at each day's market close.

The principal difference between index mutual funds and exchange-traded funds on the one hand, and indexed institutional portfolios, on the other hand, is cost. Indexed institutional portfolios managed as separate accounts with a single shareholder or, increasingly, as pooled accounts, are extremely low-cost products. Depending on the nature of the securities used in the portfolio, total annual expenses may be as low as a few basis points. Occasionally, where securities with an active lending market are involved, the revenue from securities lending can equal or exceed total portfolio management and custody expenses.[15]

Conventional index mutual funds can vary greatly in their cost structure and returns. Elton, Gruber, and Busse (2004) examined and compared the expenses and performance of S&P 500 mutual funds from 1996 to 2001. A large part of the difference in performance among these funds came from differences in the funds' expense ratios. However, differences in expenses may be expected to narrow the more such funds compete for investors' money. The results from Wahal and Wang (2011) indicates that management fees do decline as more index funds enter a market, and also that fund industry competition has increased since the late 1990s.

Other fund differences affect performance as well. For example, funds use securities lending as a source of income to varying degrees. In the Elton et al. study the difference between the best-performing S&P 500 fund and the worst-performing fund for that six-year period was an average of 209 bps (2.09 percent) a year. Clearly, S&P 500 index funds and index portfolio managers are sometimes not the "commodities" they are often thought to be.

Other differences among index funds become apparent when exchange-traded funds are added to the range of choices. At least four economically significant differences separate conventional index mutual funds from indexed exchange-traded funds:[16]

1. Shareholder accounting at the fund level can be a significant expense for conventional mutual funds in some markets, but ETFs do not have fund level shareholder accounting.
2. Exchange-traded funds generally pay much higher index license fees than conventional funds.
3. Exchange-traded funds are often much more tax-efficient than conventional funds in many markets, including the United States.
4. Users of exchange-traded funds pay transaction costs including commissions to trade them, but for their ongoing shareholders, ETFs provide inherently better protection from the cost of providing liquidity to shareholders who are selling fund shares.

To the extent that a fund has a large number of small shareholders, shareholder record-keeping will be a significant cost reflected in the fund's expense ratio. Some funds attempt to cope with this cost and to allocate it to the shareholders who are responsible for it by charging a maintenance fee for accounts below a certain size and/or by offering funds with a lower expense ratio to very large investors. For example,

15 Securities lending is a common practice in most equity and fixed-income markets around the world. The securities lender typically receives cash equal or slightly greater in value than the securities lent. The lender invests this cash and typically shares the interest with the securities borrower. In some cases, when a security has great value in the lending market because it is popular with short sellers, the securities lender may keep all the interest and even receive an additional premium for lending the securities.

16 When first introduced, all ETFs in the United States were index funds. In the late-2000s, actively managed ETFs were introduced in the United States. There are now actively managed equity, bond, and currency ETFs. There is a longer history of actively managed ETFs outside the United States.

Vanguard charges lower fees on its Admiral class shares than it does for its Investor class shares, which have a lower minimum investment.[17] Exchange-traded funds have no shareholder accounting at the fund level, so their expense ratios are typically lower than conventional mutual fund expense ratios for funds linked to comparable indexes. Brokers who carry these shares for investors may levy inactivity fees on ETF shareholders if they trade rarely, and of course there are transaction costs associated with buying and selling ETF shares in the marketplace.

Another important difference between index mutual funds and exchange-traded funds is that, at least in the United States, exchange-traded funds are usually more tax efficient in the sense that they are less likely than mutual funds to make taxable capital gains distributions. At the investor level, mutual fund buyers are affected by a fund's cost basis for its positions, which may differ quite a bit from the positions' current values. As a result, at the time of purchase an investor may buy into a potential tax liability if the positions show a gain.

At the fund level, the most significant tax difference between conventional funds and ETFs is in the process by which fund shares are redeemed. A traditional mutual fund will usually experience a tax event from selling portfolio securities when holders of a significant number of shares redeem their positions for cash. Unlike a traditional mutual fund that will ordinarily sell stocks inside the fund and pay cash to a fund shareholder who is redeeming shares, the redemption mechanism for an exchange-traded fund is usually "in kind" in the sense of being an exchange of shares. The fund typically delivers a basket of the fund's portfolio stocks to a redeeming dealer who has turned in shares of the fund for this exchange. In the United States, this transaction is not taxable from the fund's perspective, and there is no distributable gain on the redemption. Occasionally, a conventional fund—particularly a non-index fund—will deliver stock in kind to a large redeeming shareholder; but most conventional funds offer limited opportunities to redeem fund shares by delivering portfolio stock in kind. The in-kind creation and redemption process of ETFs also insulates long-term ETF shareholders from the costs of supplying liquidity to traders, a persistent problem with mutual funds in a number of markets.[18]

Turning to indexed institutional portfolios, a relatively small number of quantitatively oriented investment management organizations manage the majority of the money in such indexed accounts. The same organization may manage institutional portfolios, conventional funds, and ETFs. Management of these different portfolios may be assigned to separate groups of managers or integrated, with the portfolio management and trading functions consolidated in a single indexing group. Investment management firms' aggressiveness in implementing index composition changes varies, and in fact may vary from one type of account to another within the same firm. Indeed, index fund managers have sometimes come under scrutiny for failing to implement anticipated index composition changes aggressively because of their concern for minimizing tracking risk. The issue arises because changes to indexes are often predictable or announced in advance of the effective date, but index funds may not effect the forthcoming changes as soon as they are foreseeable because of a concern with minimizing tracking risk relative to the current index components. In the interim, arbitrageurs may trade on the basis of the anticipated changes, affecting prices and causing an implicit loss to index fund investors.[19]

If an index contains less than, say, 1,000 stocks, and the stocks are liquid, the index fund manager will usually attempt to manage the portfolio with **full replication** of the index—that is, every issue in the index will be represented in the portfolio, and

17 Vanguard and other managers also offer even lower expense ratio share classes to "institutional" investors.
18 In the United States, the inconsistent application of deadlines for accepting mutual fund buy and sell orders has been a related problem for long-term mutual fund shareholders.
19 See Chen, Noronha, and Singal (2006) and Petajisto (2011).

each portfolio position will have approximately the same weight in the fund as in the index. As the number of issues in the index passes 1,000, it is increasingly likely that the manager will construct the portfolio using either **stratified sampling** (also called representative sampling) or **optimization**. In some cases, the preferred method depends on portfolio size and the availability of active trading in an index basket by means of portfolio trades. For example, an indexer may use full replication for a large fund (e.g., an ETF) tracking the Russell 2000, making use of standard Russell 2000 basket trades, but may choose optimization for smaller, separately managed accounts indexed to the same index.

Full replication, where the number and liquidity of the issues permit using it, should result in minimal tracking risk. Apart from minimizing tracking risk, a full replication portfolio based on a value-weighted (or float-weighted) index has the advantage of being self-rebalancing because the stock weights in the portfolio will mirror changes in the index weights resulting from constantly changing stock prices. Self-rebalancing is a desirable characteristic because it implies that trading is needed only for the reinvestment of dividends and to reflect changes in index composition. Full replication is the most common procedure for indexes such as the S&P 500 that are composed of highly liquid securities. Typically, the return on a full replication index fund may be less than the index return by an amount equal to the sum of:

- the cost of managing and administering the fund;
- the transaction costs of portfolio adjustments to reflect changes in index composition;
- the transaction costs of investing and disinvesting cash flows; and
- in upward-trending equity markets, the drag on performance from any cash positions.[20]

Attempting to fully replicate an index containing a large proportion of illiquid stocks will usually result in an index portfolio that underperforms the index.[21] This phenomenon occurs because indexes do not have to bear transaction costs but a real portfolio does. These transaction costs include brokerage commissions, bid–offer spreads, taxes, and the market impact of trades (the effect of large trades on the market price).[22] There are two ways to build an index-tracking portfolio using a subset of stocks in the index: stratified sampling and optimization. Skillful use of these techniques should permit a portfolio manager to index successfully to even a very broad index containing illiquid securities.

Using stratified sampling, a portfolio manager divides the index along a number of dimensions (e.g., market capitalization, industry, value, and growth), creating multidimensional cells. Each index stock is placed into the cell that best describes it. For instance, a simple cell structure could focus on market cap and industry. A manager trying to build a portfolio mimicking the TOPIX index would then place a stock such as Toyota into a cell that is defined by automobile stocks with a market cap greater than ¥5 trillion. Next, she would characterize all stocks in the index in this way and determine the weight of each cell in the index by totaling the market cap for all stocks in that cell. The manager would then build a portfolio by selecting a random sample of stocks from each cell and ensuring that the sum of the weights of the stocks purchased from each cell corresponds to the cell's weight in the index.

---

20 In the long run, we expect equity returns to exceed the returns on cash, justifying the inclusion of this factor.

21 Nevertheless, superior tax reclaims (of withheld taxes) on large international index funds can deliver a significant boost to performance relative to most international indexes, which use conservative assumptions on tax reclaims.

22 Taxes are levied on transactions in some countries. For example, a stamp duty of 0.50% is paid on the value of each stock purchase in the United Kingdom.

For example, suppose that a cell contains 2 percent of the weight of the index and that two stocks chosen to represent the cell have index weights of 0.3 percent and 0.5 percent, leaving a balance of 2.0% – 0.8% = 1.2%. By overweighting each security by 1.2%/2 = 0.6 percentage points (i.e., holding them in weights of 0.3% + 0.6% = 0.9% and 0.5% + 0.6% = 1.1%), the index fund can achieve the same exposure to the cell factors as the index.[23] Stratified sampling allows the manager to build a portfolio that retains the basic characteristics of the index without having to buy all of the stocks in the index. Generally speaking, the greater the number of dimensions and the finer the divisions, the more closely the portfolio will resemble the index.

Sometimes an index with relatively few components or with a few heavily weighted components is not naturally compliant with regulatory requirements for fund diversification (which often place maximums on how much of the portfolio may be invested in any one issuer). In such cases, stratified sampling techniques may be used to create an index fund variation loosely based on the non-diversification-compliant index. In the United States, the relevant diversification requirements are the rules for Regulated Investment Company (RIC) diversification in Sub-Chapter M of the Internal Revenue Code. In the European Union, the appropriate rules cover Undertakings for Collective Investment in Transferable Securities (UCITS), which was passed in 2009 for implementation in 2011. UCITS rules allow index funds with an EU passport (approved for offering in all EU jurisdictions) to hold up to 20 percent of assets in one security if the index called for such.[24] Increasingly, ETF issuers and index publishers who develop indexes specifically for the ETF market are designing indexes to be inherently RIC-compliant in the United States and UCITS-compliant in Europe. If the fund can replicate the index and comply with local diversification requirements simultaneously, a fund analyst can better evaluate the fund's portfolio manager and the fund management process.

Another technique commonly used to build portfolios containing only a subset of an index's stocks is optimization. Optimization is a mathematical approach to index fund construction involving the use of:

- a multifactor risk model, against which the risk exposures of the index and individual securities are measured, and
- an objective function that specifies that securities be held in proportions that minimize expected tracking risk relative to the index subject to appropriate constraints.

The multifactor model might include factors such as market capitalization, beta, and industry membership, as well as macroeconomic factors such as interest rate levels. The objective function seeks to match the portfolio's risk exposures to those of the index being tracked. An advantage of optimization compared with stratified sampling is that optimization takes into account the covariances among the factors used to explain the return on stocks. The stratified sampling approach implicitly assumes the factors are mutually uncorrelated.

Optimization has several drawbacks as an approach to indexation. First, even the best risk models are likely to be imperfectly specified. That is, it is virtually impossible to create a risk model that exactly captures the risk associated with a given stock, if only because risks change over time and risk models are based on historical data. Furthermore, the optimization procedure seeks to maximally exploit any risk differences among securities, even if they just reflect sampling error (this is the problem

23 This simple approach to weight adjustment has been used in practice. A more precise approach would be to increase the securities weights so as to maintain their relative proportion of 0.3/0.5 = 0.6: weights of 0.75 percent and 1.25 percent for the first and second securities, respectively (0.75%/1.25% = 0.60 and 0.75% + 1.25% = 2%).

24 EU member states could increase the limit to 35 percent under exceptional market circumstances.

known as overfitting the data). Even in the absence of index changes and dividend flows, optimization requires periodic trading to keep the risk characteristics of the portfolio lined up with those of the index being tracked. As a result of these limitations, the predicted tracking risk of an optimization-based portfolio will typically understate the actual tracking risk. That said, indexers have found that the results of an optimization approach frequently compare well with those of a stratified sampling approach, particularly when replication is attempted using relatively few securities. With either stratified sampling or optimization, the indexer may fully replicate (purchase in index-weight proportions) the largest stocks and create an optimized/sampled portfolio for the rest.

EXAMPLE 2

Passive Portfolio Construction Methods

An investment manager has been given a mandate for managing a Russell 2000 index fund for a moderate-size foundation. The manager must choose either full replication or optimization for managing the portfolio. Recommend the most appropriate method for constructing this index portfolio.

Solution:

Optimization is the most appropriate method. Each of the techniques for building an index portfolio has strengths and weaknesses. Generally, when the index contains highly liquid stocks, full replication is usually the preferred index construction method. Apart from minimizing tracking risk, a full replication portfolio has the advantage of being self-rebalancing (given that it is based on a value- or float-weighted index). That said, the Russell 2000 is dominated by smaller-cap companies, and replication may not be the most cost-effective choice given the costs of transacting in small-cap issues.

Stratified sampling and optimization are preferred when a portfolio manager wishes to track an index containing a large number of stocks, particularly stocks that are more difficult and costly to trade. In this case, however, stratified sampling is not under consideration. Therefore, the pension plan should use optimization to construct the index portfolio.

4.2.2 *Equity Index Futures*

Institutional indexed portfolios and conventional indexed mutual funds, which date back to the 1970s, are the earliest index products and are probably the most familiar to investors. In the 1980s, two additional indexing products, **portfolio trades** (also known as basket trades or program trades) and **stock index futures**, arrived. These products grew in tandem because they were closely related; the success of each was closely linked to the success of the other. A portfolio trade is simply a basket of securities traded as a basket or unit, whereas a traditional security trade is done one share issue at a time. A portfolio trade is made when all of the stocks in the basket—most commonly, the components of an index—are traded together under relatively standardized terms.

In the United States, the most popular trading basket by far is the S&P 500 basket. In the early 1980s, trading in such baskets increased dramatically in conjunction with the introduction of S&P 500 index futures contracts on the Chicago Mercantile Exchange (CME). By the end of that decade, trading in S&P 500 portfolios accounted for a growing share of trading in US securities, and the notional value of trading in the S&P 500 futures contract regularly surpassed the notional value of trading in the underlying securities. The e-mini S&P 500 futures contract, with a notional value of

50 times the value of the S&P 500 (compared with 250 times for the standard S&P 500 contract), became a very liquid vehicle favored by traders in the early 2000s.[25] Trading in these index instruments interacted and found a variety of applications. Trading index securities as a basket and exchanging the stock basket for the futures contract on the index—a transaction called an Exchange of Futures for Physicals—permits sharp reductions in transaction costs.[26] Using an EFP, a futures position can be translated into a portfolio position. The product interchangeability through the EFP process facilitates risk-management transactions for many participants in the securities markets.

Although the S&P 500 portfolios are still the largest such standardized portfolios, trading in a variety of other index baskets and futures contracts has grown significantly throughout the world. Among the most liquid stock index futures contracts are those on the FTSE 100, the Nikkei 225, the CAC 40, and DAX 30.[27]

The limited life of a futures contract and the fact that the most active trading in the futures market is in the nearest expiration contract means that a futures position must be rolled over periodically to maintain appropriate market exposure. Trading a basket of stocks can be relatively cumbersome at times, particularly on the short side where any uptick rule historically impeded basket transactions in US markets. (**Uptick rules** require that a short sale must not be on a downtick relative to the last trade at a different price.)[28] Exchange-traded funds historically have been exempt from the uptick rule for short sales. This fact, and their lack of an expiration date, has made ETFs instruments of choice for many indefinite-term portfolio hedging and risk management applications.

4.2.3 *Equity Total Return Swaps*

Conceptually, equity swaps resemble the more widely known fixed-income and currency swaps. The distinct feature of an equity swap is that at least one side of the transaction receives the total return of either an equity instrument or, more commonly, an equity index portfolio. The other side can be either another equity instrument or index or an interest payment. The most common nonequity swap counter payments are US dollar Libor for equity swaps based on US securities, or Libor in the appropriate currency for equity swaps based on non-US stocks.

Equity swaps enjoyed a brief and intense popularity in the United States as a way for high-tax bracket investors to achieve diversification, by exchanging the return on a single stock or an undiversified stock basket for the return on a broad stock market index. Changes in US tax law, however, sharply curtailed this application. Today, most equity swap applications are motivated by differences in the tax treatment of shareholders domiciled in different countries or by the desire to gain exposure to an asset class in asset allocation. The tax-oriented applications focus primarily on differences in tax treatment accorded domestic and international recipients of corporate dividends in many countries. Dividend withholding taxes, and an often cumbersome process for obtaining appropriate relief from part of the withholding tax, give many cross-border investors an incentive to use an equity total return swap. They receive the total return

25 The e-mini futures contracts trade on CME's Globex electronic trading system.

26 In an EFP, one party buys cash market assets and sells futures contracts, and the opposite party sells the cash market assets and buys futures contracts. For example, a long position in equity futures can be exchanged for a long position in a portfolio of securities representative of the index composition. The counterparties privately set the prices, quantities, and other terms of the transaction.

27 The CME launched futures on equity style indexes in 1995. See Hill (2003). As of 2011, the CME continues to offer mid-cap, small-cap, value, and growth equity futures contracts.

28 A **tick** is the smallest possible price movement of a security. Uptick and downtick in this context refer to any up- or down-price change, whatever the size. In 2007, the US uptick rule was repealed, but in 2010 an alternative uptick rule was enacted that prevented short-selling when a stock fell by more than 10% from the previous close.

of a nondomestic equity index in return for an interest payment to a counterparty that holds the underlying equities more tax-efficiently. Although many crossborder tax differences have been reduced, as long as tax differences persist, equity swaps can provide significant tax-saving opportunities to many large crossborder investors.

Equity swaps have another important application: asset allocation transactions. A manager can use equity swaps to rebalance portfolios to the strategic asset allocation. Total costs to rebalance by trading the underlying securities may exceed the cost of an equity swap. Consequently, effecting the asset allocation change with a swap is often more efficient. Equity swaps are used in tactical asset allocation for similar reasons.

5 ACTIVE EQUITY INVESTING

The active equity portfolio manager's primary job is to deliver the best possible performance relative to the benchmark's performance working within the risk and other constraints specified in the client's mandate. To add value, the active manager must sharpen information, investment insights, and investment tools to the point at which he has a distinct competitive advantage over his peers. Investment tools include the area of equity valuation models, a subject of study in itself.[29] The following sections on active investing focus on macro choices of orientation and strategy that distinguish the different approaches to active equity investing.

Indexing, discussed earlier, sprang from the efficient markets theory initiated in academia during the 1960s. In the subsequent three decades, however, academic and practitioner research identified a variety of possible opportunities for active management. These developments have reinvigorated active management, allowing portfolio managers to justify the higher expenses of active management compared with passive management. Furthermore, demand for performance in excess of broad market averages has been and probably will continue to be a regular feature of both the individual and institutional investor landscape. That said, many investment managers offer a range of equity investment products from active to passive to suit the differing interests of a broad spectrum of investors.

5.1 Equity Styles

To understand the landscape of active equity portfolio management today, we must discuss the concept of equity styles. Most broadly, an **investment style** is a natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.[30] As we will discuss in detail later, a traditional equity style contrast is between **value** (focused on paying a relatively low share price in relation to earnings or assets per share) and growth (focused on investing in high-earnings-growth companies) disciplines. **Market oriented** is often specified as an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth. Furthermore, the market-capitalization segment(s) in which an equity investor operates is frequently specified in describing an investor's style.

Style plays roles in both risk management and performance evaluation. If an equity portfolio manager adopts a specific style and is evaluated relative to a benchmark that reflects that style, then investors who hire the manager can readily determine whether she is talented or is just earning the generic returns to a style, which might be more

29 See Pinto, Henry, Robinson, and Stowe (2010).
30 See Brown and Goetzmann (1997) and Ferson (2010) for a discussion of mutual fund style and performance evaluation in general.

inexpensively obtained by indexing on an appropriate equity **style index** (an index intended to reflect the average returns to a given style). Certain categories of stocks (e.g., value stocks) can outperform the overall market for years. A mediocre value stock investor might be beating a broad market benchmark consistently while actually underperforming his chosen style as represented by a benchmark for a value style.

Identifying true talent became an important issue with the emergence of the pension fund consultant in the 1980s. Pension fund consultants are hired to identify good portfolio managers, track their performance, and recommend their replacement if necessary. To accomplish this, the consultants partition managers according to the style that each follows. In this environment, an active equity portfolio manager who claims he follows no definable style automatically excludes himself from consideration by many pension funds and other institutional accounts.

The groundbreaking work in style and performance measurement was done by Nobel Laureate William F. Sharpe (1988, 1992). Sharpe set out to explain US equity mutual funds' returns in terms of their exposures to the four asset classes into which he divided the US institutional equity universe: large-cap value, large-cap growth, medium cap, and small cap. Exhibit 11 reproduces Sharpe's original diagram. The horizontal lines divide total market cap into the fraction accounted for by large-cap, mid-cap, and small-cap equities; the vertical line divides large-cap equities into equal halves of large-cap value and large-cap growth.

Exhibit 11 Composition of Four Domestic Equity Classes

Source: Sharpe (1992).

Sharpe's purpose was to define style to facilitate performance measurement and to reflect the distinct and useful differences in the way active portfolio managers structured their portfolios. As he observed in 1992,

> Much has been written about both the small-stock and the value/growth phenomena. While the terms "value" and "growth" reflect common usage in the investment profession, they serve only as convenient names for stocks that tend to be similar in several respects. As is well known, across securities there is significant positive correlation among: book/price, earnings/price, low earnings growth, dividend yield and low return on equity. Moreover, the industry compositions of the value and growth groups differ (e.g., companies with high research budgets tend to have low book values relative to their stock prices).

Thus style distinctions recognize the similarities and differences among active equity managers. The contrast between value and growth stocks is fuzzy, however, particularly when we categorize stocks in a forward-looking sense rather than using historical data. Almost any stock can be categorized as cheap or expensive depending on one's expectations for the future. Fuzziness in the growth-value contrast coincides with a movement in some quarters to give portfolio managers greater flexibility to use a wide range of techniques and instruments to add value wherever they perceive it lies.[31]

EXAMPLE 3

Same Stock, Different Opinions

Value and growth investors have opposite views on the best way to invest, and they thus tend to reach different conclusions about a stock. In 2011, one example was the Microsoft Corporation, a leading provider of computer software and services. Because of its rapid growth in the 1990s, Microsoft became a member of the DJIA in 1999.

For much of its history, Microsoft was a growth company. It dominated its only real rival in personal computer operating software, the Apple Corporation, maintaining a more than 90 percent share. It also had a dominant market share in word processing, spreadsheet, and presentation software. Microsoft's earnings and cash flow were strong throughout its history. However, the company was less successful in its attempts to diversify into phones, internet-based software, and internet-based services. In recent years, its sales and earnings growth lagged behind that of Google and other internet firms. In October 2011, its share price traded at less than half of its December 1999 peak.

A growth investor might dismiss Microsoft's stock as a potential investment. The company's share price has been relatively stagnant for over a decade and it was recently surpassed in market capitalization by Apple and IBM. It could have a difficult time transitioning from a software firm to higher growth industries. Most of the personal computer sales in the future will likely come from the emerging markets, where software piracy is often more prevalent and selling prices tend to be low. These developments could reduce Microsoft's pricing power and earnings growth. Furthermore, web-based software will likely grow in popularity, limiting Microsoft's ability to sell its application software.

A value investor, however, would point to the fact that Microsoft was trading with a P/E of 9.98, less than half Google's 19.37 and less than Apple's 15.39. Microsoft recently recorded cash of more than $50 billion, operating cash flow of $26 billion, and debt of just $12 billion. Furthermore, it has one of the strongest brand names in the world, similar in public recognition to those of Coca-Cola and Sony. Although Microsoft has struggled to make the transition to the cell phone and internet industry, it is a technologically advanced company with a great deal of intellectual capital. For a value investor, Microsoft might be a buy.

In the following sections, we examine the major types of investment styles.

31 Bernstein (2003). Sensoy (2009) finds that about one-third of actively managed, diversified US equity mutual funds use a benchmark index that does not match the fund's actual style. These mismatches appear to be to the result of funds attempting to attract investment capital.

5.1.1 *Value Investment Styles*

All else being equal, value investors are more concerned about buying a stock that is deemed relatively cheap in terms of the purchase price of earnings or assets than about a company's future growth prospects. They may make several possible arguments to justify buying such stocks. One is that companies' earnings may have a tendency to revert to a mean value; if valuation multiples for a set of stocks are depressed because of recent earnings problems, an investor in those stocks may benefit from reversion to the mean in earnings accompanied by expansion in P/Es. The flip side of the argument is that investments in stocks that are relatively expensive expose the investor to the risk of contractions in multiples and in earnings. Value investors often believe that investors inherently overpay for "glamour" stocks—those seen as having particularly good growth prospects—while neglecting those with less favorable prospects.

All of these arguments presume that investors as a whole do not accurately judge forward-looking risk and return prospects, and so this line of thinking relates closely to the behavioral argument that investors overreact to bad news and thus provide opportunities for value investors. In contrast, Fama and French (1996) suggest that stocks that are cheap in terms of assets—in particular, stocks having a relatively high ratio of book value of equity to market value of equity (equivalent to a *low* price-to-book ratio, or P/B)—have a higher risk of financial distress and thus offer higher expected returns as fair compensation for that risk.[32] Empirically, most studies have found that in the long run a value style may earn a positive return premium relative to the market.[33] Evidence on this phenomenon is still evolving, however. For example, Phalippou (2008) found that the extra return to value is concentrated in the smallest 7 percent of equities by market value. That segment is relatively illiquid. Various commentators have suggested that, in general, value investors may earn a return premium for supplying liquidity to the market, buying when short-term excess supply causes shares to decline.

The main risk for a value investor is that he has misinterpreted a stock's cheapness. The stock may be cheap for a very good economic reason that the investor does not fully appreciate. Value investors also face the risk that the perceived undervaluation will not be corrected within the investor's investment time horizon. Questions that the value investor should ask include the following:

- How long is it expected to take for price to rise to reflect the shares' perceived higher intrinsic value?
- What catalyst (triggering event or change) will make the price rise?
- Is the expected timeframe for the price to correct acceptable?

The value investing style has at least three substyles: **low P/E**, **contrarian**, and **high yield**.[34] A low P/E investor will look for stocks that sell at low prices to current or normal earnings. Such stocks are generally found in industries categorized as defensive, cyclical, or simply out-of-favor. The investor buys on the expectation that the P/E will at least rise as the stock or industry recovers. A contrarian investor will look for stocks that have been beset by problems and are generally selling at low P/Bs, frequently below 1. Such stocks are found in very depressed industries that may have virtually no current earnings. The investor buys on the expectation of a cyclical rebound that drives up product prices and demand. A yield investor focuses on stocks

32 They postulate that distress risk is highly correlated across firms so that it is nondiversifiable and commands a premium. Some support for a risk-based explanation is provided by Kapadia (2011), who finds that higher rates of business failures are associated with higher returns for distressed stocks. He also finds that the Fama–French factors for value/growth are associated with a financial distress factor.

33 See Bodie, Kane, and Marcus (2010).

34 See Christopherson, Cariño, and Ferson (2009), chapter 24, for this classification.

that offer high dividend yield with prospects of maintaining or increasing the dividend, knowing that in the long run, dividend yield has generally constituted a major portion of the total return on equities.[35]

5.1.2 *Growth Investment Styles*

In contrast to value investors, who are more concerned with price, growth investors are more concerned with earnings. Their underlying assumption is that if a company can deliver future growth in earnings per share and its P/E does not decline, then its share price will appreciate at least at the rate of EPS growth. Growth investors generally will pay above-market earnings multiples for companies that have superior growth rates. They also tend to invest in companies in growth industries, such as technology, health care, and consumer products. Growth stocks have high sales growth relative to the overall market and tend to trade at high P/Es, P/Bs, and price-to-sales ratios (P/Ss). The major risk facing growth investors is that the forecasted EPS growth does not materialize as expected. In that event, P/E multiples may contract at the same time as EPS, amplifying the investor's losses.

The growth style has at least two substyles: **consistent growth** and **earnings momentum**. Companies with consistent growth have a long history of unit-sales growth, superior profitability, and predictable earnings. They tend to trade at high P/Es and be the leaders in consumer-oriented businesses. An example of such a growth stock as of 2011 is Becton, Dickinson & Co., a US manufacturer and distributor of medical products. Companies with earnings momentum have high quarterly year-over-year earnings growth (e.g., EPS for the first quarter of 2011 represents a large increase over EPS for the first quarter of 2010). Such companies may have higher potential earnings growth rates than consistent growth companies, but such growth is likely to be less sustainable. Some growth investors also include price momentum indicators such as relative strength indicators in their investment disciplines, relying on possible patterns of price persistence for certain (usually relatively short) time horizons.[36] (**Relative strength indicators** compare a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.)

The growth investor who buys a stock at a premium to the overall market is counting on the market to continue paying a premium for the earnings growth that a company has been providing and may continue to deliver. During an economic expansion, earnings growth is abundant—even in the depressed stocks preferred by a value investor—which *may* cause this premium to above-average growth to shrink or vanish. By contrast, when companies with positive earnings momentum become scarce, as in a slowing economy, earnings growth becomes a scarce resource commanding a higher price, and growth investors may do relatively well.[37]

5.1.3 *Other Active Management Styles*

Market-oriented investors do not restrict themselves to either the value or growth philosophies. The term "market-oriented style" (also sometimes called a blend or core style) gathers an eclectic group of approaches, with the common element that the valuation metrics of market-oriented portfolios resemble those of a broad market

35 See Siegel (2008) for a popular account and details of these substyles focused on the US experience.

36 See Chan, Jegadeesh, and Lakonishok (1999) for a discussion of price persistence and reversal. At the index level, Malin and Bornholt (2010) find that momentum strategies are profitable in developed and emerging markets.

37 See Bernstein (1995), pp. 61–62. Similarly, the results for French stocks in Eser (2010) support a "flight-to-quality" effect where investors favor growth stocks when a recession is expected because growth stocks provide a hedge against losses in wealth.

index more than those of a value or growth index, averaged over a full market cycle.[38] Market-oriented investors may be willing to buy stocks no matter where they fall on the growth/value spectrum, provided they can buy a stock below its perceived intrinsic value. They might use a discounted cash flow model or other discipline to estimate intrinsic value. Market-oriented style investors might buy a stock with a high P/E provided the price can be justified through future growth expected in EPS. They might also buy a depressed cyclical issue provided that they foresee some recovery in product pricing in the future. The potential drawback of a market-oriented active style is that if the portfolio achieves only market-like returns, indexing or enhanced indexing based on a broad equity market index will likely be the lower-cost and thus more effective alternative.

Among the recognized subcategories of market-oriented investors are market-oriented with a value bias, market-oriented with a growth bias, growth-at-a-reasonable-price, and style rotators. As the names imply, value bias and growth bias investors tilt their portfolios toward value and growth respectively, but not so distinctively as to clearly identify them as value or growth investors. They typically hold well-diversified portfolios. Growth-at-a-reasonable-price investors favor companies with above-average growth prospects that are selling at relatively conservative valuation levels compared with other growth companies. Their portfolios are typically somewhat less well diversified than those of other growth investors. Style rotators invest according to the style that they believe will be favored in the marketplace in the relatively near term.

Another characteristic often used in describing the style of equity investors is the typical market capitalization of the issues they hold. Small-capitalization equity investors (also called small-cap or small-stock investors) focus on the lowest market-capitalization stocks in the countries in which they invest. (Micro-cap is sometimes used to characterize investors in the lowest capitalization range within the small-cap segment.) The underlying premise of this style is that more opportunity exists to find mispriced stocks through research in the small-cap universe than in the less numerous and more intensely researched universe of large-cap blue chip firms.[39] Another rationale is that smaller companies tend to have better growth prospects (if their business model is sound) because their business is starting from a smaller base and their product line tends to be more focused. Also, the chance of earning a very high rate of return on one's money is much better if the starting market capitalization is small. Small-cap investors can also focus on value, growth, or market-orientation within the small-cap universe.

In some equity markets, mid-cap equity investors have defined an investment segment focusing on middle-capitalization equities; in the United States, such investors typically focus on stocks that are between the 200th and 1,000th largest by market cap, which typically constitutes 20 to 30 percent of US stock market capitalization.[40] Mid-cap investors argue that the companies in this segment may be less well researched than the largest-cap companies but financially stronger and less volatile than small-cap companies.

Large-cap equity investors focus on large-cap equities. Such investors favor the relative financial stability of large-cap issues and believe that they can add value through superior analysis and insight.

---

38 Many investors use "core" in the sense of *playing a central role in the portfolio*, as in the *core-satellite* approach to managing a portfolio of managers discussed later. A "market-oriented" portfolio may be appropriate for a central role but is not absolutely required for it. Because *core* adds a connotation of role unnecessarily, rather than focusing on characteristics, we prefer the more descriptive term "market oriented."

39 Kritzman and Page (2003). However, Ibbotson, Chen, and Hu (2011) find that that the least liquid micro-cap stocks have the highest returns, suggesting that the returns to micro-cap stocks may be partly a risk premium for illiquidity.

40 See Christopherson, Cariño, and Ferson (2009), chapter 24.

Small-cap, mid-cap, and large-cap investors are frequently also classified as value, growth, or market-oriented investors within their capitalization domain.

EXAMPLE 4

One Style or Two?

Jeff Fujimori is responsible for the investment of a new ¥10 billion contribution to the Honshu Bank's pension fund. The mandate is to invest with active managers. The equity portion of the pension plan has a broad equity market benchmark. Discuss the advantages and disadvantages of hiring a single manager in either a growth or value style, one manager in each style, or one manager in a market-oriented style.

Solution:

Value* or *growth manager (but not both).

Advantage: If the investor has a position on the desirability of these equity investment styles, this choice would lead to a portfolio expressing the clear conviction of the investor. Such a portfolio has the potential for strong gains if the investor's style is favored by the market.

Disadvantages: The choice creates tracking risk relative to the equity benchmark. Substantial underperformance may occur if the manager's style is not in favor. Furthermore, Fujimori must confirm that Honshu Bank finds it acceptable to deviate from an overall broad market orientation of the benchmark before undertaking this alternative.

Value* and *growth manager.

Advantage: We would expect this choice to have lower tracking risk relative to the benchmark than investing in a single growth or value-oriented portfolio, because it does not make an overall style bet. It is a kind of barbell approach to achieving an overall market orientation, which may have the advantage of combining the expertise of two managers.

Disadvantage: This choice may have higher overall management fees than investing in a single portfolio. The investor must rely on security selection alone to overcome the transaction costs and higher fees associated with active management.

One manager with a market-oriented style.

Advantage: This is the simplest way to invest consistently with the equity benchmark.

Disadvantage: Fujimori needs to confirm that the market-oriented style reflects an appropriate and consistent process that promises to add value, as opposed to an unfocused process that has averaged to a market orientation. With that qualification, no obvious disadvantages to this approach exist.

5.1.4 *Techniques for Identifying Investment Styles*

Two major approaches to identifying style are returns-based style analysis, which relies on portfolio returns, and holdings-based style analysis (also called composition-based style analysis), which relies on an analysis of the characteristics of individual security

holdings. The analyst can use the information from either technique to identify a manager's style for performance attribution purposes and/or to formulate expectations about the manager's future performance.

The first technique of style identification was Sharpe's (1988, 1992) **returns-based style analysis** (RBSA). This technique focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns. It involves regressing portfolio returns (generally monthly returns) on return series of a set of securities indexes. In principle, these indexes are:

- mutually exclusive;
- exhaustive with respect to the manager's investment universe; and
- distinct sources of risk (ideally they should not be highly correlated).[41]

Returns-based style analysis involves a constraint that the coefficients or betas on the indexes are nonnegative and sum to 1.[42] That constraint permits us to interpret a beta as the portfolio's proportional exposure to the particular style (or asset class) represented by the index.[43] For example, if a portfolio had a beta of 0.75 on a large-cap value index, a beta of 0 on a large-cap growth index, a beta of 0.25 on a small-stock value index, and a beta of 0 on a small-stock growth index, we would infer that the portfolio was run as a value portfolio with some exposure to small stocks. The factor weights on large-cap value, large-cap growth, small-cap value, and small-cap growth indexes are 75 percent, 0, 25 percent, and 0, respectively. (The factor weights are also known as style weights or Sharpe style weights.) We expect the portfolio to move 0.75 times whatever happens to large-cap value stocks (holding everything else constant) and 0.25 times whatever happens to small-cap value stocks (holding everything else constant).

The large-cap value index and the small-cap value index held in weights of 0.75 and 0.25, respectively, would constitute a natural benchmark for this portfolio, given that the overall fit of the model was excellent. Such a benchmark is sometimes referred to as the **normal portfolio** or normal benchmark for a manager. As defined in the reading on performance evaluation, a normal portfolio is a portfolio with exposures to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide. A manager's normal portfolio or normal benchmark in effect represents the universe of securities from which a manager normally might select securities for his portfolio.

EXAMPLE 5

The Choice of Indexes in Returns-Based Style Analysis

In the example just given in the text, the style analysis used four indexes. Suppose that instead we used the following three indexes:

- a large-cap value index

41 Sharpe (1992), examining US mutual funds, used 12 indexes representing US Treasury bills, intermediate-term government bonds, long-term government bonds, corporate bonds, mortgage-related securities, large-cap value stocks, large-cap growth stocks, mid-cap stocks, small-cap stocks, non-US bonds, European stocks, and Japanese stocks.

42 With this constraint, the model must be solved using quadratic programming (e.g., Solver in Microsoft Excel). It is possible to do a returns-based style analysis constraining the coefficients to sum to 1 but not constraining the coefficients to be nonnegative; that approach could capture elements such as the use of leverage (a negative coefficient on T-bills, included as an index).

43 Furthermore, Lobosco and DiBartolomeo (1997) have shown how to calculate approximate confidence intervals for the weights.

- a large-cap growth index
- a small stock index

We find a large weight on large-cap value, no weight on large-cap growth, and a small weight on small stocks and we conclude that the portfolio was run as a value portfolio with some exposure to small stocks. Critique the conclusion.

Solution:

The evidence does not contradict the conclusion, but does not completely validate the value characterization. In particular, the portfolio's weight on small stocks might be explained (at least in part) by a positive weight on small-cap growth. By breaking down small stocks into small-cap value and small-cap growth and running the style analysis with four indexes (including large-cap value and large-cap growth), we can remove all ambiguity.

We can use a returns-based style analysis to calculate a coefficient of determination measuring style fit. The quantity 1 minus the style fit equals selection, the fraction of return variation unexplained by style. The error term in the style analysis equation—the difference between the portfolio's return and a passive asset mix with the same style as the portfolio—represents selection return (the return from active security selection ability).

Example 6 shows the use of returns-based style analysis to independently evaluate a portfolio manager's style. In this example, Exhibit 13 is a rolling style chart showing the evolution of a portfolio's style exposures through time.

EXAMPLE 6

Returns-Based Style Analysis (1)

Giles Hébert is chief pension officer of Compagnie Minière de l'Ouest SA (CMO). One of Hébert's outside managers for the US equity portion of his portfolio is Arizona Capital Partners (ACP). Hébert is conducting a review of ACP's performance as of mid-2011. CMO decided to pursue a large-cap growth strategy for its US equity investments and selected ACP's US large-cap growth strategy for the investment of part of its allocation to US large-cap growth stocks. When the relationship was established, Hébert and ACP agreed that the Russell 1000 Growth Index fairly represents the investment universe of this strategy. CMO uses returns-based style analysis in evaluating its investment managers.

Hébert knows from the portfolio's custodian that, following its mandate, the portfolio has remained fully invested in US equities. He thus selects the following four benchmarks as the independent variables for a returns-based style analysis:

- Russell 1000 Growth Index (R1000G)
- Russell 1000 Value Index (R1000V)
- Russell 2000 Growth Index (R2000G)
- Russell 2000 Value Index (R2000V)

Hébert includes the R1000G because it is the account's benchmark. He adds the R1000V to capture the degree to which the manager may not be adhering to a growth orientation. Finally, Hébert includes the R2000G and R2000V to

capture the degree to which ACP may be failing to adhere to a large-cap orientation. Exhibit 12 gives the results of the returns-based style analysis. Hébert also notes the following facts:

- Exhibit 12 is based on the most recent three years of monthly data as of 31 March 2011.
- Exhibit 13 is based on rolling three-year monthly data ending 31 March 2011.
- For the data period shown in Exhibit 12, selection is 8.1 percent and the style fit is 91.9 percent.
- For the data period shown in Exhibit 12, the annualized active return is –0.38 percent and the annualized tracking risk is 6.58 percent.

Exhibit 12 Returns-Based Style Analysis: Effective Style as of 31 March 2011

Note: Based on 36 months of data ending 31 March 2011.

Exhibit 13 Style History: A Rolling Style Chart, 30 September 2000 to 31 March 2011

Using the information given, address the following:

1. State and justify whether the ACP product in which CMO is invested is accurately described as a US large-cap growth active equity product.
2. Characterize the historical style of the ACP product and evaluate whether the historical analysis supports the answer to the previous question.
3. Calculate and interpret the information ratio of the ACP product.
4. Recommend a course of action to CMO.

Solution to 1:

The ACP product cannot accurately be described as a US large-cap growth active equity product. The product does indeed appear to be actively managed, because the fraction of return variation unexplained by style (selection) is 8.1 percent; the product is not merely replicating the returns on more-passive benchmarks. The very low weights on the R2000G and R2000V small-cap indexes, at 4 percent and 0 respectively, also confirm that the product is essentially large-cap. Furthermore, the largest factor weight at 57.2 percent is on the manager's large-cap benchmark, the R1000G. However, the product has a substantial factor weight of 38.9 percent on large-cap value as represented by the R1000V. Considering all these facts, the portfolio appears to be an actively managed large-cap market-oriented portfolio with a growth bias.

Solution to 2:

As Exhibit 13 shows, the ACP product has generally had substantial exposure to both large-cap growth and large-cap value; the factor weight on large-cap value was greatest in the first third of the overall period, peaking in 30 September 2003 when it exceeded the weight on large-cap growth. In the middle period, the factor weight on large-cap growth increased at the expense of large-cap value; however, the weight on small-cap stocks, particularly small-cap value, increased to noticeable levels. Since the end of 2008, the style weights have been fairly close to the values shown in Exhibit 12. The ACP product appears to always have had

a meaningful weight on value. For the most part, the ACP product has adhered to its specified large-cap orientation. Thus the historical analysis supports the conclusions reached in the previous question.

Solution to 3:

The information ratio is the mean historical active return divided by the tracking risk, or –0.38%/6.58% = –0.0578. For each percentage point of tracking risk, the ACP product earned approximately –0.06 percentage points of active return. Thus the portfolio's active risk has been unrewarded.

Solution to 4:

CMO wants to pursue a large-cap growth strategy for its US equity investments. The ACP US large-cap growth active equity product does not meet its needs because it is essentially a large-cap market-oriented fund with a growth bias. The product was not correctly represented by ACP, which indicated that the Russell 1000 Growth Index fairly represented the product's investment universe. An appropriate recommendation would be to move the funds invested in the ACP growth strategy to another investment manager.

Example 7 shows an error that can occur in returns-based style analysis.

EXAMPLE 7

Returns-Based Style Analysis (2)

Frank Harvey is analyzing a US equity mutual fund that states the investment objective of investing for growth and income, with an orientation to mid-cap stocks within the universe of US-domiciled companies. Harvey may select from the following indexes for use in a returns-based style analysis:

- the S&P/Citigroup 500 Growth and Value indexes, which have a large-cap orientation;
- the Russell 2000 Growth and Value indexes, which have a small-cap orientation;
- the Russell 1000 Growth and Value indexes, which include large-cap and mid-cap shares;
- the Russell Top 200 Growth and Value indexes, which together represent the 200 largest market-cap securities in the Russell 1000 Index; and
- the Russell Midcap Growth and Value indexes, which together represent the 800 smallest market-cap issues in the Russell 1000 Index (the Russell Top 200 Index and the Russell Midcap Index together constitute the Russell 1000 Index).

Harvey selects the S&P/Citigroup 500 Growth and Value indexes and the Russell 2000 Growth and Value indexes for the style analysis.

1. Critique Harvey's selection.
2. Recommend a more appropriate selection of indexes.

Solution to 1:

Harvey's choice omits from coverage a substantial number of stocks: those with market caps too small for the S&P 500 but too large for the Russell 2000. Many of the excluded stocks could be characterized as mid-cap. This omission is significant because Harvey should seek to confirm whether the fund being

analyzed is actually oriented to mid-cap stocks as it claims to be. The selection of indexes should be mutually exclusive and at least approximately exhaustive with respect to the investment manager's universe. The results of an RBSA using a faulty set of indexes can be misleading.

Solution to 2:

The following selection of indexes would be best:

- Russell Top 200 Growth
- Russell Top 200 Value
- Russell Midcap Growth
- Russell Midcap Value
- Russell 2000 Growth
- Russell 2000 Value

This selection of indexes is not only exhaustive, in contrast to the one critiqued in Part 1, but also adequate for determining a distinct style weight for mid-cap issues (because it breaks out mid-cap issues via the Russell Midcap indexes).

A less satisfactory selection, but an improvement over Harvey's selection, is the Russell 1000 Growth and Value indexes and the Russell 2000 Growth and Value indexes. This selection is exhaustive, in contrast to Harvey's selection, but would be inferior to the one recommended: It does not suffice to give a specific weight for mid-cap because the Russell 1000–based indexes include both large- and mid-cap stocks.

The second major broad approach to style identification is **holdings-based style analysis**, which categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time. For example, the analyst may examine the following variables:

- *Valuation levels.* A value-oriented portfolio has a very clear bias toward low P/Es, low P/Bs, and high dividend yields. A growth-oriented portfolio exhibits the opposite characteristics. A market-oriented portfolio has valuations close to the market average.
- *Forecast EPS growth rate.* A growth-oriented portfolio will tend to hold companies experiencing above-average and/or increasing earnings growth rates (positive earnings momentum). Typically, trailing and forecast EPS growth rates are higher for a growth-oriented portfolio than for a value-oriented portfolio. The companies in a growth portfolio typically have lower dividend payout ratios than those in a value portfolio, because growth companies typically want to retain most of their earnings to finance future growth and expansion.
- *Earnings variability.* A value-oriented portfolio will hold companies with greater earnings variability because of the willingness to hold companies with cyclical earnings.
- *Industry sector weightings.* Industry sector weightings can provide some information on the portfolio manager's favored types of businesses and security characteristics, thus furnishing some information on style. In many markets, value-oriented portfolios tend to have larger weights in the finance and utilities sectors than growth portfolios, because of these sectors' relatively high dividend yields and often moderate valuation levels. Growth portfolios often have relatively high weights in the information technology and health care sectors, because historically these sectors have often included numerous high-growth enterprises. Industry sector weightings must be interpreted with caution,

however. Exceptions to the typical characteristics exist in most if not all sectors, and some sectors (e.g., consumer discretionary) are quite sensitive to the business cycle, possibly attracting different types of investors at different points in the cycle.

Example 8 illustrates the use of a holdings-based style analysis.

EXAMPLE 8

Do Portfolio Characteristics Match the Stated Investment Style?

Charles Simpson is a consultant analyzing a portfolio for consistency with the portfolio manager's stated value investment style. Exhibit 14 summarizes the characteristics of the portfolio and those of a representative market benchmark portfolio.

Exhibit 14 Simpson's Portfolio Analysis (1)

	Portfolio	Market Benchmark
Number of stocks	30	750
Weighted-average market cap	$37 billion	$45 billion
Dividend yield	3%	2.1%
P/E	15	20
P/B	1.2	2
EPS growth (5-year projected)	10%	12%
Sector		
Consumer Discretionary	18%	13%
Consumer Staples	5	10
Energy	11	9
Finance	25	20
Health Care	2	7
Industrials	10	9
Information Technology	2	7
Materials	10	8
Telecommunications	5	10
Utilities	12	7

What can Simpson infer about the firm's investment style?

Solution:

Simpson can be fairly confident that the manager is following a value style. The portfolio's P/E and P/B are below those of the benchmark, but the dividend yield is above that of the benchmark, consistent with a value bias. EPS growth expectations that are slightly below average support the inference that the portfolio is not growth oriented. The sector breakdown suggests value as well. Finance and utilities tend to have relatively high dividend yield and moderate P/Es. On the

other hand, sectors with a greater growth orientation, in particular health care and information technology, are underweighted. Thus the portfolio appears to follow a value discipline.

In Example 8, Simpson included some of the types of variables previously mentioned in the text (market capitalization and valuation ratios, such as dividend yield, P/E, P/B, and industry sector weightings) but not others (e.g., earnings variability). Such variation is typical of holdings-based style analysis. Holdings-based analysis involves a number of modeling decisions. One decision is the set of characteristics that discriminate among different styles: Analysts use a variety of sets of discriminating characteristics. The number of discriminating characteristics may run from one (such as the value of the P/B) to a large set, as in the Barra fundamental multifactor risk models, commercial models that have been used in holdings-based analysis. Besides modeling characteristics, a decision must be made on aggregating security-level information. A security may be assigned:

- to value exclusively or to growth exclusively in all instances;
- to value exclusively or to growth exclusively but only if the value of some characteristic exceeds or is less than a specified threshold value; or
- in part to growth and in part to value.

Threshold values must be specified in order to make exclusive (also known as "0-1") assignments. For example, in the first-given assignment method, the market value–weighted average value of an attribute (or set of attributes) may determine the cutoff point for assigning a stock to growth or to value. To illustrate the second approach, assuming that the classification focuses on the P/E, if the P/E is below a specified value (e.g., 16.50) it would be assigned to value; if it is above a higher value (e.g., 24.50) it would be assigned to growth, and if it is in between (i.e., between 16.50 and 24.50), it would be viewed as neither value nor growth. In the description of the final assignment approach, "in part" means up to 100 percent so that the assignments to value and growth sum to 100 percent. To use the terminology of Lazzara (2004), in the first two approaches, style is viewed as a *category*; in the third approach, in which a stock can be "spread over" growth and value, style is viewed as a *quantity*.

Exhibit 15 contrasts the advantages and disadvantages of returns-based and holdings-based style analysis. Because of its less intense data needs, returns-based style analysis might often be performed first and suffice by itself; however, an analysis of holdings obviously can reveal important details of a manager's investment discipline. Both approaches have uses in practice.

Exhibit 15 Two Approaches to Style Analysis: Advantages and Disadvantages

	Advantages	Disadvantages
Returns-based style analysis	■ Characterizes entire portfolio ■ Facilitates comparisons of portfolios ■ Aggregates the effect of the investment process ■ Different models usually give broadly similar results and portfolio characterizations ■ Clear theoretical basis for portfolio categorization ■ Requires minimal information ■ Can be executed quickly ■ Cost effective	■ May be ineffective in characterizing current style ■ Error in specifying indexes in the model may lead to inaccurate conclusions
Holdings-based style analysis	■ Characterizes each position ■ Facilitates comparisons of individual positions ■ In looking at present, may capture changes in style more quickly than returns-based analysis	■ Does not reflect the way many portfolio managers approach security selection ■ Requires specification of classification attributes for style; different specifications may give different results ■ More data intensive than returns-based analysis

The next section discusses the increasing variety of style indexes available.

5.1.5 *Equity Style Indexes*

Significant debate exists—and probably should—about how to divide the stock universe into growth and value components. Allocating stocks between growth and value indexes can be as simple as ranking them by a single variable such as P/B, or it can involve multiple variables. The clear trend has been to construct style indexes based on multiple variables.[44] Typical elements in many classification approaches include price, earnings, book value, dividends, and past and projected growth rates in these or other elements. Each element can be part of more than one factor in a multifactor growth/value stock allocation system, creating some (probably) benign redundancy. Attention to the details of style index construction has increased as index publishers compete to serve and capture licensing fees from ETFs and other investment products.

Exhibit 16 summarizes information on some major style indexes. Characteristically, all the indexes in this exhibit essentially feature holding-based style analysis, focusing on individual stock or company attributes. In the exhibit, "overlap" means that some securities may be assigned in part to both value and growth. **Buffering** refers to rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style. Buffering reduces turnover in style classification and serves to reduce the transaction expenses of funds that track the style index.

44 With the replacement of the S&P/BARRA style indexes (which were based only on P/B) by the S&P/Citigroup style indexes in December 2005, all major commercial style indexes employ multiple factors.

Exhibit 16 Select Style Index Families: Principal Growth/Value Allocation Criteria and Rebalancing Rules

Index Family	Criteria		Rebalancing	Comments
Dow Jones Wilshire	Projected P/E Projected earnings growth P/B Dividend yield Trailing P/E Trailing earnings growth		March, September (with buffering)	Two categories (value, growth), no overlap.
FTSE	*Value* P/B P/S Dividend yield Price/Cash flow *Growth* 3-year historical sales growth rate 3-year historical EPS growth rate 2-year forward sales growth estimate 2-year forward EPS growth estimate Internal growth rate (ROE × [1 – Payout ratio]) Long-term Past book value growth		June and December	Two categories (value, growth). Constituents are members of the FTSE All-World Index, and Value and Growth indexes are calculated for the FTSE World Index, derivatives of the FTSE World Index, plus regional and country indexes in the FTSE World index. Constituents showing high growth (value) characteristics are assigned to growth (value); an intermediate group is apportioned to both growth and value.
Morningstar	*Value*	*Weight*	June, December (with buffering)	Three categories (value, core, growth), no overlap.
	Price/Projected earnings	50.0%		
	P/B	12.5		
	P/S	12.5		
	Price/Cash flow	12.5		
	Dividend yield	12.5		
	Growth	*Weight*		
	Long-term projected earnings growth	50.0%		
	Past earnings growth	12.5		
	Past sales growth	12.5		
	Past cash flow growth	12.5		
	Past book value growth	12.5		
MSCI	*Value* P/B 12-month forward earnings/Price Dividend yield *Growth* Long-term forward EPS growth rate Short-term forward EPS growth rate Long-term historical EPS growth trend Long-term historical sales per share		May, November (with buffering)	Two categories (value, growth), no overlap.
Russell	P/B IBES growth estimates		Approximately June 30	Two categories (value, growth), with overlap.

Exhibit 16 (Continued)

Index Family	Criteria	Rebalancing	Comments
S&P/Citigroup World	*Value* Book/Price Sales/Price Cash flow/Price Dividend yield *Growth* 5-year average internal growth rate* 5-year historical EPS growth rate 5-year historical sales per share growth rate	July 1	Style Index series: two categories (value, growth), with overlap. Pure Style Index series: two categories (value, growth), no overlap.

*The internal growth rate is defined as Return on equity × Earnings retention rate.
Source: www.djindexes.com, www.ftse.com, http://indexes.morningstar.com, www.msci.com, www.russell.com/US/Indexes, http://www.globalindices.standardandpoors.com.

As Exhibit 16 illustrates (and consistent with our earlier discussion of holdings-based style analysis), style index publishers use growth and value either as categories (no overlap) or as quantities (with overlap).[45] If MSCI, a categorizer, assigns a stock to the growth or value category, the company will be labeled as either growth or value and is never divided between the two. In contrast, index providers that treat growth and value as quantities will often assign a stock partly to growth and partly to value. This split allocation recognizes that some stocks do not fit neatly into either growth or value. Among the style index families in Exhibit 16, Morningstar confronts this issue most directly by explicitly distinguishing three mutually exclusive categories (value, core, and growth). The two-category value/growth split of other index families reflects the consideration that most active equity mandates specifying style are an order for the portfolio manager to manage according to one of these two styles (value or growth).

EXAMPLE 9

Returns-Based and Holdings-Based Style Analyses

John Whitney is a consultant being asked to evaluate a portfolio managed by California Investment Management. He uses proprietary software to do both returns-based and holdings-based style analyses.

Returns-Based Style Analysis

- Effective Style for 36 monthly periods ending 30 June 2011
- 44.9 percent Growth
- 55.1 percent Value
- Style Fit: 99.5 percent; Selection: 0.5 percent

45 See Lazzara (2004) for more information.

Holdings-Based Style Analysis (Based on 30 June 2011 Holdings)

Exhibit 17 Holdings-Based Analysis, 30 June 2011

	Portfolio	Market Benchmark	Difference
P/E	18.34	19.54	–1.20
P/B	2.87	2.96	–0.09
Dividend yield	1.53%	1.70%	–0.17%
Size (Market-Cap) Analysis			
Largest quintile	25.40%	24.87%	0.53%
Quintile 2	22.34	26.00	–3.66
Quintile 3	23.75	24.37	–0.62
Quintile 4	22.03	21.74	0.29
Smallest quintile	6.48	3.02	3.46

How should Whitney interpret the style analysis results from the two approaches?

Solution:

The two methods offer complementary and essentially confirming views of the portfolio. The holdings-based analysis suggests a market-oriented portfolio with a very slight tilt to value (the portfolio's P/E and P/B both are slightly lower than those of market benchmark, suggesting a tilt toward value, although dividend yield is also lower, suggesting a tilt toward growth). The portfolio also seems to have a slight bias toward smaller-cap stocks relative to the market benchmark.

The returns-based analysis produces similar conclusions. The results also suggest a market orientation, with perhaps a slight leaning toward value. The style fit (R^2) is very high at 99.5 percent. Any performance difference between this portfolio and the market benchmark can likely be attributed to the slight tilts toward value and smaller stocks.

5.1.6 *The Style Box*

Today, the style box is probably the most popular way of, literally, looking at style. Although an early version of the style box with four component boxes appeared in Sharpe's 1992 paper (see Exhibit 11), his original style divisions were only between growth and value among large-cap funds and among large-cap, midcap, and small-cap funds on the market capitalization dimension. The most widely recognized version of the style box is probably Morningstar's because of that firm's high-profile use of the 3×3-style box to categorize mutual funds and, more recently, individual common stocks. The Morningstar style box, shown in Exhibit 18, divides a fund portfolio or stock universe by market capitalization (large-cap through mid-cap to small-cap, from top to bottom), and style (value through blend to growth, from left to right), creating a total of nine boxes. Morningstar uses holdings-based style analysis and classifies roughly one-third of its stock universe as growth, one-third as value, and another third as blend. We see from Exhibit 18 that most of the value of Vanguard Mid-Cap Growth Fund is indeed centered in mid-cap growth holdings as defined by Morningstar.

Exhibit 18 Morningstar Style Box for Vanguard Mid-Cap Growth Fund

	Value	Blend	Growth
Large-cap	0	2	5
Mid-cap	7	27	58
Small-cap	1	0	0

Source: www.morningstar.com, October 2011.

Different criteria may lead to noticeably different style box characterizations for the same portfolio. The techniques used to categorize a stock or the components of a portfolio by size are relatively standard, if the size division is based on market capitalization.[46] The specifics of the techniques used to distinguish among value, growth, and (sometimes) market-oriented stocks, however, are almost as diverse as the firms selling style-based indexes and financial products/services can make them. Price relative to earnings or book value or some other measure(s) typically forms the basis of value categorization and measurement, whereas historical, forecast, or implied (by market valuation) growth in earnings, sales, or dividends typically forms the basis for growth categorization. The market-oriented category is characterized by a mix of growth and value characteristics in a portfolio. The market-oriented designation usually reflects an inability to clearly categorize a stock or a portfolio as definitively growth or value in nature. In rare cases (e.g., Morningstar's style box and the Morningstar equity style indexes), a technique makes a deliberate attempt to define a group of stocks as being *neither* growth *nor* value. An alternative interpretation is that the group constitutes a *blend* of growth and value characteristics.

The numbers in each box represent the percentage of this fund's portfolio value consisting of stocks that fall in that style box (using Morningstar's own index classification). For example, in the Vanguard Mid-Cap Growth Fund, 58 percent of the portfolio by market value falls in the mid-cap growth box and 27 percent falls in the mid-cap blend box.

5.1.7 *Style Drift*

Professional investors view inconsistency in style, or **style drift**, as an obstacle to investment planning and risk control. Ordinarily a value manager holding what is perceived by the market to be a growth stock would have some trouble explaining that holding to his or her clients. One stock in isolation may not be much of an issue; but if a manager is hired as a value manager and over time begins to hold stocks that would be primarily characterized as growth stocks, that manager can be said to be experiencing style drift. Investors should be concerned about style drift because they hired the investment manager (bought the mutual fund or unit trust) to achieve a particular exposure to an equity market segment—be it large-cap, mid-cap, small-cap, value, growth or market-oriented. Managers are also hired for their expertise in a given style. Consequently, when a manager begins to stray from her stated style to the style currently in favor, the investor understandably should worry—the investor may no longer be getting exposure to the particular style desired, and the manager may now be operating outside her area of expertise.

46 Most float-weighted indexes rank companies by total capitalization before adjusting their index weightings for float.

EXAMPLE 10

Style Drift or Not?

Six months later, Charles Simpson is reexamining the portfolio that he analyzed in Example 8. In that example, we determined that the portfolio was managed according to a value style. Exhibit 19 provides the portfolio's current characteristics. What can Simpson infer about consistency of the firm's investment style?

Exhibit 19 Simpson's Portfolio Analysis (2)

	Portfolio	Market Benchmark
Number of stocks	45	750
Weighted-average market cap	$46 billion	$45 billion
Dividend yield	2.0%	2.1%
P/E	19	20
P/B	1.9	2
EPS growth (5-year projected)	13%	12%
Sector		
Consumer Discretionary	15%	13%
Consumer Staples	8%	10%
Energy	11%	9%
Finance	22%	20%
Health Care	5%	7%
Industrials	10%	9%
Information Technology	5%	7%
Materials	10%	8%
Telecommunications	5%	10%
Utilities	9%	7%

Solution:

The portfolio's style has definitely drifted from value (in Example 8) to become market oriented. Looking at the valuation measures, the portfolio does not deviate much from the market benchmark. Although the sector weights still lean very slightly toward value (see the weights on finance, utilities, and information technology, and health care), the magnitudes of these biases relative to the market benchmark have decreased significantly compared with the prior period.

5.2 Socially Responsible Investing

Socially responsible investing, also called ethical investing, integrates ethical values and societal concerns with investment decisions. With increasing demand for SRI coming from individual investors, public pension fund sponsors, religious-affiliated groups, and others in many of the world's major markets, an increasing number of equity portfolio managers are responsible for, or have contact with, SRI mandates.

SRI commonly involves the use of stock screens involving SRI-related criteria. SRI stock screens include negative screens and positive screens. Negative SRI screens apply a set of SRI criteria to reduce an investment universe to a smaller set of securities satisfying SRI criteria. SRI criteria may include:

- industry classification, reflecting concern for sources of revenue judged to be ethically questionable (tobacco, gaming, alcohol, and armaments are common focuses); and
- corporate practices (for example, practices relating to environmental pollution, human rights, labor standards, animal welfare, and integrity in corporate governance).

Positive SRI screens include criteria used to identify companies that have ethically desirable characteristics. Internationally, SRI portfolios most commonly employ negative screens only, a smaller number employ both negative and positive screens, and even fewer employ positive screens only.[47] The particulars of the SRI screening process should reflect the concerns and values communicated by the client.

Portfolio managers should be alert to an SRI discipline's effects on a portfolio's financial characteristics. In particular, managers should track any style biases induced by the SRI portfolio selection process. For example, applying a negative screen, the portfolio manager may exclude (because of environmental concerns) companies from basic industries and energy, which sometimes present a concentration of value stocks; as a result the portfolio could have a growth bias.[48] SRI mutual funds have been documented to have an average market-cap bias toward small-cap shares.[49] At least two benefits for the client can result from measuring and managing these style biases. First, the portfolio manager may be able to address the SRI mandate fully while neutralizing any style biases inconsistent with the client's financial objectives or risk tolerance. Second, the manager can choose an appropriate performance benchmark given an accurate picture of the SRI portfolio's style. Among the methods used to identify and measure progress toward addressing issues of style bias is returns-based style analysis.

5.3 Long–Short Investing

Whereas style investing is concerned with portfolio characteristics (low P/E, high earnings growth, etc.), long–short investing focuses on a constraint. Essentially, many investors face an investment policy and/or regulatory constraint against selling short stocks. Indeed, the constraint is so common and pervasive that many investors do not even recognize it as a constraint.

In a traditional long-only strategy, the value added by the portfolio manager is called **alpha**—the portfolio's return in excess of its required rate of return, given its risk. Equivalently, alpha is the portfolio's return in excess of that on a risk-matched benchmark. In a market-neutral long–short strategy, however, the value added can be equal to two alphas. This is because the portfolio manager can use a given amount of capital to purchase a long position and to support a short position. One alpha can come from the long position and another from the short position. In addition, a market-neutral strategy is constructed to have an overall zero beta and thus show

47 See Derwall, Koedijk, and Ter Horst (2011) for a discussion of the performance of negatively and positively screened SRI investments.

48 For example, see Guerard (1997) and Statman and Glushko (2009) who find a tilt towards growth for SRI investments, and Bauer, Koedijk, and Otten (2005), who found a growth bias tendency among German, US, and UK mutual funds.

49 See Bauer, Koedijk, and Otten and references therein.

a pattern of returns expected to be uncorrelated with equity market returns. As discussed later, the alpha from such a strategy is **portable**—that is, it can be added to a variety of different systematic (beta) risk exposures.

In the basic long–short trade, known as a **pairs trade** or pairs arbitrage, an investor is long and short equal currency amounts of two common stocks in a single industry (long a perceived undervalued stock and short a perceived overvalued stock), and the risks are limited almost entirely to the specific company risks. Even such a simple convergence trade can go terribly wrong, however, if the value of the short position surges and the value of the long position collapses.

Probably the greatest risk associated with a long–short strategy involves leveraging. In order to magnify the difference in alphas between two stocks, long–short managers (in particular hedge fund managers) sometimes leverage their capital as much as two to three times using borrowed money. Although leverage magnifies the opportunity to earn alpha, it also magnifies the possibility that a negative short-term price move may force the manager to liquidate the positions prematurely in order to meet margin calls (requests for additional capital) or return borrowed securities.

5.3.1 *Price Inefficiency on the Short Side*

Some investors believe that more price inefficiency can be found on the short side of the market than the long side for several reasons.

First, many investors look only for undervalued stocks, but because of impediments to short selling, relatively few search for overvalued stocks. These impediments prevent investor pessimism from being fully expressed. For example, in order to short a stock, a short seller must borrow the shares from someone who already owns them.[50] When the original investor wants to sell, the securities loan is called and the short seller must return the stock. When many investors are willing to lend the stock, a replacement loan of stock is quickly arranged. When a stock is a popular short (e.g., many internet stocks during the late 1990s) and few shares are available to borrow, the short seller may have to cover the loan by buying back the stock at an inopportune time.

Second, opportunities to short a stock may arise because of management fraud, "window-dressing" of accounts, or negligence. Few parallel opportunities exist on the long side because of the underlying assumption that management is honest and that the accounts are accurate. Rarely do corporate managers deliberately understate profits.

Third, sell-side analysts issue many more reports with buy recommendations than with sell recommendations.[51] One explanation for this phenomenon is related to commissions that a recommendation may generate: Although most customers may be potential buyers of a stock, only those who already own shares or who are short sellers—usually a smaller group—can sell it. Moreover, those customers who already own a stock may become angry when an analyst issues a sell recommendation because it can cause them to lose money.[52]

Fourth, sell-side analysts may be reluctant to issue negative opinions on companies' stocks for reasons other than generic ones such as that a stock has become relatively expensive. Most companies' managements have a vested interest in seeing their share price rise because of personal shareholdings and stock options. After an analyst issues a sell recommendation, therefore, he can find himself suddenly cut

50 Borrowing can be done in a number of ways. Institutional investors typically borrow/lend shares through securities lending programs run by custodian banks or prime brokers.

51 See Womack (1996) and Dhiensiri, Mandelker, and Sayrak (2005) for evidence on the distribution of buy and sell recommendations.

52 Irvine (2000) provides evidence that sell-side analysts' choice to cover a security is positively related to the security's potential to generate commission revenue for their firm. Groysberg, Healey, and Maber (2011) find that analyst compensation is related to the firm revenue generated.

off from communicating with management and threatened with libel suits.[53] His employer may also face the prospect of losing highly lucrative corporate finance business.[54] Although such retaliations have occurred, they are not consistent with the Best Practice Guidelines Governing Analyst/Corporate Issue Relations sponsored by the CFA Centre for Financial Market Integrity and the National Investor Relations Institute. Furthermore, despite any such pressures, CFA Institute members and candidates are bound by the Code of Ethics and Standards of Professional Conduct, including Standard I(B) requiring independence and objectivity.[55]

Long–short strategies can make better use of a portfolio manager's information because both rising and falling stocks offer profit potential. Rather than simply avoiding a stock with a bad outlook, a long–short manager can short it, thereby earning the full performance spread.

5.3.2 *Equitizing a Market-Neutral Long–Short Portfolio*

A market-neutral long–short portfolio can be **equitized** (given equity market systematic risk exposure) by holding a permanent stock index futures position (rolling over contracts), giving the total portfolio full stock market exposure at all times. In carrying out this strategy, the manager may establish a long futures position with a notional value approximately equal to the value of the cash position resulting from shorting securities. Equitizing a market-neutral long–short portfolio is appropriate when the investor wants to add an equity-beta to the skill-based active return the investor hopes to receive from the long–short investment manager. The rate of return on the total portfolio equals the sum of the gains or losses on the long and short securities positions, the gain or loss on the long futures position, and any interest earned by the investor on the cash position that results from shorting securities, all divided by the portfolio equity.

Depending on carrying costs and the ability to borrow ETF shares for short selling, ETFs may be a more attractive way than futures to equitize or de-equitize a long–short alpha over a longer period than the life of a single futures contract. The general ease of borrowing ETF shares for institutional-sized short-sale transactions, as well as the fact that the fund's expense ratio lowers the expected cost of shorting, can make shorting ETFs an attractive alternative to rolling short futures contracts.[56]

A long–short spread can be transported to various asset classes. An investment with no systematic risk should earn the risk-free rate. Therefore, a market-neutral portfolio's performance should be measured against a nominally risk-free rate such as a Treasury bill return, provided the portfolio is truly market neutral rather than simply leveraged equity. If the long–short portfolio has been equitized, then it should be treated as equity, with returns benchmarked against the index underlying the equitizing instrument.

5.3.3 *The Long-Only Constraint*

Long–short strategies have an inherent efficiency advantage over long-only portfolios. That inherent advantage is the ability to act on negative insights that the investor may have, which can never be fully exploited in a long-only context. First, consider

53 Lim (2001) finds evidence consistent with this hypothesis.

54 See Michaely and Womack (1999). Sette (2011) finds that the recommendations of analysts affiliated with the lead underwriter in an IPO are significantly more optimistic than those of analysts affiliated with the co-managers.

55 See the *Standards of Practice Handbook* (2010). Furthermore, a variety of self-regulatory organizations (e.g., the New York Stock Exchange in the United States) have issued rules for their members concerning analyst conflicts of interest.

56 Individual investors often find it difficult to borrow a small number of ETF shares or other securities to sell short. Small stock loan transactions are often uneconomic for a brokerage firm to arrange.

the example of the long-only investor whose benchmark is the FTSE 100 and whose portfolio holds 45 stocks. One way of thinking about that portfolio is to characterize each stock held relative to that stock's weight in the FTSE 100. A stock that is 4 percent of the portfolio but whose index weight is 3 percent can be said to have an active weight of 1 percent. A stock not included in the portfolio but whose index weight is 5 percent is said to have an active weight of –5 percent, and so on.

Looking at the portfolio this way, the investor can think of the portfolio as being long–short (positive active weights/negative active weights) around the FTSE 100 index. The problem with this portfolio, however, is that its maximum short position (negative active weight) in any given stock is limited by that stock's index weight. If the investor has a strong negative view on a company with a 5 percent index weight, the best she could do is not to hold it at all. On the other hand, if the investor has a very favorable view on a company with a 1 percent index weight, she can (at least theoretically) invest the entire portfolio in that company. The bottom line is that the investor's opportunity set is not symmetric.

A true long–short portfolio, built around a cash benchmark, solves this problem of symmetry. Subject to borrowing constraints and other risks outlined above, a long–short portfolio allows an investor to fully exploit both positive and negative views on a stock. One significant caveat exists, however. The investor needs to have both positive and negative insights about stocks in the investment universe. Stocks excluded from further research because they fail to pass some preliminary screen are not necessarily good candidates for shorting.

5.3.4 *Short Extension Strategies*

Short extension strategies (also known as partial long–short strategies) modify equity long-only strategies by specifying the use of a stated level of short selling. These strategies attempt to benefit from a partial relaxation of the long-only constraint while controlling risk by not relaxing it completely. In contrast to market-neutral long–short strategies which specify long and short positions of equal value and an overall market beta of zero, short extension strategies are generally designed to have a market beta of one with long positions of 100 percent + x percent and short positions of x percent of capital invested. For example, a common implementation of the short extension strategy is a 130/30 portfolio. In this type of portfolio, for every €100 received from the client, the portfolio manager shorts 0.30(€100) = €30 worth of securities and invests €100 + €30 = €130 long—the initial €100 plus €30 provided by short sales proceeds. The costs of a short extension strategy include trade execution costs and stock loan fees paid to brokers lending securities for short sale.

The idea behind short extension strategies is that the partial relaxation of the long-only constraint allows the portfolio manager to make more efficient use of his or her information. In a long-only portfolio, the manager's maximum response to negative information is to avoid holding the stock (selling an existing position or not adding it to the portfolio). With a short extension strategy, the manager can also go short the stock. This shorting activity has the follow-on effect of releasing money with which to take on larger long positions than would otherwise be possible (apart from using borrowed money). That is to say, every €1 of shorts allows a portfolio manager to invest €1 in long positions that he would not otherwise have been able to establish. That €1 in longs could be an addition to an equity already held or an entirely new equity. This is an important point because the long-only constraint not only limits the portfolio manager's ability to take advantage of negative information, but also limits his or her ability to exploit positive information.

A 130/30 short extension strategy is inherently different from a 100/0 long-only strategy plus a 30/30 strategy. The key difference is that in the 130/30 strategy, portfolio decisions on long and short positions are coordinated, whereas with a combination of 100/0 and 30/30 strategies they are generally not. In managing a 130/30 portfolio,

the portfolio manager thinks in terms of a single portfolio rather than two separate portfolios. Separate 30/30 and 100/0 strategies, by contrast, may be uncoordinated to the extent of having offsetting positions in the two portfolios, particularly if the 100/0 strategy is an indexed portfolio. For example, the 100/0 strategy could have a 0.5 percent long position in an issue, matching the issue's benchmark weight, at the same time that the 30/30 strategy has a short position (e.g., –2 percent) in the issue.

A short extension strategy has several potential advantages. In contrast to a long–short market neutral portfolio that is equitized using futures or swaps, a short extension strategy can be established even in the absence of a liquid swap or futures market. Another advantage is that relaxing the long-only constraint even to the extent of 20 percent to 30 percent can result in an appreciable increase in the proportion of a manager's investment insight that is incorporated in the portfolio. The long-only constraint's effects on the portfolio manager's opportunity set are more serious in the case of negative information about small and mid-sized companies than they are in the case of such information about large-sized companies, given that the manager's benchmark is market capitalization weighted. Therefore, relaxing the long-only constraint helps the portfolio manager first in the place where the long-only constraint is most limiting, namely, stocks with small market capitalizations.

A disadvantage of short extension strategies is that they gain their market return and earn their alpha from the same source. By contrast, with an equitized long–short market neutral portfolio, it is possible to earn the market return from one source and the alpha from another. This is an appealing feature to investors because it gives them flexibility to pursue alpha wherever it may be found without having to adjust their strategic asset allocation.

Short extension strategies also differ from long–short market neutral strategies in how investors tend to perceive them. Because they are beta zero, long–short market neutral strategies are typically seen by investors as an alternative investment (even if the underlying investments are equities). Short extension strategies, however, are often seen as a substitute for long-only strategies in an investor's portfolio largely because of their inherent market exposure.

EXAMPLE 11

Long–Short and Market Structure

Jim Summers is being asked to investigate two alternatives for his company's pension plan. The first is a market-oriented active long-only portfolio benchmarked to the FTSE 100 index. Only moderate tracking risk with respect to the FTSE 100 is acceptable. The second alternative involves building a long–short portfolio using British stocks and then overlaying that portfolio with FTSE 100 futures. Summers is familiar with the FTSE 100 index and knows that the nine largest stocks account for slightly more than 50 percent of the index's weight. Explain a rationale for choosing a long–short strategy.

Solution:

Summers recognizes that a market-oriented active manager will have some difficulty outperforming the FTSE 100 index because relatively few stocks make up such a large portion of the index's weight. He reasons that if the portfolio is to be market oriented, the investment manager will have to produce a portfolio with an average market capitalization somewhat in line with the index. The fact that only nine stocks make up half the index weight means that roughly half of the portfolio value will also need to be concentrated in these largest companies. The availability of insights concerning these nine stocks (a relatively small number) would have an important effect on the portfolio's benchmark-relative

results. Summers concludes that this concentration of market value in a small number of issues will hinder the market-oriented active manager's ability to outperform the benchmark.

Summers then examines the long–short approach and quickly concludes that not only can the investment manager take equivalent long or short positions in all 100 stocks in the index, to increase the opportunity set the manager may also be able to use stocks not included in the index.

5.4 Sell Disciplines/Trading

Equity portfolios are not unchanging. Besides sales associated with rebalancing or a change in asset allocation, investors may sell stocks from their portfolios to raise needed cash or replace existing holdings with other stocks. Turnover may be related to the investment discipline. Several recognized categories of selling disciplines exist.

First, an investor can follow a strategy of substitution. In this situation, the investor is constantly looking at potential stocks to include in the portfolio and will replace an existing holding whenever a better opportunity presents itself. This strategy revolves around whether the new stock being added will have a higher risk-adjusted return than the stock it is replacing net of transaction costs and taking into account any tax consequences of the replacement. Such an approach may be called an opportunity cost sell discipline. Based on the portfolio manager's ongoing review of portfolio holdings, the manager may conclude that a company's business prospects will deteriorate, initiating a reduction or elimination of the position. This approach may be called a deteriorating fundamentals sell discipline.

Another group of sell disciplines is more rule driven. A value investor purchasing a stock based on its low P/E multiple may choose to sell if the multiple reaches its historical average. This approach may be called a valuation-level sell discipline. Also rule based are down-from-cost, up-from-cost, and target price sell disciplines. As an example of a down-from-cost sell discipline, the manager may decide at the time of purchase to sell any stock in the portfolio once it has declined 15 percent from its purchase price; this strategy is a kind of stop-loss measure. An up-from-cost may specify at purchase a percent or absolute gain that will trigger a sale. At the time of purchase, the manager may specify a target price, representing an estimate of intrinsic value, and the stock reaching that price triggers a sale.

The manager may use a combination of sell disciplines. Sales typically generate realized capital gains or losses. Thus, the implications of a sell discipline need to be evaluated on an after-tax basis for tax-sensitive investors such as private wealth investors and certain institutional investors such as insurance companies.

So how much trading in a portfolio is normal? To answer that question, we need to understand what drives the manager's stock selection. Ultimately, the nature of the ideas motivating the purchase should determine what level of turnover is reasonable. Value investors frequently have relatively low turnover; they buy cheap stocks hoping to reap a longer-term reward. Annual turnover levels for a value manager typically range from 20 percent to 80 percent.[57] Growth managers are trying to capitalize on earnings growth and stability. Company earnings are reported quarterly, semiannually, or annually, depending on the stock's country of domicile. In any case, it is easy to understand that a growth portfolio would generally tend to have higher turnover than value—a range of 60 percent to several hundred percent for more short-term oriented investors.

57 This level of turnover translates to a holding period of between 1.25 and 5 years.

SEMI-ACTIVE EQUITY INVESTING

6

Semi-active strategies (also known as "enhanced index" or "risk-controlled active" strategies) are designed for investors who want to outperform their benchmark while carefully managing their portfolio's risk exposures. An enhanced index portfolio is designed to perform better than its benchmark index without incurring much additional risk. The portfolio manager creates such a portfolio by making use of his investment insights while neutralizing the portfolio's risk characteristics inconsistent with those insights. Although tracking risk (also called active risk) will increase, the enhanced indexer believes that the incremental returns more than compensate for the small increase in risk. Such a portfolio is expected to perform better than the benchmark on a risk-adjusted basis. As Exhibit 3 showed, enhanced indexing strategies with their strict control of tracking risk have tended to have the highest information ratios.

Semi-active equity strategies come in two basic forms: derivatives based (also called synthetic) and stock based. Derivatives-based semi-active equity strategies intend to provide exposure to the desired equity market through a derivative and the enhanced return through something other than equity investments. A common and straightforward derivatives-based semi-active equity strategy is to equitize a cash portfolio and then attempt to add value by altering the duration of the underlying cash.[58] For example, one simple approach could be to vary the duration between 90-day bills (cash) and 3-year notes based on yield curve slope. When this segment of the yield curve slopes steeply, the manager should invest in longer-duration fixed income, because the higher yield compensates the investor for the increased risk. When the slope is flat, the manager should stay short because no increased yield exists for investing in longer maturities. In this way, a portfolio manager can attempt to achieve some incremental return over cash from the short-term fixed-income portfolio while obtaining equity exposure through the futures market, thereby creating an enhanced index fund.

Enhanced indexing strategies based on stock selection attempt to generate alpha by identifying stocks that will either outperform or underperform the index. Risk control is imposed in order to limit the degree of individual stock underweighting or overweighting and the portfolio's exposure to factor risks and industry concentrations. The resulting portfolio is intended to look like the benchmark in all respects except in those areas on which the manager explicitly wishes to bet.

One way of thinking about an enhanced index stock-selection strategy versus traditional active management involves considering the investment manager's frame of reference. A traditional active manager begins with a pool of investment capital, tries to identify stocks that will appreciate the most, and includes those in the portfolio. Whatever that manager's benchmark, if the manager is uninformed about a particular stock, she will not hold it in the portfolio. In an enhanced index stock selection strategy, the neutral portfolio is the benchmark. If the manager has no opinion about a given stock, that manager holds the stock at its benchmark weight. Every portfolio position is evaluated relative to the benchmark weight.

How do semi-active equity managers try to generate alpha using stock selection? Mostly, they do it the same way traditional active managers do. They may look at broad themes relating to a company's valuation or growth. They may also build complex

58 To equitize is to go long on sufficient futures contracts to provide equity exposure to the underlying cash investment. For example, to equitize cash using a $10 million cash portfolio with S&P 500 futures, divide $10 million by the notional value of each S&P 500 contract to determine how many long position contracts are required. (In practice, a small adjustment called "tailing" is made to this calculation to account for the time value of money on the daily futures marks received or paid. A discussion of tailing is outside the scope of this reading.)

models to process vast quantities of information in their quest for alpha. But the bottom line is that these portfolio managers are essentially active managers who build portfolios with a high degree of risk control.

In addition to a high degree of risk control, another reason for the popularity of enhanced index portfolios can be explained in terms of Grinold and Kahn's **Fundamental Law of Active Management**.[59] The law states that

$$\text{IR} \approx \text{IC}\sqrt{\text{Breadth}} \tag{1}$$

Translated, this means that the information ratio (IR) is approximately equal to what you know about a given investment (the **information coefficient** or IC)[60] multiplied by the square root of the investment discipline's breadth, which is defined as the number of independent, active investment decisions made each year. Therefore, a lower-breadth strategy necessarily requires more accurate insight about a given investment to produce the same IR as a strategy with higher breadth. Well-executed enhanced indexed strategies may have a relatively high combination of insight and breadth, resulting from the disciplined use of information across a wide range of securities that differ in some important respects. (Note, however, that the number of *independent* decisions available per period does not *necessarily* increase with the size of the research universe.)

EXAMPLE 12

Illustration of the Fundamental Law of Active Management

Gerhardt Holz is evaluating two investment managers:

- Manager A follows 500 stocks with annual forecasts, and the IC for each of the forecasts is 0.03.
- Manager B follows 100 stocks with annual forecasts, and the IC for each of the forecasts is twice that of Manager A's security forecasts.

Based only on the above information, which manager should Holz select?

Solution:

Manager A's breadth of 500 and IC of 0.03 translates into an information ratio of approximately $0.03\sqrt{500} = 0.67$ (on an annual basis). Manager B's breadth of 100 and IC of 0.06 translates into an information ratio of approximately $0.06\sqrt{100} = 0.60$ (on an annual basis). Based only on the information given, Holz would select Manager A.

A semi-active stock-selection approach has several possible limitations. The first is that any technique that generates positive alpha may become obsolete as other investors try to exploit it. A successful enhanced indexer is always innovating. Also, quantitative and mathematical models derived from analysis of historical returns and prices may be invalid in the future. Markets undergo secular changes, lessening the effectiveness

59 See Grinold and Kahn (2000) for a complete development.

60 The information coefficient is more formally defined as the correlation between forecast return and actual return. In essence, it measures the effectiveness of investment insight.

of the past as a guide to the future. Markets also occasionally undergo shocks that, at least temporarily, render forecasting or risk models ineffective. Example 13 illustrates a comparison made in terms of alpha and tracking risk.[61]

EXAMPLE 13

Derivatives-Based versus Stock-Based Semi-Active Strategies

Heidi Erikson is an investment officer with a large Swedish pension plan. Her supervisor is thinking about investing in an enhanced index product focused on Japanese equities benchmarked against the Index. He asks Erikson to investigate the various alternative approaches. Exhibit 20 presents her findings.

Exhibit 20 Semi-Active Alternatives

	Expected Alpha	Tracking Risk
Stock-based semi-active	1.2%	2.7%
Derivative-based semi-active	1.0	2.1

Using the information given, address the following:

1. Contrast stock-based and derivative-based semi-active investment strategies.
2. State an appropriate quantitative criterion for evaluating alternative semi-active approaches.
3. Recommend and justify a semi-active approach for the pension plan.

Solution to 1:

A stock-based semi-active approach involves controlled under- and overweighting of securities relative to their index weights. This approach attempts to pick up active return through equity insights. By contrast, a derivative-based semi-active approach involves using derivatives to equitize cash and attempting to pick up active return by adjusting the duration of the fixed-income position.

Solution to 2:

The information ratio (IR), defined as mean active return divided by tracking risk, is the appropriate quantitative criterion for evaluating alternative active strategies because it permits comparison based on the mean active return gained for bearing a unit of active risk in each strategy.

Solution to 3:

The stock-based semi-active strategy has an IR of 1.2/2.7 = 0.44 versus 1/2.1 = 0.48 for the derivative-based strategy. Because it has the higher information ratio, based only on the information given, Erikson should recommend using a derivative-based strategy.

61 In the example, the use of alpha rather than active return in calculating the information ratio means only that the portfolio's benchmark has been matched in terms of systematic risk.

7 MANAGING A PORTFOLIO OF MANAGERS

When investing a pool of assets, every investor must decide first on the overall asset allocation of the investments—which asset classes to use and how much to invest in each. The investor then needs to decide how to invest the assets within each class. Should the investor use index funds or have the money managed actively? What is the correct level of active risk? How many managers should be used?

When developing an asset allocation policy, the investor seeks an allocation to asset classes that maximizes expected total return subject to a given level of *total* risk. The framework of optimizing allocations to a group of managers (in this context, equity managers within the equity allocation) takes a parallel form, but with the investor now maximizing active return for a given level of active risk determined by his level of aversion to active risk:[62]

$$\underset{\text{by choice of managers}}{\text{Maximize}} \quad U_A = r_A - \lambda_A \sigma_A^2 \tag{2}$$

Where

U_A = expected utility of the active return of the manager mix
r_A = expected active return of the manager mix
λ_A = the investor's trade-off between active risk and active return; measures risk aversion in active risk terms
σ_A^2 = variance of the active return

The efficient frontier specified by this objective function is drawn in active risk and active return space, because once active or semi-active managers are potentially in the mix, the investor's trade-off becomes one of active return versus active risk (the asset allocation decision determines the trade-off between total risk and return). How much active risk an investor wishes to assume determines the mix of specific managers. For example, an investor wishing to assume no active risk at all would hold an index fund. On the other hand, investors desiring a high level of active risk and active return may find their mix skewed toward some combination of higher active risk managers with little or no exposure to index funds.

Take the hypothetical case of Yasu Nakasone, an investment officer with the pension fund of RBG Electronics. Nakasone wants to invest ¥60 billion in Japanese equities benchmarked to TOPIX. He is considering the managers shown in Exhibit 21. The active managers and semi-active managers follow distinct investment styles.[63]

Exhibit 21 Portfolio Statistics

	Expected Active Return	Expected Tracking Risk
Index	0.0%	0%
Semi-active	1.5	2
Active A	2.0	3

62 See Waring, Whitney, Pirone, and Castille (2000), on which this discussion is based. The objective function shown does not consider fees and other costs associated with the mix of managers. Investment management fees and custody costs also must be considered, and these will be higher for active and semi-active managers than for index funds. One way of incorporating costs into the optimization is simply to subtract them from each manager's expected returns.

63 Because these investment managers have different investment styles, the assumption of uncorrelated alphas made subsequently is reasonable. The model also applies if alphas are correlated, although the details will be more complex.

Exhibit 21 (Continued)

	Expected Active Return	Expected Tracking Risk
Active B	3.0	5
Active C	4.0	8

For his analysis, Nakasone assumes that all five managers' active returns are uncorrelated; he generates the efficient frontier in Exhibit 22 using a mean–variance optimizer. The question Nakasone must ask himself is how much active risk he wishes to take in the aggregate equity portfolio. The answer will help him determine the required manager mix.

Exhibit 22 Efficient Frontier of Managers

In addition to generating the efficient frontier, Nakasone has also put together a "waterfall" chart (Exhibit 23) that breaks down manager mix for each level of active risk.

Exhibit 23 Manager Allocation by Active Risk Level

Nakasone must now select the appropriate level of active risk. Generally, investors are far more risk averse in active risk terms than in total risk terms, for several reasons. For example, an investor can achieve the benchmark return by purchasing an index portfolio. To achieve an active return in his portfolio, however, Nakasone must believe both that successful active management is possible and that he has the necessary skill to select active managers who will outperform. Second, Nakasone is responsible for the whole equity portfolio, and his superiors will judge him based on how well the overall portfolio performs relative to the benchmark. Successful active management is difficult, and many who attempt it underperform.[64] This fact produces a sort of institutional conservatism on the part of many investors. Finally, Nakasone realizes that as one moves up on the efficient frontier assuming more active risk, less manager diversification exists. For institutional investors, an overall active risk budget (target) in the range of 1.5 percent to 2.5 percent is fairly typical.[65]

Nakasone decides that he is willing to assume only 1.51 percent active risk, leading him to select the portfolio shown in Exhibit 24:

Exhibit 24 RBG Pension Fund Manager Mix

	Allocation
Index	8%
Semi-active	44
Active A	26
Active B	14
Active C	8

64 The average actively managed dollar, yen, euro, etc. must necessarily underperform, per Sharpe (1991).
65 See Waring et al. (2000).

Despite its relatively modest level of active risk, this manager mix is expected to produce an active return of 1.92 percent, leading to a very strong IR of 1.27. The active return for the overall portfolio is a weighted average of the active returns for the individual managers.

$$\text{Portfolio active return} = \sum_{i=1}^{n} h_{Ai} r_{Ai}$$

where

h_{Ai} = weight assigned to the ith manager
r_{Ai} = active return of the ith manager

The active risk is a bit more complex. Recall that Nakasone assumes the active returns are uncorrelated. Therefore,

$$\text{Portfolio active risk} = \sqrt{\sum_{i=1}^{n} h_{Ai}^2 \sigma_{Ai}^2}$$

where

h_{Ai} = the weight assigned to the ith manager
σ_{Ai} = the active risk of the ith manager

The portfolio active risk in this case is the square root of the weighted sum of the individual managers' variances.[66]

7.1 Core-Satellite

The type of portfolio that Nakasone constructed in the previous section is referred to as a **core-satellite portfolio**.[67] Specifically, 52 percent of the overall portfolio—the index and semi-active managers—constitutes the core holding, and the three active managers represent a ring of satellites around this core. When we apply the optimization shown in Equation 2 to a group of equity managers that includes effective indexers and/or enhanced indexers and successful active managers (as judged by information ratios), a core-satellite portfolio is a likely result.

Core-satellite portfolios can be constructed using Nakasone's rigorous approach or much more simply, as demonstrated in Example 14 below. In either case, the objective is to anchor a strategy with either an index portfolio or an enhanced index portfolio and to use active managers opportunistically around that anchor to achieve an acceptable level of active return while mitigating some of the active risk associated with a portfolio consisting entirely of active managers. The index or enhanced index portfolios used in the core generally should resemble as closely as possible the investor's benchmark for the asset class. The satellite portfolios may also be benchmarked to the overall asset class benchmark, but there is greater latitude for them to have different benchmarks as well (e.g., having a growth or value focus rather than the more likely core benchmark for the asset class).

66 Had the active returns been correlated, the portfolio active risk equation would also have included covariance terms under the square root sign.

67 Core-satellite is sometimes discussed as an approach to overall asset allocation in which certain asset classes are held in a passively managed core while others (believed to be inefficiently priced) are held in actively managed satellites. See Singleton (2005). The text discusses the concept in terms of allocating assets within a single asset class, another frequent usage of the term.

EXAMPLE 14

A Pension Fund's Performance Objectives

Jim Smith manages the international equity portion of the pension portfolio of ACME Minerals, a large Australian mining company. Smith is responsible for a portfolio of A$700 million of non-Australian equities. Smith's annual compensation is related to the performance of this portfolio versus the MSCI World ex-Australia Index, the benchmark for the pension portfolio's international equity portion. He has hired the following managers with expected alphas and active risk shown.

Exhibit 25 Portfolio Managers' Characteristics

	AUM (Millions)	Expected Alpha	Expected Tracking Risk
Manager A	A$400	0%	0%
Manager B	100	2	4
Manager C	100	4	6
Manager D	100	4	6

All four managers' alphas are uncorrelated and are measured against the MSCI World ex-Australia benchmark.

The pension fund's trustees have stated objectives of achieving a ratio of alpha to tracking risk of 0.6 or greater, with tracking risk of no more than 2 percent a year. An optimization based on Equation 2 results in weights on Managers A, B, C, and D of 4/7, 1/7, 1/7, and 1/7, respectively. Based only on the information given, address the following:

1. Identify the investment approach of Manager A.
2. Characterize the structure of the optimal portfolio of managers.
3. Evaluate whether the optimal portfolio of managers is expected to meet the trustees' investment objectives.

Solution to 1:

Because Manager A has expected tracking risk of 0 percent, we can infer that this manager is an indexer.

Solution to 2:

The portfolio of managers represents a core-satellite portfolio. An indexed investment (Manager A) represents more than half the portfolio's value and functions as the core. Actively managed portfolios (Managers B, C, and D) represent the satellite portfolios surrounding the core.

Solution to 3:

We need to calculate the expected alpha and active tracking risk for the portfolio of managers to evaluate whether this portfolio meets the trustees' performance objectives. The portfolio's expected alpha is

$$(4/7)(0\%) + (1/7)(2\%) + (1/7)(4\%) + (1/7)(4\%) = 1.43\%$$

The portfolio's tracking risk is

$$\left[(4/7)^2(0)^2 + (1/7)^2(4\%)^2 + (1/7)^2(6\%)^2 + (1/7)^2(6\%)^2\right]^{1/2} = 1.34\%$$

Tracking risk of 1.34 percent satisfies the trustees' objective of tracking risk of no more than 2 percent annually. The ratio of 1.43%/1.34% = 1.07 exceeds the target of 0.6. Thus the portfolio of managers meets the performance requirements of the trustees. Note that the tracking risk calculation used the assumption that the managers' alphas are uncorrelated.

Example 14 assumed that the managers under consideration were all benchmarked to the benchmark for the overall international equity allocation—that is, all of the managers are essentially broad capitalization market-oriented managers. In reality, investors often wish to consider managers that are either value or growth and perhaps specialize within a given range of market capitalization. To evaluate such managers, it is useful to divide their total active return into two components:

1. Manager's return – Manager's normal benchmark = Manager's "true" active return
2. Manager's normal benchmark – Investor's benchmark = Manager's "misfit" active return

To review, the manager's normal benchmark (normal portfolio) represents the universe of securities from which a manager normally might select securities for her portfolio. The term **investor's benchmark** refers to the benchmark the investor uses to evaluate performance of a given portfolio or asset class.

The standard deviation of "true" active return is called manager's "true" active risk (or "true" active risk); the standard deviation of "misfit" active return is manager's "misfit" risk (or "misfit" risk). The manager's total active risk, reflecting both "true" and "misfit" risk, is

$$\text{Manager's total active risk} = [(\text{Manager's "true" active risk})^2 + (\text{Manager's "misfit" active risk})^2]^{1/2}$$

The most accurate measure of the manager's risk-adjusted performance is the IR computed as (Manager's "true" active return)/(Manager's "true" active risk).

The "true"/"misfit" distinction has two chief uses: One relates to performance appraisal, and the other relates to optimizing a portfolio of managers. We can illustrate the technically less complex of these two uses, that related to performance appraisal, using the numbers given in Exhibit 25 in Example 14, and the following additional facts:

- Manager C is a value-oriented manager;
- the MSCI World ex-Australia Value Index well represents Manager C's investment universe;
- Manager C, the MSCI World ex-Australia Index, and the MSCI World ex-Australia Value Index respectively return 12 percent, 10 percent, and 15 percent per year, for a given time period; and
- Manager C's total active risk computed with respect to MSCI World ex-Australia Index is 5.5 percent annually. The manager's "misfit" risk is 4 percent annually.

Based on the second fact above, the MSCI World ex-Australia Value Index is appropriate as Manager C's normal benchmark. By contrast, the MSCI World ex-Australia Index is the investor's benchmark. Although Manager C appears to outperform the asset class benchmark (12 percent versus 10 percent), in reality the manager has not done such a great job:

- The manager's "true" active return is 12% – 15% = –3%.
- The manager's "misfit" active return is 15% – 10% = 5%.

Measuring the manager's results against the normal benchmark rather than the investor's benchmark far more accurately evaluates performance. The positive "misfit" active return indicates that the manager would be expected to outperform the asset class benchmark for the simple reason that value stocks outperformed the investor's benchmark. The manager's negative "true" active return, however, indicates that the manager actually underperformed a passive investment in the normal benchmark. The manager's performance relative to the investor's benchmark reflects the sum of "true" active return and "misfit" active return and misleadingly nets to a positive value: –3% + 5% = 2%. To complete the picture, we need to calculate the manager's IR based on "true" active risk and "true" active return. Using the expression for manager's total active risk and letting X represent "true" active risk, $5.5\% = [X^2 + (4\%)^2]^{1/2}$, $X = 3.775\%$ is "true" active risk. The manager's "true" IR was thus quite poor: –3%/3.775% = –0.7947.

The second use of the "true"/"misfit" distinction is in optimization. By disaggregating the active risk and return into two components, it is possible to create optimal solutions that maximize total active return at every level of total active risk and that also allow for the optimal level of "misfit" risk. Although it may seem that no "misfit" risk is desired, a nonzero amount may actually be optimal, because a high level of "true" active return may more than compensate for a given level of "misfit" risk.

7.2 Completeness Fund

The Nakasone and Smith examples illustrated a rigorous approach to constructing a portfolio of managers. Some investors will construct a portfolio of active managers using an equal-weighting approach or other heuristic. Whether the active manager's normal portfolio is the overall equity benchmark or some other benchmark (especially in this latter case), the aggregate portfolio of active managers may have any number of risk exposures or biases, such as sector underweighting or overweighting, relative to the investor's overall equity benchmark. The portfolios of bottom-up stock pickers often evidence industry concentrations as an outcome of their stock selection processes rather than intentional macro bets.

In such cases, the fund sponsor should consider establishing a completeness fund for the equity portfolio. A **completeness fund**, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.[68] For example, the completeness fund may be constructed with the objective of making the overall portfolio sector and/or style neutral with respect to the benchmark while attempting to retain the value added from the active managers' stock-selection ability. The completeness portfolio may be managed passively or semi-actively. This portfolio needs to be re-estimated periodically to reflect changes in the active portfolios.

68 Completeness funds are sometimes referred to as dynamic completion funds or as bias control funds. Tierney and Winston (1990) offer an early presentation of the rationale for this technique.

One drawback of completeness portfolios is that they essentially seek to eliminate misfit risk. As stated above, a nonzero amount of misfit risk may be optimal. In seeking to eliminate misfit risk through a completeness fund, a fund sponsor may be giving up some of the value added from the stock selection of the active managers.

7.3 Other Approaches: Alpha and Beta Separation

Another method which may be used to build a portfolio of multiple managers involves what has become known as **alpha and beta separation**. A typical long active equity portfolio provides an investor with exposure to the market (beta) as well as to the active manager's stock selection ability (alpha). As previously discussed, a market-neutral long–short strategy is a pure alpha strategy with no beta exposure.

For example, an investor might choose to hire a comparatively inexpensive index fund manager to provide beta exposure and pay explicitly for alpha by hiring a market-neutral long–short manager. The second approach adds the advantage of allowing the investor to mix and match beta and alpha in a way that long-only active management cannot accomplish. For example, an investor may need beta exposure to a relatively efficient part of the equity market (e.g., the Russell Top 200, representing the 200 largest securities in the Russell 3000) but will also want to outperform that part of the market. This may be difficult to do with long-only active management. The investor, however, may choose to hire a Russell Top 200 index fund manager and a manager that seeks to add 4 percent annual alpha by managing a long–short portfolio of Japanese equities. Assuming that the long–short portfolio is also market neutral (i.e., beta of zero with respect to the Japanese equity market) and that the long–short manager delivers on the alpha target, the strategy becomes a Russell Top 200 + 4% strategy. This is an example of **portable alpha**—that is, alpha available to be added to a variety of systematic risk exposures.

One of this approach's big advantages is that an investor can obtain the beta exposure desired while broadening the opportunity set for alpha to cover styles and even asset classes outside the beta asset class. In the example above, the long–short manager could also have been a bond manager. Alpha and beta separation allows the investor to manage the market and active risks more effectively than if dealing solely with long-only managers. In doing so, the investor can also very clearly understand the fees being paid to capture market (inexpensive) and active (costly) returns. That said, certain markets may constrain the ability to manage long–short alpha-generating strategies. Short positions may be very costly to establish in smaller or emerging markets. Also, investors need to realize that not all long–short strategies that appear to be market neutral really are. Some may have a degree of market risk.

Some investors may be explicitly precluded from investing on a long–short basis. These investors may still be able to use portable alpha, although in a less efficient way than described above. For example, assume that an investor desires S&P 500 market exposure but has identified a capable active manager of Japanese equities benchmarked to the TOPIX index. The investor can port the manager's alpha by taking a short futures position in TOPIX and a corresponding long position in S&P 500 futures.[69] The resulting portfolio is S&P 500 plus an alpha associated with the Japanese equity portfolio.

69 The short exposure to TOPIX can be seen as a hedge of sorts and might not violate specific pension plan restrictions in the way that an explicit net short position in an equity issue would.

8 IDENTIFYING, SELECTING, AND CONTRACTING WITH EQUITY PORTFOLIO MANAGERS

Institutional and private wealth investors face critical decisions when deciding what funds (if any) to manage themselves and, second, what investment managers to engage for the funds they delegate to outside management. Frequently, investors will work with a consultant in an investment manager search. The following sections address some of the issues that investors will face in identifying, selecting, and contracting with equity managers.

8.1 Developing a Universe of Suitable Manager Candidates

The process of developing a universe of suitable manager candidates starts with a general evaluation of the large number of investment managers, and then researching and monitoring those that are worthy of further consideration. Investment consultants typically have a research staff whose job is to collect information on investment managers and to meet with them to understand the managers' investment approach and organization. Consultants employ various tools to determine which managers have talented individuals and truly add value in their investment style.

Consultants use both qualitative and quantitative factors in evaluating investment managers. The qualitative factors include the people and organizational structure, the firm's investment philosophy, the decision-making process, and the strength of its equity research. The quantitative factors include performance comparisons with benchmarks and peer groups, as well as the measured style orientation and valuation characteristics of the firm's portfolios. At all times, the investment consultant seeks consistency between a firm's *stated* philosophy and process and its *actual* practices.

8.2 The Predictive Power of Past Performance

Anyone who invests in the stock market is well aware that the best performing stock or sector in any given year is rarely the best performer in the next. In fact, one reasonable approach to investing could be simply to sell the winners and buy the losers (although many investors tend to do the opposite). The same holds true of investment performance, which is one reason why fund managers are legally required to state in their advertisements that "past performance is no guarantee of future results."

The evidence generally supports this caution. For example, the Frank Russell Company, a multimanager investment strategies firm, found that of the 81 managers who were in the top quartile of their 293 US equity manager database in 1997, only 16 remained in the top quartile in 1998, and only 7 remained in 1999. None of these original top performers in 1997 was still in the top quartile in 2000, 2001, or 2002. Busse, Goyal, and Wahal (2010) examined the performance of over 1,400 investment management firms and found little to no persistence in their risk-adjusted excess returns. These results do not mean that past performance goes unexamined, however. A portfolio manager who has consistently underperformed his benchmark is unlikely to be considered for an active manager role, because an active manager is expected to generate positive alpha.

Investors and their consultants place considerable weight on an equity manager's investment process and the strength of the manager's organization. A good investment record achieved by the same set of managers over a long period, following consistent investment disciplines, is more likely to indicate future satisfactory results for the client than a record with comparable statistics but an underlying history of manager turnover and shifts in investment orientation.

8.3 Fee Structures

Investors must pay attention to the management fees of the investment managers that they hire. Absent such fees, the investor would realize exactly the same alpha that the manager achieves (after transactions costs). With management fees, the investor earns a net-of-fee alpha that is smaller and possibly negative even when the manager's alpha (gross of fees) is positive. In short, the investment management fee represents a wedge between managerial skill and investor results.[70]

Fees are typically set in one of two basic ways: ad valorem and performance based. **Ad valorem fees** are calculated by multiplying a percentage by the value of assets managed (e.g., 0.60 percent on the first £50 million, and 0.45 percent on assets above £50 million). Ad valorem fees are also called assets under management (AUM) fees.

A simple **performance-based fee** is usually specified by a combination of a base fee plus sharing percentage (e.g., 0.20 percent on all assets managed plus 20 percent of any performance in excess of the benchmark return). Performance-based fees can also include other features such as fee caps and "high-water marks." A **fee cap** limits the total fee paid regardless of performance and is frequently put in place to limit the portfolio manager's incentive to aim for very high returns by taking a high level of risk. A **high-water mark** is a provision requiring the portfolio manager to have cumulatively generated outperformance since the last performance-based fee was paid. As an example, ABC Investments charged a performance-based fee based on its performance in 2011. In 2012, however, the firm underperformed its benchmark and could collect only the base fee. If ABC is subject to a high-water mark provision, in 2013 it will need to outperform its benchmark by an amount greater than the 2012 underperformance in order to collect a performance-based fee.

Ad valorem fees have the advantage of simplicity and predictability. If a plan sponsor must budget fees in advance, an ad valorem approach makes estimation much simpler. In contrast, performance-based fees are typically quite involved, as every term of the performance-based fee must be precisely defined. But performance-based fees—particularly symmetric incentive fees that reduce as well as increase compensation—may align the plan sponsor's interests with those of the portfolio manager by spurring the manager to greater effort. The better the manager's performance, the greater the reward for both sides. For the client, the impact of poor performance is reduced by the smaller fees paid to the investment manager. On the other hand, reliance on such arrangements can create revenue volatility for the investment manager, which might present practical issues (e.g., staff retention) when the manager performs relatively poorly in a year in which its competitors have done better.[71] A one-sided performance-based fee, by contrast, conveys a call option to the investment manager whose value can be determined by option pricing methodology and whose expected net cost to the fund sponsor may be judged relative to expected fee if a strictly ad valorem compensation contract were in place.

8.4 The Equity Manager Questionnaire

A typical equity manager questionnaire examines five key areas: organization/people, philosophy/process, resources, performance, and fees. The questionnaire creates a formal basis for directly comparing different investment firms.

70 Ennis (2005) quantifies the extent of this wedge for various fee levels and levels of managerial skill. Fabozzi, Focardi, and Jonas (2010) report that the weighted average expense ratio for mutual funds has declined as assets are increasingly shifted to lower cost investments.

71 See Arnott (2005) for a further discussion.

In the questionnaire's first section, Organization/People, the investment firm must describe the firm's organization and who will be managing the portfolio. Equity portfolio management is a people business; nothing is more important than having the right people in place. Typical questions cover such areas as the vision of the firm, its competitive advantages, and how it defines success; the organization of the group and the role of portfolio managers, traders, and analysts; the delegation of responsibility for decisions on asset allocation, portfolio construction, research, and security selection; the structure of the compensation program, with an emphasis on the manner in which talented individuals are rewarded; the background of the professionals directly involved in managing the assets, such as prior experience, education, and professional qualifications such as the CFA designation; and finally, the length of time the team has been together and the reasons for any turnover.

The second section, Philosophy/Process, asks questions about how the equity portfolio will be managed. Typical questions concern:

- the firm's investment philosophy and the market inefficiency that it is trying to capture, along with any supporting evidence for this inefficiency;
- the research process, including whether or not a top-down analysis is applied (**top-down** analysis is analysis that proceeds from the macroeconomy to the economic sector level to the industry level to the firm level);
- the risk management function, including management and monitoring of risk and risk models;
- how the firm monitors the portfolio's adherence to its stated investment style, philosophy, and process;
- the stock selection process, including unique sources of information, and how the buy or sell decision is made; and
- the portfolio construction process.

The third section, Resources, looks at the allocation of resources within the organization. In particular, the focus is on the research process: how and by whom research is conducted, the outputs of this research, how the research outputs are communicated, and how the research is incorporated into the portfolio construction process. In addition, there are questions addressing any quantitative models used in research and portfolio construction, and the investments that have been made in technology. Finally, the trading function is examined in terms of turnover, traders, trading strategies, and the measurement of costs.

The fourth section, Performance, asks questions about what the equity manager considers to be an appropriate benchmark (and why) and what level of excess return is appropriate. There are also questions about how performance is evaluated within the firm, including causes of dispersion in the returns of similarly managed portfolios. The firm must then normally submit monthly or quarterly returns as well as holdings, so that the evaluator can calculate performance for all candidates in the same way.

The final section deals with fees. Questions are typically about what is included in the fee, the type of fee (ad valorem or performance based), and any specific terms and conditions relating to the fees quoted.

The equity manager questionnaire is used to identify a short list of the fund managers most suitable for the sponsor's needs. This process is followed up with face-to-face interviews (and sometimes on-site visits) to better understand the fund manager and to ask additional questions raised by any responses to the questionnaire before the final selection decision.

EXAMPLE 15

Equity Manager Questionnaire (Excerpt)

A. Organization, Structure, and Personnel

1. Provide a brief history of the firm, including:
   - **a** the month and year of SEC 1940 Act registration;
   - **b** the month and year the subject product was introduced; and
   - **c** ownership structure.
2. Form of ownership (if an affiliate, designate percent of parent firm's total revenue generated by your organization).
3. If the firm is a joint venture partner, identify the percentage of ownership and revenues recognized by each partner to the combined association.
4. Provide an organizational chart diagramming the relationships between the professional staff as well as the parent–subsidiary, affiliate, or joint venture entities.
5. Describe the levels (US dollar amounts) of coverage for SEC-required (17g-1) fidelity bonds, errors and omissions coverage, and any other fiduciary coverage which your firm carries. List the insurance carriers supplying the coverage.
6. During the past five years, has your organization or any of its affiliates or parent, or any officer or principal been involved in any business litigation, regulatory, or legal proceedings? If so, provide a detailed explanation and indicate the current status. Also provide complete Form ADV (Parts I and II) or explain the nature of the exemption.
7. Has your firm been the subject of an audit, censure (fine), inquiry, or administrative action by the SEC, IRS, State Attorney General, or Department of Labor in the past seven years? If so, explain findings and provide a copy, as well as evidence of any changes in procedures implemented as a result of such audit.
8. Describe in detail the material developments in your organization (changes in ownership, restructuring, personnel, business, etc.) during the past three years.
9. Provide the location and function of each of your firm's offices.
10. Provide details on the financial condition of the firm (i.e., most recent annual report filed with the SEC).
11. Investment Professionals
    - **a** List all senior investment professionals and portfolio managers involved with the subject product. Please also separately provide appropriate biographical information. Highlight the person(s) who would be responsible for this account.
    - **b** Indicate when and why any investment professionals left or joined the firm in the last three years. In which products were they involved? For personnel who have left, indicate job titles and years with the firm. Please include all additions and departures, regardless of seniority.

c Discuss your organization's compensation and incentive program. How are professionals evaluated and rewarded? What incentives are provided to attract and retain superior individuals? If equity ownership is possible, on what basis is it determined and distributed? How is the departure of a shareholder treated?

d Describe your firm's backup procedures in the event the key investment professional assigned to this account should leave the firm.

For Items 12 through 14, please provide the following information for the years ending on 30 June from 2007 through 2012 (all in $ millions and number of accounts, counting funds as one account):

12 Total assets under management—all products.

13 Total discretionary US equity assets—all products.

14 Total assets in subject product—distinguish between retail and institutional.

15 Provide the names and the size of the mandate for your top five clients.

16 Provide the names and the size of your top five clients in the strategy under review.

17 List all clients (or the number and type) and asset amounts gained in the subject product during the past five years as of June 30, 2012.

18 List all clients (or the number and type) and asset amounts lost in the subject product during the past five years as of June 30, 2012.

19 Identify three clients that have terminated accounts in the subject product during the past three years that can be contacted as references. Provide the firm name, contact person and title, phone number, product name, and reason for termination.

20 Provide the client name, address, phone number, contact name, title, and account type (e.g., defined benefit, defined contribution, endowment) of three accounts, who are invested in the subject product that can be contacted as references. Also indicate the length of your relationship and AUM for each reference.

B. Investment Philosophy, Policy, and Process

1 Describe your investment philosophy for the product.

a What market anomaly or inefficiency are you trying to capture?

b Why do you believe this philosophy will be successful in the future?

c Provide any evidence or research that supports this belief.

d How has this philosophy changed over time?

e What are the product's shortcomings or limitations?

f In what market environment(s) will your product have difficulty outperforming?

2 Describe your investment decision process and valuation approaches used in regard to the following:

a security selection;

b sector selection; and

c portfolio construction.

3. Indicate what fundamental/quantitative factors are used to analyze a stock and indicate their relative importance in the decision-making process. If applicable, who developed and maintains your quantitative models?
4. Describe the techniques used to identify and control overall portfolio risk. What limits/constraints do you establish, if any?
   a. What is the market liquidity criteria applied by your firm for the companies in which it invests?
   b. Provide the typical number of securities in a portfolio of $50 million, $100 million, $1 billion, and $2 billion.
   c. Describe the use of futures, options, or other derivatives (when and how much?).
5. Describe the decision process used to make sell decisions. When would your firm deviate from its sell disciplines?
6. Over what time horizon could your strategy be expected to meet performance objectives?
7. Provide the average annual portfolio turnover for the past three years and the source of this turnover.
8. Describe your firm's policy regarding cash and cash equivalents. Would your firm accept a "fully invested" mandate?
9. Describe your firm's process for executing trades. Include answers to the following:
   a. Does your firm use electronic trading systems?
   b. What guidelines do you have pertaining to dealing/trading execution parameters/costs?
   c. How are trading costs monitored? How are these costs minimized?
   d. Describe how your firm evaluates trading execution.
   e. What is the firm's average commission (cents/share) for the product in question?
   f. Does your firm trade with an affiliate broker/dealer?
10. Submit a sample portfolio (an actual portfolio) as of June 30, 2012, that reflects the investments of the product proposed for this account.
11. Provide the following characteristics as of June 30, 2012 and for the years ending 2007 through 2011:
    - typical number of holdings
    - typical turnover rate
    - average market capitalization
    - median market capitalization
    - P/E
    - P/B
    - beta
    - sector limitations
    - highest sector weightings
    - tracking error
    - since-inception information ratio

C. Research Capabilities and Resources

1 Explain your firm's research process as it pertains to the product.

2 Rate your firm's reliance on the following sources of research; average rating should approximate 3 (*1 = very important, 5 = unimportant*).

- **a** Internal
- **b** Broker/dealer
- **c** Third-party fundamental research
- **d** External economists
- **e** Company visits
- **f** Other (explain)

3 Describe the software packages used to manage portfolios. If owned, were they internally developed and by whom? Are they internally maintained? How long have the current systems been in place?

D. Historical Performance/Risk Factors

1 Provide your monthly gross and net-of-fees composite performance in the subject product, since the inception of the product, in an attached Microsoft Excel spreadsheet file in the following format:

	A	B	C
1	Date	Gross Returns	Net Returns
2	12/2010	1.01	0.81
3	1/2011	–3.04	–3.24
4	2/2011	5.02	4.82
5	3/2011	12.10	11.90

2 Provide a description of composite:

- **a** Number of accounts and market value of assets represented in composite as of each annual period shown.
- **b** Include low/high and median return for each annual period.
- **c** Is composite in compliance with the Global Investment Performance Standards?
- **d** Has composite been verified for compliance? If not, why not?
- **e** Is there a period for which composite is not in compliance?

3 What benchmark is most appropriate for evaluating the performance results of your process?

E. Fee Structure

1 Provide a proposed fee schedule for the proposed strategy, including any breakpoints. In addition, please provide a proposed fee schedule for the various portfolio sizes of: $50 million, $100 million, and $500 million.

2 Will you certify that the fee schedule provided above is the most favorable fee schedule that the firm offers for accounts of similar size? If not, please explain why.

3 Do you offer clients performance-based fees?

Note: Exhibits and other sections omitted.

Example 16 shows a highly simplified fee proposal. In practice, fees stated as an annual rate are usually paid at regular intervals during the year, and asset valuations within a given payment interval are important. For instance, in practice an ad valorem fee of 0.50 percent a year of assets under management might be billed at the end of each quarter at a rate of 0.50%/4 = 0.125%, based on the average AUM during the quarter. Nevertheless, the principles involved would be the same as those illustrated.

EXAMPLE 16

A Fee Proposal

Helen Warburton is evaluating a fee proposal from Buckingham Equity Investors. She has been quoted both ad valorem and performance-based fees.

Ad Valorem
First £25 million @ 0.80%
Next £25 million @ 0.60%
Balance @ 0.40%
The above fees are payable in advance.

Performance Based
Base fee of 0.20% of beginning AUM plus 20% of outperformance versus the FTSE All-Share Index, to be paid annually at the end of each 12-month period.

Warburton expects to invest a £100 million lump sum, and based on Buckingham's questionnaire response, she expects the firm to outperform the FTSE All-Share by 2.50 percent gross of fees. If Warburton assumes that the FTSE All-Share returns 0 percent, what fee approach should she choose? What other considerations might she make in deciding which fee structure makes more sense?

Solution:

The fees for a £100 million account given Buckingham's expected performance are:

Ad Valorem
£550,000 = (£25 million)(0.80%) + (£25 million)(0.60%) + (£50 million)(0.40%)

Performance Based
£700,000 = (£100 million)(0.20%) + (£100 million)(20%)(2.50%)

The ad valorem fee is lower assuming that Buckingham delivers its expected outperformance. Investors should consider a firm's performance history when determining which approach to choose. If Buckingham's FTSE All-Share strategy has a very high information ratio, implying a high degree of consistency in annual outperformance, Warburton might prefer using an ad valorem fee because Warburton might expect to pay higher fees over time under a performance-based fee arrangement. The reverse is true if Buckingham's history of outperformance

was less consistent. (Note that in setting its fee structure, Buckingham could factor in the volatility of its outperformance. This element would make both Buckingham and Warburton indifferent to the fee structure.)

9 STRUCTURING EQUITY RESEARCH AND SECURITY SELECTION

Equity research is a necessary component of both active and semi-active investing. The security selection process varies from firm to firm, but some generalities apply.

9.1 Top-Down versus Bottom-Up Approaches

Investors focusing their research primarily on macroeconomic factors or investment themes are said to use a top-down approach. For example, an investor focused on a single country might favor certain defensive industries like consumer staples and utilities if she believes the economy may be heading into a recession. Although top-down investors build portfolios from individual stocks, they want those stocks to reflect their macro insights.

A more complex top-down example might involve a global portfolio. The investor might wish to identify:

1. themes affecting the global economy;
2. the effect of those themes on various economic sectors and industries;
3. any special country or currency considerations; and
4. individual stocks within the industries or economic sectors that are likely to benefit most from the global themes.

On the other hand, an investor focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development is said to follow a **bottom-up** approach. This investor pays attention to company specifics when doing research and building a portfolio. For example, a value investor might screen stocks based on P/E or dividend yield. His focus is on the individual company. Bottom-up investors have little interest in the state of the economy or other macro factors but rather try to put together the best portfolio of stocks based on company-specific information.

A more complex bottom-up example might also involve a global portfolio. The investor might approach the problem by:

1. identifying factors with which to screen the investment universe (e.g., stocks in the lowest P/E quartile that also have expected above-median earnings growth);
2. collecting further financial information on companies passing the screen; and
3. identifying companies from this subset that may be potential investments based on other company-specific criteria.

That said, many investors use some combination of the two approaches. An investor managing a global portfolio can, for example, decide which countries to favor based on a top-down analysis but build the portfolio of stocks within each country based on a bottom-up analysis. Furthermore, some analysts use technical analysis, which attempts to predict future stock prices from the time series of their past values.

9.2 Buy-Side versus Sell-Side Research

The terms "buy side" and "sell side" refer to the source of the equity research. **Buy side** refers to those who do research with the intent of assembling a portfolio, such as investment management firms. **Sell side** refers either to independent researchers who sell their work, or to investment banks/brokerage firms that use research as a means to generate business for themselves. Sell-side research is also what most people hear on TV or read about in the newspaper. Buy-side research by its very nature is generally inaccessible to those outside of the investment firm generating the research.

Sell-side and buy-side research frequently are developed in a different manner. Sell-side research is generally organized by sector/industry with a regional delineation (e.g., US autos, European telecommunications, Japanese banks, etc.). Analysts work either in teams or by themselves and produce reports on individual companies and also on the industries they cover. In addition to providing information such as earnings forecasts, sell-side analysts also rate companies as buy, hold, or sell (the nomenclature varies from firm to firm).

Because buy-side research is concerned with assembling a portfolio rather than just rating a company, decisions on buy-side research are usually made through a committee structure. An analyst may investigate a particular theme or individual company, but usually an investment committee makes the decisions. The analyst prepares a report to substantiate the idea and why it should be included in the portfolio or sold; she then uses the research to persuade the investment committee.

EXAMPLE 17

Top Down or Bottom Up?

Maria Ramirez is watching a financial program on television in which a unit trust portfolio manager is explaining the investment approach he uses in managing the global equity unit trust. He says, "Right now, I really like Japan. The economic growth we see there looks to us like it is solid and driven as much by consumer demand as it is by capital investment. One market that we really don't like very much is the United Kingdom, which we are avoiding because we fear further interest rate hikes by the Bank of England." From this brief statement what can Maria conclude about the portfolio manager's research approach?

Solution:

The portfolio manager is employing a top-down approach, because his comments are focused exclusively on macro factors driving the British and Japanese markets. A bottom-up investor might also have favored Japan over the United Kingdom but would have emphasized that he finds more stocks that are attractive investments in one market rather than another.

9.3 Industry Classification

Many equity research departments are organized along industry or sector lines. Given the need to do sector/industry research across many countries, it is important to have a system for like companies to be classified in the same categories. Developed

by Standard & Poor's and MSCI, the Global Industry Classification Standard is one representative industry classification method that does exactly this. GICS divides stocks into:

- 10 Sectors (Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Telecommunication, and Utilities);
- 24 Industry Groups;
- 68 Industries;
- 154 Sub-Industries.

GICS assigns a company to a particular category based on the percentage of revenue derived from each of that company's businesses. The company is then categorized into one and only one sector, industry group, industry, and sub-industry. For example, Michelin is included in the Consumer Discretionary Sector, the Automobiles & Components Industry Group, the Auto Components Industry, and the Tires & Rubber Sub-Industry. Other classification systems include:

- the Industry Classification Benchmark, proprietary to FTSE International Ltd and Dow Jones & Co., consisting of 10 industries (Oil & Gas, Basic Materials, Industrials, Consumer Goods, Health Care, Consumer Services, Telecommunications, Utilities, Financials, and Technology), 19 supersectors, 41 sectors and 114 subsectors; and
- the highly detailed North American Industry Classification System (NAICS—pronounced "nakes"), sponsored by the US, Canadian, and Mexican governments.

SUMMARY

Equity portfolio management is not only challenging; for many investors, the skill applied to it can determine their long-term investment success. This reading has provided a detailed introduction to the major concepts and tools that professional equity investors use.

- Equities play a growth role in investment portfolios.
- The major investment approaches are passive, active, and semi-active. The major passive approach is indexing, which is based on the rationale that after costs, the return on the average actively managed dollar should be less than the return on the average passively managed dollar. Active management is historically the dominant approach to investment and is based on the rationale that markets offer opportunities to beat a given equity benchmark. Semi-active or enhanced indexing is a growing discipline based on the rationale that markets offer opportunities to achieve a positive information ratio with limited risk relative to a benchmark.
- A successful active equity manager will have an expected active return of 2 percent or higher, but his tracking error is likely to be more than 4 percent. Hence, his information ratio will be 0.5 or lower. At the opposite end of the spectrum, an index fund will have minimal tracking risk and an expected active return of 0 percent, implying an information ratio of zero. Enhanced indexing strategies tend to have the highest information ratios, often in the range of 0.5 to 2.0.

- An indexer must choose the index that the portfolio will track and understand the details of the index's construction. The major types of indexes are:
  - *Price weighted*. In a price-weighted index, each stock in the index is weighted according to its absolute share price.
  - *Value weighted* (or *market-capitalization weighted*). In a value-weighted index, each stock in the index is weighted according to its market capitalization (share price multiplied by the number of shares outstanding). A subset of the value-weighted method is the float-weighted method, which adjusts value weights for the floating supply of shares (the fraction of shares outstanding that is actually available to investors).
  - *Equal weighted*. In an equal-weighted index, each stock in the index is weighted equally.

  A price-weighted index is biased toward shares with the highest price, and a value- or float-weighted index is biased toward the largest market cap companies, which may reflect positive valuation errors. An equal-weighted index is biased toward smaller-cap companies.
- Indexed separate or pooled accounts, index mutual funds, exchange traded funds, equity index futures, and equity total return swaps are the major methods for implementing an indexing strategy. Indexed separate or pooled accounts are typically very low cost. Index mutual funds are a widely accessible alternative with a considerable range of cost structures. Exchange traded funds may have structural advantages compared with mutual funds and also permit short positions. Equity index futures are relatively low-cost vehicles for obtaining equity market exposure that require a rollover to maintain longer term. Equity total return swaps are a relatively low-cost way to obtain long-term exposure to an equity market that may offer tax advantages.
- Three methods of indexation include full replication (in which every index security is held in approximately the same weight in the fund as in the index), stratified sampling (which samples from the index's securities organized into representative cells), and optimization (which chooses a portfolio of securities that minimizes expected tracking risk relative to the index based on a multifactor model of index risk exposures). Full replication is the most common procedure for indexes composed of highly liquid securities. Stratified sampling and optimization are applicable when full replication is not feasible or cost-effective.
- All else being equal, value investors are more concerned about buying a stock that is deemed relatively cheap in terms of the purchase price of earnings or assets than about the company's future growth prospects. In contrast to value investors' focus on price, growth investors are more concerned with earnings growth. Value has substyles of low P/E, contrarian, and high yield. Growth has substyles of consistent growth and earnings momentum.
- The main risk for a value investor is the potential for misinterpreting a stock's cheapness; it may be cheap for a very good economic reason that the investor does not fully appreciate. The major risk for growth investors is that the forecasted EPS growth fails to materialize as expected. In that event, P/E multiples may contract at the same time as EPS, amplifying the investor's losses.
- Two major approaches to identifying style are returns-based style analysis, based on portfolio returns, and holdings-based style analysis based on analysis of security holdings. Returns-based style analysis is quickly executed, cost-effective, and requires minimal information. Holdings-based style analysis requires detailed information on security holdings and can give an up-to-date and detailed picture of a manager's style. Most current style indexes are constructed using a holdings-based approach.

- The style box is a means of visualizing a manager's style exposures, which is typically based on a holdings-based analysis. It may contain as many as nine cells representing a portfolio on value–market-oriented–growth and small–mid–large spectrums.
- Inconsistency in style, or style drift, is of concern to investors because 1) the investor may no longer have exposure to the particular style desired and 2) the manager may be operating outside her area of expertise.
- A long-only strategy can capture one overall alpha. With a long–short strategy, however, the value added can be equal to two alphas, one from the long position and one from the short position. A market-neutral strategy is constructed to have an overall zero beta. Long–short strategies may benefit from pricing inefficiencies on the short side (a greater supply of overvalued than undervalued securities).
- The Fundamental Law of Active Management states that $\text{IR} \approx \text{IC}\sqrt{\text{Breadth}}$, which implies that the information ratio approximately equals what the investor knows about the company multiplied by the square root of the number of independent active investment decisions made each year.
- The framework for optimizing allocations to a group of managers (in this context, equity managers within the equity allocation) involves maximizing active return for a given level of active risk determined by the investor's aversion to active risk.
- A core-satellite portfolio involves an indexed and/or enhanced indexed core portfolio and actively managed satellite portfolios.
- A completion fund may be used to neutralize unintended bets against the overall equity benchmark.
- Investment management contracts may involve an ad valorem fee schedule and/or an incentive fee schedule.
- Selecting and monitoring good managers is as complex a process as selecting and managing good investments.

PRACTICE PROBLEMS

1 Katrina Lowry works for the pension department of National Software. Her supervisor has asked her to evaluate the different style alternatives for a large-cap mandate and to highlight their differences.

A State the three main large-cap styles.

B Describe the basic premise and risks of each style identified in Part A.

2 Juan Varga is concerned about the performance and investment positions of an investment firm he hired five years ago. The firm, Galicia Investment Management, has been tasked with managing an active portfolio with a developed market mandate (MSCI World countries). Galicia is a well-known value manager. Varga performs some returns-based style analysis and finds the following results for the last two years (each quarterly snapshot is the result of a regression using the prior 36 months return data).

	MSCI World Value (%)	MSCI World Growth (%)	Other (%)
1Q 2011	83	16	1
2Q 2011	77	20	3
3Q 2011	79	19	2
4Q 2011	68	29	3
1Q 2012	55	40	5
2Q 2012	48	45	7
3Q 2012	52	45	3
4Q 2012	55	43	2

What reasonable conclusions can Varga reach regarding the Galicia investment process?

3 David Burke is considering investing in a mutual fund that is classified generically under the term "growth and income." In preparation for his CFA exams, Burke studied style investing. Using publicly available data sources, he gathered the following information about the mutual fund in question. How should he characterize the fund based on what he has learned in his CFA exam preparation?

	Fund	Market Benchmark
Number of stocks	80	600
Weighted-average market cap	$37 billion	$40 billion
Dividend yield	2.5%	2.1%
P/E	16	19
P/B	1.6	1.9
EPS growth (5-year projected)	11%	12%
Sector		
Consumer Discretionary	16%	10%
Consumer Staples	9	12

(continued)

Practice Problems and Solutions: 1–11 taken from *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All other problems and solutions © CFA Institute. All rights reserved.

	Fund	Market Benchmark
Energy	9	9
Finance	15	20
Health Care	9	7
Industrials	12	9
Information Technology	8	7
Materials	5	8
Telecommunications	7	10
Utilities	10	7

4 Phillipa Jenkins has been asked to manage internally a FTSE 100 index fund. Because the index's 10 largest stocks make up more than 50 percent of its weight, Jenkins is considering using optimization to build the portfolio using many fewer than 100 stocks. All 100 stocks in the index are considered liquid. Is optimizing the best approach?

5 Shawn Miller plans to use returns-based style analysis to analyze his global portfolio. He will use style indexes as a proxy for style in the analysis and is debating whether to use indexes like Dow Jones (which categorizes stocks as value, growth, or neutral) or like MSCI (which categorize stocks only as value or growth).

A What are the benefits and drawbacks of each method?

B Does it matter which type Miller chooses for a returns-based style analysis?

6 Explain the principal benefit of a market-neutral long–short portfolio. What risks are inherent in such a portfolio that a long-only equity portfolio lacks?

7 Simon Hayes is a long–short portfolio manager with Victoria Investment Management in London. His expertise lies in building market-neutral long–short strategies using UK equities. After meeting with his most important client, Hayes learns that the client is planning to hire an investment firm to manage a Japanese equity portfolio. How can Hayes satisfy this mandate using UK equities and no Japanese equities?

8 Yoko Suzuki manages an enhanced index portfolio benchmarked to the index for Kyushu Motors' pension fund. The strategy has a target alpha of 1.5 percent annually with an annualized active risk of 2 percent. Her client is quite pleased that the portfolio has met its stated objective for the last five years. Kyushu's other investment managers have not done so well against their objectives, however, and the pension fund now suffers from a large shortfall between its assets and liabilities. To make up this shortfall, Kyushu asks her to double the portfolio's active risk with the intention of doubling the alpha as well. How should Suzuki respond to this suggestion?

9 Mike Smith is a consultant evaluating a market neutral long–short strategy for his client. Based on the holdings data he receives from the client, Smith notices a small but persistent difference between the alphas generated on the long side and those generated on the short side. State which of the two alphas is more likely the larger one, and provide three reasons why that might be the case.

10 Karen Johnson is responsible for the US equity portion of her company's pension plan. She is thinking about trying to boost the overall alpha in US equities by using an enhanced index fund to replace her core index fund holding.

A The US equity portion of the pension plan currently consists of three managers (one index, one value, and one growth) and is expected to produce a target annual alpha of 2.4 percent with a tracking risk of 2.75 percent. By

replacing the index manager with an enhanced indexer the target alpha changes to 2.8 percent with a tracking risk of 2.9 percent. Does this change represent an improvement? Why?

B Johnson also needs to decide whether she prefers a stock-based or a synthetic enhanced index manager. What are the advantages and disadvantages of each?

11 Stephanie Whitmore is evaluating several alternatives for the US equity portfolio of her company's pension plan, involving the following managers:

	Active Return	Active Risk (with Respect to Normal Benchmark)	Normal Benchmark
Index	0%	0%	Russell 3000
Semiactive	1	1.5	Russell 3000
Active A (Value)	3	5	Russell 1000 Value
Active B (Growth)	4	6	Russell 1000 Growth
Long–Short	6	6	Cash with Russell 1000 overlay

Active A's misfit risk is 7.13 percent. In all of the questions below, assume that the active returns are uncorrelated. The overall equity portfolio benchmark is the Russell 3000.

A Whitmore has taken the information in the table above and used a mean variance optimizer to create an implementation efficient frontier. The highest risk point on the efficient frontier is a 100 percent allocation to the long–short manager with a 100 percent Russell 1000 overlay. The active risk of this portfolio is 6.1 percent. Why is the risk greater than 6 percent?

B Calculate the total active risk for Active A.

C Whitmore's current equity manager allocation is 30 percent Index and 70 percent Semiactive. Calculate this portfolio's current expected active return, active risk, and information ratio.

D After determining the desired level of active risk, Whitmore selected the appropriate portfolio from the efficient frontier. The portfolio allocates 39 percent to the Index manager, 34 percent to the Semiactive manager, 7 percent to Active Manager A, 8 percent to Active Manager B, and 12 percent to the Long–Short manager. This portfolio has an expected active return of 1.59 percent and an expected active risk of 1.10 percent. Does this portfolio represent an improvement over the current allocation? If so, by how much?

E Upon further investigation of the long–short manager, Whitmore learns that approximately 20 percent of the active return generated comes from equity positions in non-US companies. Is this a concern? Why or why not?

The following information relates to Questions 12–17

Carl Tyner is a portfolio manager for the Gibson State University (GSU) Endowment Fund. The GSU Endowment's Investment Policy Statement mandates a core-satellite portfolio for the equity portion of the Endowment's assets. The portfolio assets are managed with institutional commingled (or pooled) investment funds. The details for the managers of each of the commingled funds are presented in Exhibit 1.

Exhibit 1 Investment Manager Data

	Manager A	Manager B	Manager C
Assets under management ($ millions)	$678	$4,200	$1,600
Weighted-average market cap (billions)	$50.60	$52.30	$54.10
P/E	12.20	15.55	19.61
EPS growth (long-term projected)	8.50%	11.00%	14.00%
Dividend yield	2.90%	1.65%	1.00%
Portfolio active return	2.50%	0.00%	2.50%
Portfolio active risk	4.00%	0.00%	4.00%
Management fees & expenses (% of portfolio)	0.40%	0.18%	0.41%
Allocation to GSU Endowment Equity Portfolio	20%	45%	35%

The investment committee would like Tyner to invest a small portion, $2.0 million, in international equities. The committee suggests that the MSCI ACWI Index would be an appropriate benchmark for the international equity exposure. Tyner responded that there are several index strategies that GSU could use to gain exposure to the MSCI ACWI index. The committee wants Tyner to use a strategy that will minimize tracking error.

12 Which of the managers *most likely* is following a passive investment strategy?

A Manager A.

B Manager B.

C Manager C.

13 Which of the managers is *most likely* following a growth investment style?

A Manager A.

B Manager B.

C Manager C.

14 Which of the following substyles is *least consistent* with Manager A's investment style?

A Contrarian.

B High Yield.

C Momentum.

15 The portfolio active return and portfolio active risk for GSU Endowment's equity portfolio are *closest* to:

	Portfolio Active Return	Portfolio Active Risk
A	1.38%	1.61%
B	1.38%	3.27%
C	1.67%	3.27%

16 Which of the following index strategies for the international equity exposure is *most* appropriate given the investment committee's goal related to tracking error?

A Optimization.

B Style Indexing.

C Full replication.

17 Which of the following is *most likely* to have the highest investment cost associated with meeting the investment committee's tracking error goal?

A MSCI ACWI ETF.

B MSCI ACWI mutual fund.

C Full replication of the index.

The following information relates to Questions 18–23

Roy Bernard is a portfolio manager with an institutional investment management firm. He has several US-based clients seeking domestic and international equity exposure. Three of these clients are discussed below.

Satellite Fund

Satellite Fund is a new client seeking international equity management services. Simon Day, President of Satellite Fund, tells Bernard that the fund's objectives are to exploit information not reflected in current stock prices, maximize the information ratio, and maintain a low tracking error. The portfolio's constraints include substantial unpredictable cash inflows and outflows.

Day asks Bernard for assistance in selecting a suitable international benchmark. Bernard advises him of the various trade-offs to consider when choosing an international index benchmark.

Eastern Reserve College

A second client, Eastern Reserve College, has chosen to index a portion of its large endowment fund to the S&P 500 Index. The college's finance director wants to minimize ongoing rebalancing costs and tracking error. Bernard recommends stratified sampling as the indexing strategy that best meets the college's objectives and constraints.

The college wants another portion of its endowment fund managed to maximize alpha by fully exploiting available investment opportunities in international equity markets. Bernard suggests a market-neutral, long–short portfolio using UK equities. He makes the following statements comparing the market-neutral, long–short portfolio strategy to a long-only portfolio strategy:

Statement 1 A market-neutral, long–short portfolio can generate two alphas, one from the long position and one from the short position.

Statement 2 In a long-only portfolio, alpha can be doubled by doubling the active risk.

Statement 3 The opportunity set for a long-only portfolio strategy is asymmetrical.

Gardelli

Bernard has another client, Gardelli Fund, that has inquired about semiactive portfolio management. Paolo Caruso, the manager of the fund, says he wants to avoid benchmarks biased toward small-capitalization stocks.

Bernard evaluates two forms of semiactive equity styles for Gardelli's fund, stock based and derivatives based.

Bernard prepares Exhibit 1 comparing the two:

Exhibit 1 Semiactive Equity Styles

	Expected Alpha	Tracking Risk
Stock-based semiactive	1.5%	2.9%
Derivatives-based semiactive	1.2%	2.1%

18 The investment approach *most* consistent with Satellite Fund's objectives is:

A enhanced indexing.

B active management.

C indexing using optimization.

19 Given Satellite Fund's constraints, the *most* appropriate international benchmark will favor:

A investability over breadth.

B float bands over judgment-based construction.

C fewer reconstitution effects over fewer crossing opportunities.

20 Is stratified sampling the *most* appropriate construction method for the indexed portion of the Eastern Reserve endowment fund?

A Yes.

B No, optimization is more appropriate.

C No, full replication is more appropriate.

21 Which of Bernard's statements comparing the market-neutral, long–short strategy to the long-only strategy is incorrect?

A Statement 1.

B Statement 2.

C Statement 3.

22 The type of index that would *least likely* address Caruso's concern about bias is:

A a price-weighted index.

B a value-weighted index.

C an equal-weighted index.

23 Which is the *most* appropriate strategy for Bernard to recommend for Gardelli's fund?

A The derivatives-based strategy, because it has lower tracking risk.

B The stock-based strategy, because it has a higher information ratio.

C The derivatives-based strategy, because it has a higher information ratio.

SOLUTIONS

1 **A** The three main large-cap styles are value, growth, and market oriented.

B Value managers seek to buy stocks below their intrinsic value. That said, the stocks may be cheap for good reason. Also, it may take a long time for stocks to reach their intrinsic value. Growth managers buy stocks of companies with either steadily growing earnings or companies whose earnings they expect to sharply appreciate. On the other hand, they may overpay for these earnings or the expected earnings may not materialize. Managers following the third style, market oriented, may forecast stock returns using a combination of growth or value considerations but endeavor to build portfolios that more closely resemble the market than either value or growth managers. If their fees are relatively high for achieving market-like returns, indexing or enhanced indexing may be a more cost-effective alternative.

2 The portfolio managed by Galicia is experiencing style drift. The threefold increase in the weighting of growth stocks suggests that Galicia has decided to shift to more of a market orientation, although some or all of the drift may have occurred because the stocks in the portfolio have become less value-like during the two-year period. The relatively low percentages given to "Other" suggest that Galicia's style bets explain the overwhelming majority of the portfolio's performance.

3 The fund has a modest value orientation. P/E, P/B, and EPS growth are all slightly lower than the market benchmark, and dividend yield is slightly higher. The sector weights are a bit more mixed. Some sectors that typically contain stocks with value characteristics (consumer discretionary and utilities) are overweight, while others (finance and energy) are underweight or equal weight to the benchmark. Also, traditionally growth-oriented sectors like health care and information technology are modestly overweight—unlikely in a deep value portfolio.

4 A better approach would be full replication. The main justification for using full replication is that all the components of the FTSE 100 are very liquid, so full replication can be accomplished readily and inexpensively. Because full replication minimizes tracking risk, it is the preferred method when the index consists of liquid securities. Another point is that full replication allows for the creation of a self-rebalancing portfolio in the case of a value-weighted (or float-weighted index): Trading is required only to reinvest dividends and to reflect changes in index composition. A self-rebalancing portfolio is one in which the portfolio moves in line with the index without any need for trading activity. An optimized portfolio may indeed hold fewer than 100 stocks. Because it does not contain every stock in the index in the proper capitalization weight, however, periodic trading will be required (even in the absence of index changes and dividend flows) simply to realign the portfolio's characteristics with those of the index. Over time, the trading-related costs will drag down performance. In general, optimization should be used only in situations in which full replication would result in substantial transaction costs.

5 **A** The principal benefit of all stocks being categorized as either growth or value (MSCI approach) is that it is collectively exhaustive. That said, many stocks are "border" stocks (i.e., have characteristics that place them near the value/growth border) that don't really exhibit significant value or growth characteristics but are categorized in one of these styles anyway. The Dow

Jones method's neutral/core category eliminates this problem, but the value and growth indexes by definition do not contain all of the stocks in the broad index.

B Either set of indexes can be used for returns-based style analysis. That said, Miller is likely to obtain a higher R^2 in a regression of the portfolio returns on the style index returns if he uses the more "granular" set of style indexes—those by Dow Jones. For example, if the portfolio is a deep value portfolio or a strong growth portfolio, the Dow Jones indexes are more likely to better explain the portfolio's style than a set of style indexes in which every stock is forced into either value or growth. Specifically, the deep value portfolio will be better represented by the Dow Jones Value Index because that index focuses more on deep value stocks. That same portfolio's returns regressed versus the MSCI Value Index is likely to show a lower R^2.

6 The principal benefit of a market-neutral long–short portfolio is absence of a long-only constraint. A long-only constraint penalizes portfolios in two ways. First, it prevents the portfolio manager from fully exploiting a negative forecast on a given stock. Second, in a long-only portfolio, being unable to fully exploit a negative forecast also limits the ability of the portfolio manager to maximize positive forecasts. The main risk with long–short portfolios is the unlimited liability on the short trades. If a stock in which an investor has a long position loses all of its value, the most that could happen is that the investor loses his entire investment. With a short position, however, the investor's upside is limited (stock goes to zero) but the liability is unlimited (theoretically, a stock can appreciate infinitely).

7 Hayes can produce such a portfolio through the use of a portable alpha. He submits a proposal to manage a market-neutral long–short portfolio of UK stocks. This strategy generates alpha (α). To produce beta (β), the Japanese equity exposure, Hayes takes a long position in a notional value of futures equal to the size of the portfolio.

8 Suzuki tells her client that although she can certainly double the portfolio's tracking risk to 4 percent, the portfolio's alpha will increase but not double. The problem is that as an investor increases a portfolio's tracking risk, the long-only constraint increasingly limits the portfolio manager from taking full advantage of her investment insights. Remember, $\text{IR} \approx \text{IC}\sqrt{\text{Breadth}}$. If the breadth is constant but the IC falls because a smaller portion of the manager's insight is translated into the portfolio, then the IR must also fall.

9 The short side alpha is likely the larger of the two. Many investors look for cheap stocks in which to take long positions, but comparatively few look for expensive stocks to short. Shorting is operationally more cumbersome than taking a long position, which contributes to the limited use of shorting by most investors. Also, sell recommendations from the analyst community are relatively uncommon. Analysts are more likely to simply not cover a stock on which they have an unfavorable opinion. Also, analysts working for investment banking firms have a strong incentive not to issue negative reports on companies with which the bank may wish to do business.

10 A The change is in fact positive (assuming that Johnson is willing to accept a slightly higher level of tracking risk) because the information ratio improves. Her current portfolio has an information ratio of 0.87 (2.4%/2.75%). The portfolio with the enhanced indexer has an information ratio of 0.97 (2.8%/2.9%).

B Stock-based enhanced indexing begins with an index portfolio and then over- or underweights individual stocks based on the portfolio manager's return expectations for those stocks. The portfolio is built to look like its target benchmark but to add some level of outperformance on a fairly consistent basis. The advantage of this approach is greater breadth than the synthetic approach. That said, as with all active strategies, obtaining a satisfactory IC or level of investment insight is the challenge. Synthetic enhanced index strategies involve gaining exposure to the benchmark with futures (or a swap) while generating an alpha, typically using fixed income. This strategy has the advantage of being straightforward. It generally has narrower breadth (usually a duration or credit bet) and so requires a high IC to produce the same level of IR as the stock-based approach.

11 A The total active risk is greater than 6 percent because in the calculation, the long–short manager would be benchmarked to the Russell 1000 rather than the manager's normal benchmark, which most closely captures the manager's orientation. We can see this by noting the positive level of misfit risk. The misfit risk is calculated with the equation

$\sqrt{6.0\%^2 + (\text{Misfit risk})^2} = 6.1\%$, which equals 1.1 percent.

B The total active risk is $\sqrt{5\%^2 + 7.13\%^2} = 8.71\%$.

C The expected total active return is (0.3 × 0%) + (0.7 × 1%) = 0.7%. The expected total active risk for the portfolio is

$\sqrt{\left(0.3^2 \times 0\%^2\right) + \left(0.7^2 \times 1.5\%^2\right)} = 1.05\%$.

The expected IR is 0.7%/1.05% = 0.67.

D The efficient combination of managers leads to a portfolio with an IR of 1.59%/1.10% = 1.45. Hence, despite the slightly greater active risk exposure, the overall portfolio IR increases by a factor of 2.17 versus the current mix.

E In general, the exposures to non-US equities in the long–short portfolio should not concern Whitmore as long as she believes that the manager has skill in managing non-US equities. As shown in Part A of this problem, the misfit risk for the strategy is relatively small because the manager overlays the long–short portfolio with Russell 1000 futures and thus has a high correlation with the Russell 3000 benchmark. The large majority of the strategy's total active risk is driven by the manager's active return volatility.

12 B is correct. Both the active return and active risk are expected to be 0.00%, which would indicate a passive or index investment style.

13 C is correct. Relative to the other managers' portfolio characteristics, Portfolio C has characteristics most like a growth portfolio, such as a higher average P/E, higher average earnings growth rate, and lower average dividend-yield.

14 C is correct. Manager A most likely is pursuing a value investment style, not a growth investment style. This is evidenced by the relatively low long-term projected EPS growth. Contrarian and high yield, along with low P/E, are examples of value investment substyles. Momentum is an investment substyle consistent with a growth investment style.

15 A is correct. Portfolio active return and portfolio active risk are calculated as follows:

$$\begin{aligned}\text{Portfolio active return} &= (0.20 \times 0.025) + (0.45 \times 0.0) + (0.35 \times 0.025)\\ &= 0.01375 = 1.38\%\\ \text{Portfolio active risk} &= \left[\left(0.20^2 \times 0.04^2\right) + \left(0.45^2 \times 0.0^2\right) + \left(0.35^2 \times 0.04^2\right)\right]^{0.5}\\ &= (0.000260)^{0.5} = 0.0161 = 1.61\%\end{aligned}$$

16 C is correct. Full replication of an index is the indexing methodology that is most likely to have the least tracking error because every issue in the index is represented in the portfolio in approximately the same weight as in the index.

17 C is correct. Full replication is likely to have the highest investment cost. The other choices are low-cost index options of large pooled investments. While full replication of an index will generally have the least tracking error, a portfolio of just $2.0 million on an index as large as the MSCI ACWI would be very inefficient and cost-ineffective due to the inherent costs of managing and administering the portfolio, transaction costs of portfolio adjustments, transaction costs of investing and disinvesting cash flows, and a drag on performance from cash positions in an upward-trending equity market.

18 A is correct. Enhanced indexing seeks to outperform a given index (exploit information not yet reflected in stock prices) and limit tracking risk: ". . . enhanced indexing strategies with their strict control of tracking risk have tended to have the highest information ratios."

19 A is correct. A client with unpredictable cash inflows and outflows needs greater liquidity and furthermore would not want an index with a large number of stocks.

20 C is correct. Full replication has self-rebalancing properties when used for a float-weighted index, which would translate into lower costs from lower transaction fees and also should result in minimal tracking risk. In addition, full replication is generally the preferred index construction method for indexes such as the S&P 500 that are composed of highly liquid securities. It is usually used for indexes with fewer than 1,000 stocks.

21 B is correct. You cannot double a long-only portfolio's alpha by doubling its risk. As tracking risk increases, the long-only constraint limits the investor's investment opportunity set. Because IR (active return/active risk) = IC (effectiveness of investment insight, or correlation between forecast return and actual return) * $\sqrt{\text{breadth}}$ (number of independent active decisions made), if the breadth is constant but the IC falls because a smaller portion of the manager's insight is translated into the portfolio, then the IR must also fall.

22 C is correct. An equal-weighted index is biased toward small-cap companies.

23 C is correct. An enhanced indexed portfolio is designed to perform better than its benchmark index without incurring much additional risk. The derivatives-based strategy has the higher information ratio of the two, meaning it generates a higher mean active return for each unit of active risk:

Stock based	1.5/2.9 = .52
Derivatives based	1.2/2.1 = .57

CUSTOMER SERVICE

68

Glossary

Absolute return benchmark A minimum target return that an investment manager is expected to beat.

Absolute return vehicles Investments that have no direct benchmark portfolio.

Accounting defeasance Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

Accounting risk The risk associated with accounting standards that vary from country to country or with any uncertainty about how certain transactions should be recorded.

Accumulated benefit obligation (ABO) The present value of pension benefits, assuming the pension plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date.

Accumulated service Years of service of a pension plan participant as of a specified date.

Active investment strategies An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active-lives The portion of a pension fund's liabilities associated with active workers.

Active management An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active return The portfolio's return in excess of the return on the portfolio's benchmark.

Active risk The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

Active risk budgeting Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

Actual extreme events A type of scenario analysis used in stress testing. It involves evaluating how a portfolio would have performed given movements in interest rates, exchange rates, stock prices, or commodity prices at magnitudes such as occurred during past extreme market events (e.g., the stock market crash of October 1987).

Ad valorem fees Fees that are calculated by multiplying a percentage by the value of assets managed; also called assets under management (AUM) fees.

Adaptive markets hypothesis (AMH) A hypothesis that applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives.

Adverse selection risk The risk associated with information asymmetry; in the context of trading, the risk of trading with a more informed trader.

Algorithmic trading Automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints.

Allocation/selection interaction return A measure of the joint effect of weights assigned to both sectors and individual securities; the difference between the weight of the portfolio in a given sector and the portfolio's benchmark for that sector, times the difference between the portfolio's and the benchmark's returns in that sector, summed across all sectors.

Alpha Excess risk-adjusted return.

Alpha and beta separation An approach to portfolio construction that views investing to earn alpha and investing to establish systematic risk exposures as tasks that can and should be pursued separately.

Alpha research Research related to capturing excess risk-adjusted returns by a particular strategy; a way investment research is organized in some investment management firms.

Alternative investments Groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments.

Anchoring and adjustment An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring and adjustment bias An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring trap The tendency of the mind to give disproportionate weight to the first information it receives on a topic.

Angel investor An accredited individual investing chiefly in seed- and early-stage companies.

Anomalies Apparent deviations from market efficiency.

Ask price The price at which a dealer will sell a specified quantity of a security. Also called *ask*, *offer price*, or *offer*.

Ask size The quantity associated with the ask price.

Aspirational risk bucket In goal-based portfolio planning, that part of wealth allocated to investments that have the potential to increase a client's wealth substantially.

Asset covariance matrix The covariance matrix for the asset classes or markets under consideration.

Asset/liability management The management of financial risks created by the interaction of assets and liabilities.

Asset location The type of account an asset is held within, e.g., taxable or tax deferred.

Asset-only With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

Assurity of completion In the context of trading, confidence that trades will settle without problems under all market conditions.

Assurity of the contract In the context of trading, confidence that the parties to trades will be held to fulfilling their obligations.

Asynchronism A discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

AUM fee A fee based on assets under management; an *ad valorem* fee.

Authorized participants Broker/dealers who enter into an agreement with the distributor of the fund.

Automated trading Any form of trading that is not manual, including trading based on algorithms.

Availability bias An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

Average effective spread A measure of the liquidity of a security's market. The mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study.

Back office Administrative functions at an investment firm such as those pertaining to transaction processing, record keeping, and regulatory compliance.

Backtesting A method for gaining information about a model using past data. As used in reference to VaR, it is the process of comparing the number of violations of VaR thresholds over a time period with the figure implied by the user-selected probability level.

Backwardation With respect to the futures curve in a commodity futures market, the condition of being downward sloping.

Balance of payments An accounting of all cash flows between residents and nonresidents of a country.

Bancassurance The sale of insurance by banks.

Barbell A fixed income portfolio combining securities concentrated in short and long maturities relative to the benchmark.

Base With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in "one unit of a currency."

Base-rate neglect A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

Basis point value (BPV) The change in the bond price for a 1 basis point change in yield. Also called *present value of a basis point* or *price value of a basis point (PVBP)*.

Basis risk The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

Batch auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Bayes' formula A mathematical rule explaining how existing probability beliefs should be changed given new information; it is essentially an application of conditional probabilities.

Bear spread An option strategy that involves selling a put with a lower exercise price and buying a put with a higher exercise price. It can also be executed with calls.

Behavioral finance An approach to finance based on the observation that psychological variables affect and often distort individuals' investment decision making.

Behavioral finance macro A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

Behavioral finance micro A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

Benchmark In an investments context, a standard or point of reference for evaluating the performance of an investment portfolio.

Benchmark spread The yield on a credit security over the yield on a security with little or no credit risk (benchmark bond) and with a similar duration.

Best efforts order A type of order that gives the trader's agent discretion to execute the order only when the agent judges market conditions to be favorable.

Beta A measure of the sensitivity of a given investment or portfolio to movements in the overall market.

Beta research Research related to systematic (market) risk and return; a way investment research is organized in some investment management firms.

Bid The price at which a dealer will buy a specified quantity of a security. Also called *bid price*.

Bid–ask spread The difference between the current bid price and the current ask price of a security.

Bid price In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

Bid size The quantity associated with the bid price.

Block order An order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets.

Bond-yield-plus-risk-premium method An approach to estimating the required return on equity which specifies that required return as a bond yield plus a risk premium.

Bottom-up Focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development.

Bottom-up approach A credit strategy approach that involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features.

Bounded rationality The notion that people have informational and cognitive limitations when making decisions and do not necessarily optimize when arriving at their decisions.

Box spread An option strategy that combines a bull spread and a bear spread having two different exercise prices, which produces a risk-free payoff of the difference in the exercise prices.

Broad market indexes An index that is intended to measure the performance of an entire asset class. For example, the S&P 500 Index, Wilshire 5000, and Russell 3000 indexes for US common stocks.

Broker An agent of a trader in executing trades.

Brokered markets Markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.

Bubbles Episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value.

Buffering With respect to style index construction, rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style.

Build-up approach Synonym for the risk premium approach.

Bull spread An option strategy that involves buying a call with a lower exercise price and selling a call with a higher exercise price. It can also be executed with puts.

Bullet A fixed income portfolio made up of securities targeting a single segment of the curve.

Business cycle Fluctuations in GDP in relation to long-term trend growth, usually lasting 9–11 years.

Business risk The equity risk that comes from the nature of the firm's operating activities.

Butterfly spread An option strategy that combines two bull or bear spreads and has three exercise prices, or, a measure of yield curve curvature.

Buy side Investment management companies and other investors that use the services of brokerages.

Buy-side traders Professional traders that are employed by investment managers and institutional investors.

Calendar-and-percentage-of-portfolio rebalancing Monitoring a portfolio at regular frequencies, such as quarterly. Rebalancing decisions are then made based upon percentage-of-portfolio principles.

Calendar rebalancing Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

Calmar ratio The compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period.

Cap A combination of interest rate call options designed to hedge a borrower against rate increases on a floating-rate loan.

Cap weighting See *capitalization weighting*.

Capital adequacy ratio A measure of the adequacy of capital in relation to assets.

Capital flows forecasting approach An exchange rate forecasting approach that focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment.

Capital market expectations (CME) Expectations concerning the risk and return prospects of asset classes.

Capitalization weighting The most common security weighting scheme in which constituents are held in proportion to their market capitalizations, calculated as price times available shares. Also known as *market value*, *market cap*, or *cap weighting*.

Caplet Each component call option in a cap.

Carried interest A private equity fund manager's incentive fee; the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital.

Carry trade A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

Cash balance plan A defined-benefit plan whose benefits are displayed in individual recordkeeping accounts.

Cash flow at risk A variation of VaR that measures the risk to a company's cash flow, instead of its market value; the minimum cash flow loss expected to be exceeded with a given probability over a specified time period.

Cash flow matching Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps.

Cell approach See *stratified sampling*.

Certainty equivalent The maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in an opportunity.

Chain-linking A process for combining periodic returns to produce an overall time-weighted rate of return.

Cheapest-to-deliver A bond in which the amount received for delivering the bond is largest compared with the amount paid in the market for the bond.

Civil law A legal system derived from Roman law, in which judges apply general, abstract rules or concepts to particular cases. In civil systems, law is developed primarily through legislative statutes or executive action.

Clawback provision With respect to the compensation of private equity fund managers, a provision that specifies that money paid to the fund manager be returned to the investors if, at the end of a fund's life, the investors have not received back their capital contributions and contractual share of profits.

Closed-book markets Markets in which a trader does not have real-time access to all quotes in a security.

Closeout netting In a bankruptcy, a process by which multiple obligations between two counterparties are consolidated into a single overall value owed by one of the counterparties to the other.

Cobb-Douglas model A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cobb-Douglas production function A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cognitive dissonance The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

Cognitive errors Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

Collar An option strategy involving the purchase of a put and sale of a call in which the holder of an asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. Collars also can be used to provide protection against rising interest rates on a floating-rate loan by giving up gains from lower interest rates.

Commingled real estate funds (CREFs) Professionally managed vehicles for substantial commingled (i.e., pooled) investment in real estate properties.

Commitment period The period of time over which committed funds are advanced to a private equity fund.

Commodities Articles of commerce such as agricultural goods, metals, and petroleum; tangible assets that are typically relatively homogeneous in nature.

Commodity trading advisers (CTAs) Registered advisers who manage futures funds.

Common law A legal system which draws abstract rules from specific cases. In common law systems, law is developed primarily through decisions of the courts.

Community property regime A marital property regime under which each spouse has an indivisible one-half interest in property received during marriage.

Company-specific risk The non-systematic or idiosyncratic risk specific to a particular company's operations, reputation, and business environment.

Completeness fund A portfolio that, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.

Confidence band With reference to a quality control chart for performance evaluation, a range in which the manager's value-added returns are anticipated to fall a specified percentage of the time.

Confirmation bias A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

Confirming evidence trap The bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it.

Conjunction fallacy An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

Conservatism bias A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

Consistent growth A growth investment substyle that focuses on companies with consistent growth having a long history of unit-sales growth, superior profitability, and predictable earnings.

Constant returns to scale A characteristic of a production function such that a given percentage increase in capital stock and labor input results in an equal percentage increase in output.

Contingent immunization Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

Continuous auction markets Auction markets where orders can be executed at any time during the trading day.

Contrarian A value investment substyle focusing on stocks that have been beset by problems.

Controlled foreign corporation A company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law.

Convexity A measure of how interest rate sensitivity changes with a change in interest rates.

Core capital The amount of capital required to fund spending to maintain a given lifestyle, fund goals, and provide adequate reserves for unexpected commitments.

Core–satellite A way of thinking about allocating money that seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles.

Core-satellite portfolio A portfolio in which certain investments (often indexed or semi-active) are viewed as the core and the balance are viewed as satellite investments fulfilling specific roles.

Corporate governance The system of internal controls and procedures used to define and protect the rights and responsibilities of various stakeholders.

Corporate venturing Investments by companies in promising young companies in the same or a related industry.

Covered call An option strategy involving the holding of an asset and sale of a call on the asset.

Creation units Large blocks of ETF shares often traded against a basket of underlying securities.

Credit default swap A swap used to transfer credit risk to another party. A protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event.

Credit derivative A contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

Credit method When the residence country reduces its taxpayers' domestic tax liability by the amount of taxes paid to a foreign country that exercises source jurisdiction.

Credit risk The risk of loss caused by a counterparty's or debtor's failure to make a timely payment or by the change in value of a financial instrument based on changes in default risk. Also called *default risk*.

Credit spread forward A forward contract used to transfer credit risk to another party; a forward contract on a yield spread.

Credit spread option An option based on the yield spread between two securities that is used to transfer credit risk.

Credit VaR A variation of VaR related to credit risk; it reflects the minimum loss due to credit exposure with a given probability during a period of time.

Credited rates Rates of interest credited to a policyholder's reserve account.

Cross-default provision A provision stipulating that if a borrower defaults on any outstanding credit obligations, the borrower is considered to be in default on all obligations.

Cross hedge A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

Currency overlay programs A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

Current credit risk The risk of credit-related events happening in the immediate future; it relates to the risk that a payment currently due will not be paid. Also called *jump-to-default risk*.

Custom security-based benchmark Benchmarks that are custom built to accurately reflect the investment discipline of a particular investment manager. Also called *strategy benchmarks* because they reflect a manager's particular strategy.

Cyclical stocks The shares of companies whose earnings have above-average sensitivity to the business cycle.

Cyclically Adjusted P/E Ratio (CAPE) A price-to-earnings ratio in which the numerator (in a US context) is defined as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings on the S&P 500.

Day traders Traders that rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are prepared to hold a position. Day traders hold a position open somewhat longer than a scalper but closing all positions at the end of the day.

Dealer A business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order. Also called *market maker*.

Decision price The prevailing price when the decision to trade is made. Also called *arrival price* or *strike price*.

Decision-reversal risk The risk of reversing a chosen course of action at the point of maximum loss.

Decision risk The risk of changing strategies at the point of maximum loss.

Deduction method When the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income.

Deemed dispositions Tax treatment that assumes property is sold. It is sometimes seen as an alternative to estate or inheritance tax.

Deemed distribution When shareholders of a controlled foreign corporation are taxed as if the earnings were distributed to shareholders, even though no distribution has been made.

Default risk The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.

Default risk premium Compensation for the possibility that the issue of a debt instrument will fail to make a promised payment at the contracted time and in the contracted amount.

Defaultable debt Debt with some meaningful amount of credit risk.

Deferred annuity An annuity that enables an individual to purchase an income stream that will begin at a later date.

Defined-benefit plan A pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants.

Defined-contribution plan A pension plan that specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants.

Deflation A decrease in the general level of prices; an increase in the purchasing power of a unit of currency.

Delay costs Implicit trading costs that arise from the inability to complete desired trades immediately due to order size or market liquidity. Also called *slippage*.

Delta The relationship between the option price and the underlying price, which reflects the sensitivity of the price of the option to changes in the price of the underlying.

Delta hedge An option strategy in which a position in an asset is converted to a risk-free position with a position in a specific number of options. The number of options per unit of the underlying changes through time, and the position must be revised to maintain the hedge.

Delta hedging Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

Delta-normal method A measure of VaR equivalent to the analytical method but that refers to the use of delta to estimate the option's price sensitivity.

Demand deposit A deposit that can be drawn upon without prior notice, such as a checking account.

Demutualizing The process of converting an insurance company from mutual form to stock.

Descriptive statistics Methods for effectively summarizing data to describe important aspects of a dataset.

Differential returns Returns that deviate from a manager's benchmark.

Diffusion index An index that measures how many indicators are pointing up and how many are pointing down.

Direct commodity investment Commodity investment that involves the cash market purchase of physical commodities or exposure to changes in spot market values via derivatives, such as futures.

Direct market access Platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker.

Disability income insurance A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

Discounted cash flow models (DCF models) Valuation models that express the idea that an asset's value is the present value of its (expected) cash flows.

Discretionary trust A trust structure in which the trustee determines whether and how much to distribute in the sole discretion of the trustee.

Disintermediation To withdraw funds from financial intermediaries for placement with other financial intermediaries offering a higher return or yield. Or, to withdraw funds from a financial intermediary for the purposes of direct investment, such as withdrawing from a mutual fund to make direct stock investments.

Dispersion The weighted *variance* of the times to receipt of cash flow; it measures the extent to which the payments are spread out around the duration.

Disposition effect As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

Distressed debt arbitrage A distressed securities investment discipline that involves purchasing the traded bonds of bankrupt companies and selling the common equity short.

Distressed securities Securities of companies that are in financial distress or near bankruptcy; the name given to various investment disciplines employing the securities of companies in distress.

Diversification effect In reference to VaR across several portfolios (for example, across an entire firm), this effect equals the difference between the sum of the individual VaRs and total VaR.

Dividend recapitalization A method by which a buyout fund can realize the value of a holding; involves the issuance of debt by the holding to finance a special dividend to owners.

Domestic asset An asset that trades in the investor's domestic currency (or home currency).

Domestic currency The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

Domestic-currency return A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

Donor-advised fund A fund administered by a tax-exempt entity in which the donor advises on where to grant the money that he or she has donated.

Double inflection utility function A utility function that changes based on levels of wealth.

Downside deviation A measure of volatility using only rate of return data points below the investor's minimum acceptable return.

Due diligence Investigation and analysis in support of an investment action or recommendation, such as the scrutiny of operations and management and the verification of material facts.

Duration A measure of the approximate sensitivity of a security to a change in interest rates (i.e., a measure of interest rate risk).

Duration matching Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

Dynamic asset allocation A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

Dynamic hedge A hedge requiring adjustment as the price of the hedged asset changes.

Earnings at risk (EAR) A variation of VaR that reflects the risk of a company's earnings instead of its market value.

Earnings momentum A growth investment substyle that focuses on companies with earnings momentum (high quarterly year-over-year earnings growth).

Earnings risk The risk associated with the earning potential of an individual.

Econometrics The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

Economic balance sheet A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet.*

Economic exposure The risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.

Economic indicators Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

Effective convexity A second-order effect that describes how a bond's interest rate sensitivity changes with changes in yield. Effective convexity is used when the bond has cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities).

Effective duration Duration adjusted to account for embedded options.

Effective spread Two times the distance between the actual execution price and the midpoint of the market quote at the time an order is entered; a measure of execution costs that captures the effects of price improvement and market impact.

Electronic communications networks (ECNs) Computer-based auctions that operate continuously within the day using a specified set of rules to execute orders.

Emerging market debt The sovereign debt of nondeveloped countries.

Emotional biases Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Empirical duration A measure of interest rate sensitivity that is determined from market data.

Endogenous variable A variable whose values are determined within the system.

Endowment bias An emotional bias in which people value an asset more when they hold rights to it than when they do not.

Endowments Long-term funds generally owned by operating nonprofit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Enhanced derivatives products companies A type of subsidiary separate from an entity's other activities and not liable for the parent's debts. They are often used by derivatives dealers to control exposure to ratings downgrades. Also called *special purpose vehicles.*

Enhanced indexing strategy Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

Enterprise risk management An overall assessment of a company's risk position. A centralized approach to risk management sometimes called firmwide risk management.

Environmental, social, and corporate governance (ESG) Also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.

Equal probability rebalancing Rebalancing in which the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor.

Equal weighted In an equal-weighted index, each stock in the index is weighted equally.

Equal weighting Security weighting scheme in which all constituents are held at equal weights at specified rebalancing times.

Equitized Given equity market systematic risk exposure.

Equity forward sale contract A private contract for the forward sale of an equity position.

Equity monetization The realization of cash for an equity position through a manner other than an outright sale.

Equity *q* The ratio of a company's equity market capitalization divided by net worth measured at replacement cost.

Equity risk premium Compensation for the additional risk of equity compared with debt.

ESG risk The risk to a company's market valuation resulting from environmental, social, and governance factors.

Estate All of the property a person owns or controls; may consist of financial assets, tangible personal assets, immovable property, or intellectual property.

Estate planning The process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime.

Estate tax freeze A plan usually involving a corporation, partnership, or limited liability company with the goal to transfer *future* appreciation to the next generation at little or no gift or estate tax cost.

Eurozone The region of countries using the euro as a currency.

Evaluated pricing See *matrix pricing.*

***Ex post* alpha** (or Jensen's alpha) The average return achieved in a portfolio in excess of what would have been predicted by CAPM given the portfolio's risk level; an after-the-fact measure of excess risk-adjusted return.

Excess capital An investor's capital over and above that which is necessary to fund their lifestyle and reserves.

Excess return The difference between the benchmark return and the portfolio return, which may be either positive or negative.

Exchange A regulated venue for the trading of investment instruments.

Exchange fund A fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself.

Exchange-traded funds Exchange-traded Funds or ETFs are hybrid investment products with many features of mutual funds combined with the trading features of common stocks or bonds. Essentially, ETFs are typically portfolios of stocks or bonds or commodities that trade throughout the day like common stocks.

Execution uncertainty Uncertainty pertaining to the timing of execution, or if execution will even occur at all.

Exemption method When the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, in effect having only one jurisdiction impose tax.

Exogenous shocks Events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example.

Exogenous variable A variable whose values are determined outside the system.

Extended portfolio assets and liabilities Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

Externality Those consequences of a transaction (or process) that do not fall on the parties to the transaction (or process).

Factor covariance matrix The covariance matrix of factors.

Factor-model-based benchmark Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

Factor push A simple stress test that involves pushing prices and risk factors of an underlying model in the most disadvantageous way to estimate the impact of factor extremes on the portfolio's value.

Factor sensitivities In a multifactor model, the responsiveness of the dependent variable to factor movements. Also called *factor betas* or *factor loadings*.

Fallen angels Debt that has crossed the threshold from investment grade to high yield.

Fed model An equity valuation model that relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds.

Federal funds rate The interest rate on overnight loans of reserves (deposits) between US Federal Reserve System member banks.

Fee cap A limit on the total fee paid regardless of performance.

Fiduciary A person or entity standing in a special relation of trust and responsibility with respect to other parties.

Financial buyers Buyers who lack a strategic motive.

Financial capital The tangible and intangible assets (excluding human capital) owned by an individual or household.

Financial equilibrium models Models describing relationships between expected return and risk in which supply and demand are in balance.

Financial risk Risks derived from events in the external financial markets, such as changes in equity prices, interest rates, or currency exchange rates.

Fiscal policy Government activity concerning taxation and governmental spending.

Fixed trust A trust structure in which distributions to beneficiaries are prescribed in the trust document to occur at certain times or in certain amounts.

Flexible-premium variable life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *variable universal life*.

Floating supply of shares The number of shares outstanding that are actually available to investors. Also called *free float*.

Floor A combination of interest rate options designed to provide protection against interest rate decreases.

Floor broker An agent of the broker who, for certain exchanges, physically represents the trade on the exchange floor.

Floorlet Each component put option in a floor.

Forced heirship rules Legal ownership principles whereby children have the right to a fixed share of a parent's estate.

Foreign assets Assets denominated in currencies other than the investor's home currency.

Foreign currency Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

Foreign-currency return The return of the foreign asset measured in foreign-currency terms.

Formal tools Established research methods amenable to precise definition and independent replication of results.

Forward conversion with options The construction of a synthetic short forward position against the asset held long.

Forward rate bias Persistent violation of uncovered interest rate parity that is exploited by the carry trade.

Foundations Typically, grant-making institutions funded by gifts and investment assets.

Fourth market A term occasionally used for direct trading of securities between institutional investors; the fourth market would include trading on electronic crossing networks.

Framing An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Framing bias An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Front office The revenue generating functions at an investment firm such as those pertaining to trading and sales.

Front-run To trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions.

Full replication When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Full replication approach When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Fully funded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is 100 percent or greater.

Fund manager The professional manager of separate accounts or pooled assets structured in a variety of ways.

Fund of funds A fund that invests in a number of underlying funds.

Fundamental law of active management The relation that the information ratio of a portfolio manager is approximately equal to the information coefficient multiplied by the square root of the investment discipline's breadth (the number of independent, active investment decisions made each year).

Fundamental weighting Patented by Research Affiliates LLC, this scheme uses company characteristics such as sales, cash flow, book value, and dividends to weight securities.

Funded status The relationship between the value of a plan's assets and the present value of its liabilities.

Funding currencies The low-yield currencies in which borrowing occurs in a carry trade.

Funding risk The risk that liabilities funding long asset positions cannot be rolled over at reasonable cost.

G-spread The yield on a credit security over the yield of an actual or interpolated government bond.

Gain-to-loss ratio The ratio of positive returns to negative returns over a specified period of time.

Gamblers' fallacy A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

Gamma A numerical measure of the sensitivity of delta to a change in the underlying's value.

Global custodian An entity that effects trade settlement, safekeeping of assets, and the allocation of trades to individual custody accounts.

Global investable market A practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.

Goals-based With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

Goals-based investing An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

Gordon (constant) growth model A version of the dividend discount model for common share value that assumes a constant growth rate in dividends.

Government structural policies Government policies that affect the limits of economic growth and incentives within the private sector.

Grinold–Kroner model An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

Growth in total factor productivity A component of trend growth in GDP that results from increased efficiency in using capital inputs; also known as technical progress.

H-model A variant of the two-stage dividend discount model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate that holds in perpetuity.

Hague Conference on Private International Law An intergovernmental organization working toward the convergence of private international law. Its 69 members consist of countries and regional economic integration organizations.

Halo effect An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

Health insurance A type of insurance used to cover health care and medical costs.

Health risk The risk associated with illness or injury.

Hedge funds A historically loosely regulated, pooled investment vehicle that may implement various investment strategies.

Hedge ratio The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

Hedging A general strategy usually thought of as reducing, if not eliminating, risk.

Herding When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

High-water mark A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

High yield A value investment substyle that focuses on stocks offering high dividend yield with prospects of maintaining or increasing the dividend.

High-yield investing A distressed securities investment discipline that involves investment in high-yield bonds perceived to be undervalued.

Hindsight bias A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

Historical simulation method The application of historical price changes to the current portfolio.

Holdings-based style analysis An approach to style analysis that categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time.

Holistic balance sheet See *economic balance sheet.*

Home bias A preference for securities listed on the exchanges of one's home country.

Home-country bias The favoring of domestic over non-domestic investments relative to global market value weights.

Home currency See *domestic currency.*

Horizon matching Hybrid approach that combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short-and long-term liabilities.

Human capital An implied asset; the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital.*

Hybrid markets Combinations of market types, which offer elements of batch auction markets and continuous auction markets, as well as quote-driven markets.

Hypothetical events A type of scenario analysis used in stress testing that involves the evaluation of performance given events that have never happened in the markets or market outcomes to which we attach a small probability.

I-spread The yield on a credit security over the swap rate (denominated in the same currency as the credit security). Also known as interpolated spread.

Illiquidity premium Compensation for the risk of loss relative to an investment's fair value if an investment needs to be converted to cash quickly.

Illusion of control A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Illusion of control bias A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Immediate annuity An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

Immunization An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

Implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return.

Implementation shortfall strategy A strategy that attempts to minimize trading costs as measured by the implementation shortfall method. Also called *arrival price strategy*.

Implied yield A measure of the yield on the underlying bond of a futures contract implied by pricing it as though the underlying will be delivered at the futures expiration.

Incremental VaR A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.

Indexing A common passive approach to investing that involves holding a portfolio of securities designed to replicate the returns on a specified index of securities.

Indifference curve analysis A decision-making approach whereby curves of consumption bundles, among which the decision-maker is indifferent, are constructed to identify and choose the curve within budget constraints that generates the highest utility.

Indirect commodity investment Commodity investment that involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production.

Inferential statistics Methods for making estimates or forecasts about a larger group from a smaller group actually observed.

Inflation An increase in the general level of prices; a decrease in the purchasing power of a unit of currency.

Inflation hedge An asset whose returns are sufficient on average to preserve purchasing power during periods of inflation.

Inflation premium Compensation for expected inflation.

Information coefficient The correlation between forecast and actual returns.

Information-motivated traders Traders that seek to trade on information that has limited value if not quickly acted upon.

Information ratio The mean excess return of the account over the benchmark (i.e., mean active return) relative to the variability of that excess return (i.e., tracking risk); a measure of risk-adjusted performance.

Infrastructure funds Funds that make private investment in public infrastructure projects in return for rights to specified revenue streams over a contracted period.

Initial public offering The initial issuance of common stock registered for public trading by a formerly private corporation.

Input uncertainty Uncertainty concerning whether the inputs are correct.

Inside ask The lowest available ask price. Also called *market ask*.

Inside bid The highest available bid price. Also called *market bid*.

Inside bid–ask spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *market spread*.

Inside quote Combination of the highest available bid price with the lowest available ask price. Also called *market quote*.

Inside spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside bid–ask spread*, or *market spread*.

Institutional investors Corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets.

Interest rate management effect With respect to fixed-income attribution analysis, a return component reflecting how well a manager predicts interest rate changes.

Interest spread With respect to banks, the average yield on earning assets minus the average percent cost of interest-bearing liabilities.

Internal rate of return The growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows; money-weighted rate of return is a synonym.

Intestate Having made no valid will; a decedent without a valid will or with a will that does not dispose of their property is considered to have died intestate.

Intrinsic value The difference between the spot exchange rate and the strike price of a currency option.

Inventory cycle A cycle measured in terms of fluctuations in inventories, typically lasting 2–4 years.

Inverse floater A floating-rate note or bond in which the coupon is adjusted to move opposite to a benchmark interest rate.

Investment currencies The high-yielding currencies in a carry trade.

Investment skill The ability to outperform an appropriate benchmark consistently over time.

Investment style A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

Investment style indexes Indexes that represent specific portions of an asset category. For example, subgroups within the US common stock asset category such as large-capitalization growth stocks.

Investment universe The set of assets that may be considered for investment.

Investor's benchmark The benchmark an investor uses to evaluate performance of a given portfolio or asset class.

Irrevocable trust A trust arrangement wherein the settlor has no ability to revoke the trust relationship.

J factor risk The risk associated with a judge's track record in adjudicating bankruptcies and restructurings.

Joint ownership with right of survivorship Jointly owned; assets held in joint ownership with right of survivorship automatically transfer to the surviving joint owner or owners outside the probate process.

Justified P/E The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.

Key rate duration A method of measuring the interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

Knock-in/knock-out Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

Lagging economic indicators A set of economic variables whose values correlate with recent past economic activity.

Leading economic indicators A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

Legal/contract risk The possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake; for example, if a contract is voided through litigation.

Leverage-adjusted duration gap A leverage-adjusted measure of the difference between the durations of assets and liabilities which measures a bank's overall interest rate exposure.

Leveraged floating-rate note (leveraged floater) A floating-rate note or bond in which the coupon is adjusted at a multiple of a benchmark interest rate.

Leveraged recapitalization A leveraging of a company's balance sheet, usually accomplished by working with a private equity firm.

Liability-based benchmark A benchmark structured to accurately reflect the return required to meet the future obligations of an investor and to mimic the volatility of the liabilities.

Liability-driven investing An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

Liability glide path A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

Liability insurance A type of insurance used to manage liability risk.

Liability-relative With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

Liability risk The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

Life-cycle finance A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

Life insurance A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

Lifetime gratuitous transfer A lifetime gift made during the lifetime of the donor; also known as *inter vivos* transfers.

Limit order An instruction to execute an order when the best price available is at least as good as the limit price specified in the order.

Liquidity The ability to trade without delay at relatively low cost and in relatively large quantities.

Liquidity-motivated traders Traders that are motivated to trade based upon reasons other than an information advantage. For example, to release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs.

Liquidity risk Any risk of economic loss because of the need to sell relatively less liquid assets to meet liquidity requirements; the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.

Lock-up period A minimum initial holding period for investments during which no part of the investment can be withdrawn.

Locked up Said of investments that cannot be traded at all for some time.

Logical participation strategies Protocols for breaking up an order for execution over time. Typically used by institutional traders to participate in overall market volumes without being unduly visible.

Longevity risk The risk associated with living to an advanced age in retirement, including the uncertainty surrounding how long retirement will last; the risk of outliving one's financial resources.

Loss-aversion bias A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

Loss given default See *loss severity*.

Loss severity The amount of loss if a default occurs. Also called *loss given default*.

Low P/E A value investment substyle that focuses on shares selling at low prices relative to current or normal earnings.

M^2 A measure of what a portfolio would have returned if it had taken on the same total risk as the market index.

Macaulay duration The percentage change in price for a percentage change in yield. The term, named for one of the economists who first derived it, is used to distinguish the calculation from modified duration. (See also *modified duration*).

Macro attribution Performance attribution analysis conducted on the fund sponsor level.

Macro expectations Expectations concerning classes of assets.

Managed futures Pooled investment vehicles, frequently structured as limited partnerships, that invest in futures and options on futures and other instruments.

Managed futures funds Pools of private capital managed by commodity trading advisers.

Manager continuation policies Policies adopted to guide the manager evaluations conducted by fund sponsors. The goal of manager continuation policies is to reduce the costs of manager turnover while systematically acting on indications of future poor performance.

Manager monitoring A formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations; used to identify warning signs of adverse changes in existing managers' organizations.

Manager peer group See *manager universe*.

Manager review A detailed examination of a manager that currently exists within a plan sponsor's program. The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired.

Manager universe A broad group of managers with similar investment disciplines. Also called *manager peer group*.

Market-adjusted implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return, adjusted using beta to remove the effect of the return on the market.

Market ask The lowest available ask price.

Market bid The best available bid; highest price any buyer is currently willing to pay.

Market bid–ask spread Market ask price minus market bid price. Also called *inside bid–ask spread*, *inside spread*, or *market spread*.

Market cap weighting See *capitalization weighting*.

Market fragmentation A condition whereby a market contains no dominant group of sellers (or buyers) that are large enough to unduly influence the market.

Market impact The effect of the trade on transaction prices. Also called *price impact*.

Market index Represents the performance of a specified security market, market segment, or asset class.

Market integration The degree to which there are no impediments or barriers to capital mobility across markets.

Market microstructure The market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Market model A regression equation that specifies a linear relationship between the return on a security (or portfolio) and the return on a broad market index.

Market-not-held order A variation of the market order designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the floor broker is not required to trade at any specific price or in any specific time interval.

Market on close order A market order to be executed at the closing of the market.

Market on open order A market order to be executed at the opening of the market.

Market order An instruction to execute an order as soon as possible in the public markets at the best price available.

Market oriented With reference to equity investing, an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth.

Market quote Combination of the highest available bid price with the lowest available ask price. Also called *inside quote*.

Market risk The risk associated with interest rates, exchange rates, and equity prices.

Market risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to maintain the client's current standard of living.

Market segmentation The degree to which there are some meaningful impediments to capital movement across markets.

Market spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *inside bid–ask spread*.

Market value weighting See *capitalization weighting*.

Marking to market A procedure used primarily in futures markets in which the parties to a contract settle the amount owed daily. Also known as the *daily settlement*.

Mass affluent An industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services.

Matrix prices Prices determined by comparisons to other securities of similar credit risk and maturity; the result of matrix pricing.

Matrix pricing An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

Maturity premium Compensation for the increased sensitivity of the market value of debt to a change in market interest rates as maturity is extended.

Maximum loss optimization A stress test in which we would try to optimize mathematically the risk variable that would produce the maximum loss.

Mega-cap buyout funds A class of buyout funds that take public companies private.

Mental accounting bias An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

Micro attribution Performance attribution analysis carried out on the investment manager level.

Micro expectations Expectations concerning individual assets.

Middle-market buyout funds A class of buyout funds that purchase private companies whose revenues and profits are too small for them to access capital from the public equity markets.

Midquote The halfway point between the market bid and ask prices.

Minimum-variance hedge ratio A mathematical approach to determining the optimal cross hedging ratio.

Mismatch in character The potential tax inefficiency that can result if the instrument being hedged, and the tool that is being used to hedge it, produce income and loss of a different character.

Missed trade opportunity costs Unrealized profit/loss arising from the failure to execute a trade in a timely manner.

Model risk The risk that a model is incorrect or misapplied; in investments, it often refers to valuation models.

Model uncertainty Uncertainty concerning whether a selected model is correct.

Modified duration An adjustment of the duration for the level of the yield. Contrast with *Macaulay duration*.

Monetary policy Government activity concerning interest rates and the money supply.

Monetize To access an item's cash value without transferring ownership of it.

Money duration A measure of the price change in units of the currency in which the bond is denominated given a change in its yield-to-maturity.

Money markets Markets for fixed-income securities with maturities of one year or less.

Money-weighted rate of return Same as the internal rate of return; the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows.

Multifactor model A model that explains a variable in terms of the values of a set of factors.

Multiperiod Sharpe ratio A Sharpe ratio based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment.

Mutual funds A professionally managed investment pool in which investors in the fund typically each have a pro-rata claim on the income and value of the fund.

Mutuals With respect to insurance companies, companies that are owned by their policyholders, who share in the company's surplus earnings.

Natural liquidity An extensive pool of investors who are aware of and have a potential interest in buying and/or selling a security.

Net asset value Value established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.

Net employment capital See *human capital*.

Net interest margin With respect to banks, net interest income (interest income minus interest expense) divided by average earning assets.

Net interest spread With respect to the operations of insurers, the difference between interest earned and interest credited to policyholders.

Net wealth The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

Net worth tax or net wealth tax A tax based on a person's assets, less liabilities.

Nominal default-free bonds Conventional bonds that have no (or minimal) default risk.

Nominal gross domestic product A money measure of the goods and services produced within a country's borders. Also called *nominal GDP*.

Nominal risk-free interest rate The sum of the real risk-free interest rate and the inflation premium.

Non-deliverable forwards Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

Nonfinancial risk Risks that arise from sources other than the external financial markets, such as changes in accounting rules, legal environment, or tax rates.

Nonparametric Involving minimal probability-distribution assumptions.

Nonstationarity A property of a data series that reflects more than one set of underlying statistical properties.

Normal portfolio A portfolio with exposure to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Objective function A quantitative expression of the objective or goal of a process.

Offer price The price at which a counterparty is willing to sell one unit of the base currency.

Open market operations The purchase or sale by a central bank of government securities, which are settled using reserves, to influence interest rates and the supply of credit by banks.

Open outcry auction market Public auction where representatives of buyers and sellers meet at a specified location and place verbal bids and offers.

Operational risk The risk of loss from failures in a company's systems and procedures (for example, due to computer failures or human failures) or events completely outside of the control of organizations (which would include "acts of God" and terrorist actions).

Opportunistic participation strategies Passive trading combined with the opportunistic seizing of liquidity.

Optimization With respect to portfolio construction, a procedure for determining the best portfolios according to some criterion.

Option-adjusted spread The constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price.

Order-driven markets Markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices.

Ordinary life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *whole life insurance*.

Orphan equities investing A distressed securities investment discipline that involves investment in orphan equities that are perceived to be undervalued.

Orphan equity The newly issued equity of a company emerging from reorganization.

Output gap The difference between the value of GDP estimated as if the economy were on its trend growth path (potential output) and the actual value of GDP.

Overall trade balance The sum of the current account (reflecting exports and imports) and the financial account (consisting of portfolio flows).

Overbought When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

Overconfidence bias A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

Overconfidence trap The tendency of individuals to overestimate the accuracy of their forecasts.

Oversold The opposite of overbought; see *overbought*.

Pairs trade A basic long–short trade in which an investor is long and short equal currency amounts of two common stocks in a single industry. Also called *pairs arbitrage*.

Panel method A method of capital market expectations setting that involves using the viewpoints of a panel of experts.

Partial correlation In multivariate problems, the correlation between two variables after controlling for the effects of the other variables in the system.

Partial fill Execution of a purchase or sale for fewer shares than was stipulated in the order.

Participate (do not initiate) order A variant of the market-not-held order. The broker is deliberately low-key and waits for and responds to the initiatives of more active traders.

Passive investment Investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

Passive investment strategies A buy-and-hold strategy to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive management A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive traders Traders that seek liquidity in their rebalancing transactions, but are much more concerned with the cost of trading.

Payment netting A means of settling payments in which the amount owed by the first party to the second is netted with the amount owed by the second party to the first; only the net difference is paid.

Pension funds Funds consisting of assets set aside to support a promise of retirement income.

Pension surplus Pension assets at market value minus the present value of pension liabilities.

Percent-range rebalancing An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

Percentage-of-portfolio rebalancing Rebalancing is triggered based on set thresholds stated as a percentage of the portfolio's value.

Percentage-of-volume strategy A logical participation strategy in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Perfect markets Markets without any frictional costs.

Performance appraisal The evaluation of portfolio performance; a quantitative assessment of a manager's investment skill.

Performance attribution A comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns.

Performance-based fee Fees specified by a combination of a base fee plus an incentive fee for performance in excess of a benchmark's.

Performance evaluation The measurement and assessment of the outcomes of investment management decisions.

Performance measurement A component of performance evaluation; the relatively simple procedure of calculating an asset's or portfolio's rate of return.

Performance netting risk For entities that fund more than one strategy and have asymmetric incentive fee arrangements with the portfolio managers, the potential for loss in cases where the net performance of the group of managers generates insufficient fee revenue to fully cover contractual payout obligations to all portfolio managers with positive performance.

Periodic auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Permanent income hypothesis The hypothesis that consumers' spending behavior is largely determined by their long-run income expectations.

Permanent life insurance A type of life insurance that provides lifetime coverage.

Personal risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to protect the client from a drastic decrease in lifestyle.

Plan sponsor The trustee, company, or employer responsible for a public or private institutional investment plan.

Pledging requirement With respect to banks, a required collateral use of assets.

Point estimate A single-valued estimate of a quantity, as opposed to an estimate in terms of a range of values.

Policyholder reserves With respect to an insurance company, an amount representing the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Political risk The risk of war, government collapse, political instability, expropriation, confiscation, or adverse changes in taxation. Also called *geopolitical risk*.

Portable Moveable. With reference to a pension plan, one in which a plan participant can move his or her share of plan assets to a new plan, subject to certain rules, vesting schedules, and possible tax penalties and payments.

Portable alpha A strategy involving the combining of multiple positions (e.g., long and short positions) so as to separate the alpha (unsystematic risk) from beta (systematic risk) in an investment.

Portfolio trade A trade in which a number of securities are traded as a single unit. Also called *program trade* or *basket trade*.

Position a trade To take the other side of a trade, acting as a principal with capital at risk.

Post-trade transparency Degree to which completed trades are quickly and accurately reported to the public.

Potential output The value of GDP if the economy were on its trend growth path.

Preferred return With respect to the compensation of private equity fund managers, a hurdle rate.

Premature death risk The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

Premium Regarding life insurance, the asset paid by the policy holder to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy.

Prepackaged bankruptcy A bankruptcy in which the debtor seeks agreement from creditors on the terms of a reorganization before the reorganization filing.

Prepaid variable forward A collar and loan combined within a single instrument.

Present value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Present value of distribution of cash flows methodology Method used to address a portfolio's sensitivity to rate changes along the yield curve, this approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

Pretrade transparency Ability of individuals to quickly, easily, and inexpensively obtain accurate information about quotes and trades.

Price discovery Adjustment of transaction prices to balance supply and demand.

Price improvement Execution at a price that is better than the price quoted at the time of order placement.

Price uncertainty Uncertainty about the price at which an order will execute.

Price value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Price weighted With respect to index construction, an index in which each security in the index is weighted according to its absolute share price.

Price weighting Security weighting scheme in which constituents are weighted in proportion to their prices.

Priced risk Risk for which investors demand compensation.

Primary capital Assets held outside a concentrated position that are at least sufficient to provide for the owner's lifetime spending needs.

Prime brokerage A suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

Principal trade A trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell.

Private equity Ownership interests in non-publicly traded companies.

Private equity funds Pooled investment vehicles that generally invest in highly illiquid assets; include venture capital funds and buyout funds.

Private exchange A method for handling undiversified positions with built-in capital gains in which shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.

Private placement memorandum A document used to raise venture capital financing when funds are raised through an agent.

Probate The legal process to confirm the validity of a will so that executors, heirs, and other interested parties can rely on its authenticity.

Profit-sharing plans A defined-contribution plan in which contributions are based, at least in part, on the plan sponsor's profits.

Projected benefit obligation (PBO) A measure of a pension plan's liability that reflects accumulated service in the same manner as the ABO but also projects future variables, such as compensation increases.

Property insurance A type of insurance used by individuals to manage property risk.

Property risk The possibility that a person's property may be damaged, destroyed, stolen, or lost.

Prospect theory An alternative to expected utility theory, it assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses.

Protective put An option strategy in which a long position in an asset is combined with a long position in a put.

Proxy hedge See *cross hedge*.

Prudence trap The tendency to temper forecasts so that they do not appear extreme; the tendency to be overly cautious in forecasting.

Public good A good that is not divisible and not excludable (a consumer cannot be denied it).

Purchasing power parity The theory that movements in an exchange rate should offset any difference in the inflation rates between two countries.

Pure indexing Method investors use to match an underlying market index in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk.

Pure sector allocation return A component of attribution analysis that relates relative returns to the manager's sector-weighting decisions. Calculated as the difference between the allocation (weight) of the portfolio to a given sector and the portfolio's benchmark weight for that sector, multiplied by the difference between the sector benchmark's return and the overall portfolio's benchmark return, summed across all sectors.

Put spread A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

Quality control charts A graphical means of presenting performance appraisal data; charts illustrating the performance of an actively managed account versus a selected benchmark.

Quantitative easing A policy measure in which a central bank buys financial assets to inject a predetermined quantity of money in the financial system.

Quote-driven markets Markets that rely on dealers to establish firm prices at which securities can be bought and sold. Also called *dealer markets*.

Quoted depth The number of shares available for purchase or sale at the quoted bid and ask prices.

Ratio spread An option strategy in which a long position in a certain number of options is offset by a short position in a certain number of other options on the same underlying, resulting in a risk-free position.

Rational economic man A self-interested, risk-averse individual who has the ability to make judgments using all available information in order to maximize his/her expected utility.

Re-base With reference to index construction, to change the time period used as the base of the index.

Real estate Interests in land or structures attached to land.

Real estate investment trusts (REITs) Publicly traded equities representing pools of money invested in real estate properties and/or real estate debt.

Real option An option involving decisions related to tangible assets or processes.

Real risk-free interest rate The single-period interest rate for a completely risk-free security if no inflation were expected.

Rebalancing In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

Rebalancing range A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

Rebate rate The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

Recallability trap The tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory.

Recession A broad-based economic downturn, conventionally defined as two successive quarterly declines in GDP.

Regime A distinct governing set of relationships.

Regret The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

Regret-aversion bias An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

Regulatory risk The risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change.

Reinvestment risk The risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate.

Relative economic strength forecasting approach An exchange rate forecasting approach that suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate.

Relative strength indicators A price momentum indicator that involves comparing a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.

Remaindermen Beneficiaries of a trust; having a claim on the residue.

Repo rate The interest rate on a repurchase agreement.

Representativeness bias A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

Repurchase agreements (repos) In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount, while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

Repurchase yield The negative of the expected percent change in number of shares outstanding, in the Grinold–Kroner model.

Residence jurisdiction A framework used by a country to determine the basis for taxing income, based on residency.

Residence–residence conflict When two countries claim residence of the same individual, subjecting the individual's income to taxation by both countries.

Residence–source conflict When tax jurisdiction is claimed by an individual's country of residence and the country where some of their assets are sourced; the most common source of double taxation.

Residue With respect to trusts, the funds remaining in a trust when the last income beneficiary dies.

Resistance levels Price points on dealers' order boards where one would expect to see a clustering of offers.

Retired-lives The portion of a pension fund's liabilities associated with retired workers.

Returns-based benchmarks Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

Returns-based style analysis An approach to style analysis that focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns.

Reverse repos Repurchase agreement from the standpoint of the lender.

Revocable trust A trust arrangement wherein the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets.

Risk budgeting The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

Risk exposure A source of risk. Also, the state of being exposed or vulnerable to a risk.

Risk premium approach An approach to forecasting the return of a risky asset that views its expected return as the sum of the risk-free rate of interest and one or more risk premiums.

Risk reversal With respect to foreign exchange option strategies, one involving a long position in a call option and a short position in a put option.

Risk tolerance The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

Rolling return The moving average of the holding-period returns for a specified period (e.g., a calendar year) that matches the investor's time horizon.

Sale and leaseback A transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rate and term acceptable to the new owner and on financial terms consistent with the marketplace.

Sample estimator A formula for assigning a unique value (a point estimate) to a population parameter.

Sample-size neglect A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or "real" data).

Sandwich spread An option strategy that is equivalent to a short butterfly spread.

Satisfice A combination of "satisfy" and "suffice" describing decisions, actions, and outcomes that may not be optimal, but are adequate.

Savings–investment imbalances forecasting approach An exchange rate forecasting approach that explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate.

Scenario analysis A risk assessment technique involving the examination of the performance of a portfolio under specified situations.

Seagull spread An extension of the risk reversal foreign exchange option strategy that limits downside risk.

Secondary offering An offering after the initial public offering of securities.

Sector/quality effect In a fixed-income attribution analysis, a measure of a manager's ability to select the "right" issuing sector and quality group.

Security selection effect In a fixed-income attribution analysis, the residual of the security's total return after other effects are accounted for; a measure of the return due to ability in security selection.

Segmentation With respect to the management of insurance company portfolios, the notional subdivision of the overall portfolio into sub-portfolios each of which is associated with a specified group of insurance contracts.

Self-attribution bias A bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control.

Self-control bias A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

Sell side Broker/dealers that sell securities and make recommendations for various customers, such as investment managers and institutional investors.

Semi-active management A variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark with tightly controlled risk relative to the benchmark. Also called *enhanced indexing* or *risk-controlled active management.*

Separate property regime A marital property regime under which each spouse is able to own and control property as an individual.

Settlement netting risk The risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.

Settlement risk When settling a contract, the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.

Settlor (or grantor) An entity that transfers assets to a trustee, to be held and managed for the benefit of the trust beneficiaries.

Shari'a The law of Islam. In addition to the law of the land, some follow guidance provided by Shari'a or Islamic law.

Sharpe ratio A measure of risk-adjusted performance that compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. Also called *reward-to-variability*.

Short sale against the box Shorting a security that is held long.

Shortfall probability The probability of failing to meet a specific liability or goal.

Shortfall risk The risk that portfolio value will fall below some minimum acceptable level during a stated time horizon; the risk of not achieving a specified return target.

Shrinkage estimation Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

Shrinkage estimator The formula used in shrinkage estimation of a parameter.

Smart beta Involves the use of simple, transparent, rules-based strategies as a basis for investment decisions.

Smart routing The use of algorithms to intelligently route an order to the most liquid venue.

Smoothing rule With respect to spending rates, a rule that averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

Social proof A bias in which individuals tend to follow the beliefs of a group.

Socially responsible investing An approach to investing that integrates ethical values and societal concerns with investment decisions. Also called *ethical investing*.

Soft dollars The use of commissions to buy services other than execution services. Also called *soft dollar arrangements* or *soft commissions*.

Sole ownership Owned by one person; assets held in sole ownership are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will through the probate process.

Solow residual A measure of the growth in total factor productivity that is based on an economic growth model developed by economist Robert M. Solow.

Sortino ratio A performance appraisal ratio that divides the difference between a portfolio's return and a minimum acceptable return by downside deviation.

Source jurisdiction A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Source–source conflict When two countries claim source jurisdiction of the same asset; both countries may claim that the income is derived from their jurisdiction.

Sovereign risk A form of credit risk in which the borrower is the government of a sovereign nation.

Spread curve The fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Spread duration A measure used in determining a portfolio's sensitivity to changes in credit spreads.

Stale price bias Bias that arises from using prices that are stale because of infrequent trading.

Static hedge A hedge that is not sensitive to changes in the price of the asset hedged.

Stationary A series of data for which the parameters that describe a return-generating process are stable.

Status quo bias An emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change.

Status quo trap The tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past.

Sterling ratio The compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%.

Stock companies With respect to insurance companies, companies that have issued common equity shares.

Stock index futures Futures contracts on a specified stock index.

Stops Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

Straddle An option strategy involving the purchase of a put and a call on the same underlying with the same exercise price and expiration date. If the put and call are held long, it is a long straddle; if they are held short, it is a short straddle.

Straight-through processing Systems that simplify transaction processing through the minimization of manual and/or duplicative intervention in the process from trade placement to settlement.

Strangle A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

Strap An option strategy involving the purchase of two calls and one put.

Strategic asset allocation 1) The process of allocating money to IPS-permissible asset classes that integrates the investor's return objectives, risk tolerance, and investment constraints with long-run capital market expectations. 2) The result of the above process, also known as the policy portfolio.

Strategic buyers Buyers who have a strategic motive (e.g., realization of synergies) for seeking to buy a company.

Strategy benchmarks See custom security-based benchmarks.

Stratified sampling A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

Strip An option strategy involving the purchase of two puts and one call.

Structural level of unemployment The level of unemployment resulting from scarcity of a factor of production.

Structural risk Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

Structured note A variation of a floating-rate note that has some type of unusual characteristic such as a leverage factor or in which the rate moves opposite to interest rates.

Style drift Inconsistency in style.

Style index A securities index intended to reflect the average returns to a given style.

Stylized scenario A type of analysis often used in stress testing. It involves simulating the movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio.

Sunshine trades Public display of a transaction (usually high-volume) in advance of the actual order.

Support levels Price points on dealers' order boards where one would expect to see a clustering of bids.

Surplus The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

Surplus capital Capital that is in excess of primary capital.

Survey method A method of capital market expectations setting that involves surveying experts.

Survival probability The probability an individual survives in a given year; used to determine expected cash flow required in retirement.

Survivorship bias Bias that arises in a data series when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain; when a data series as of a given date reflects only entities that have survived to that date.

Swap rate The interest rate applicable to the pay-fixed-rate side of an interest rate swap.

Tactical asset allocation Asset allocation that involves making short-term adjustments to asset class weights based on short-term predictions of relative performance among asset classes.

Tactical rebalancing A variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals.

Tail risk The risk that there are more actual events in the tail of a probability distribution than would be predicted by probability models.

Tail value at risk (or conditional tail expectation) The VaR plus the expected loss in excess of VaR, when such excess loss occurs.

Target covariance matrix A component of shrinkage estimation; allows the analyst to model factors that are believed to influence the data over periods longer than observed in the historical sample.

Tax avoidance Developing strategies that minimize tax, while conforming to both the spirit and the letter of the tax codes of jurisdictions with taxing authority.

Tax efficiency The proportion of the expected pretax total return that will be retained after taxes.

Tax evasion The practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

Tax premium Compensation for the effect of taxes on the after-tax return of an asset.

Tax risk The uncertainty associated with tax laws.

Taylor rule A rule linking a central bank's target short-term interest rate to the rate of growth of the economy and inflation.

Temporary life insurance A type of life insurance that covers a certain period of time, specified at purchase. Commonly referred to as "term" life insurance.

Term life insurance A type of life insurance policy that provides coverage for a specified length of time and accumulates little or no cash values.

Territorial tax system A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Testamentary gratuitous transfer The bequeathing or transfer of assets upon one's death. From a recipient's perspective, it is called an inheritance.

Testator A person who makes a will.

Theta The change in price of an option associated with a one-day reduction in its time to expiration; the rate at which an option's time value decays.

Tick The smallest possible price movement of a security.

Time deposit A deposit requiring advance notice prior to a withdrawal.

Time-series estimators Estimators that are based on lagged values of the variable being forecast; often consist of lagged values of other selected variables.

Time to expiration The time remaining in the life of a derivative, typically expressed in years.

Time value The difference between the market price of an option and its intrinsic value, determined by the uncertainty of the underlying over the remaining life of the option.

Time-weighted average price (TWAP) strategy A logical participation strategy that assumes a flat volume profile and trades in proportion to time.

Time-weighted rate of return The compound rate of growth over a stated evaluation period of one unit of money initially invested in the account.

Tobin's *q* An asset-based valuation measure that is equal to the ratio of the market value of debt and equity to the replacement cost of total assets.

Top-down Proceeding from the macroeconomy, to the economic sector level, to the industry level, to the firm level.

Top-down approach A credit strategy approach that involves formulating a view on major macroeconomic trends and then selecting the bonds that the investor expects to perform best in the expected environment.

Total factor productivity (TFP) A variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

Total future liability With respect to defined-benefit pension plans, the present value of accumulated and projected future service benefits, including the effects of projected future compensation increases.

Total rate of return A measure of the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized).

Total return equity swap A swap contract that involves a series of exchanges of the total return on a specified asset or equity index in return for specified fixed or floating rate payments.

Total return payer Party responsible for paying the reference obligation cash flows and return to the receiver, but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Total return receiver Party receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread.

Total return swap A swap in which one party agrees to pay the total return on a security. Often used as a credit derivative, in which the underlying is a bond.

Tracking error The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking risk*.

Tracking risk The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking error*.

Trade blotter A device for entering and tracking trade executions and orders to trade.

Trade settlement Completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller.

Trading activity In fixed-income attribution analysis, the effect of sales and purchases of bonds over a given period; the total portfolio return minus the other components determining the management effect in an attribution analysis.

Transaction exposure The risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale.

Translation exposure The risk associated with the conversion of foreign financial statements into domestic currency.

Transparency Availability of timely and accurate market and trade information.

Trigger points In the context of portfolio rebalancing, the endpoints of a rebalancing range (corridor).

Twist With respect to the yield curve, a movement in contrary directions of interest rates at two maturities; a nonparallel movement in the yield curve.

Type I error With respect to manager selection, keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct).

Type II error With respect to manager selection, firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect).

Underfunded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is less than 100 percent.

Underwriting (profitability) cycle A cycle affecting the profitability of insurance companies' underwriting operations.

Unit-linked life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *variable life insurance*.

Universal life insurance A type of life insurance policy that provides for premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element.

Unrelated business income With respect to the US tax code, income that is not substantially related to a foundation's charitable purposes.

Unstructured modeling Modeling without a theory on the underlying structure.

Uptick rules Trading rules that specify that a short sale must not be on a downtick relative to the last trade at a different price.

Urgency of the trade The importance of certainty of execution.

Utility The level of relative satisfaction received from the consumption of goods and services.

Utility theory Theory whereby people maximize the present value of utility subject to a present value budget constraint.

Valuation reserve With respect to insurance companies, an allowance, created by a charge against earnings, to provide for losses in the value of the assets.

Value The amount for which one can sell something, or the amount one must pay to acquire something.

Value at risk (VaR) A probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy over a specified period of time.

Value-motivated traders Traders that act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range.

Value weighted With respect to index construction, an index in which each security in the index is weighted according to its market capitalization. Also called *market-capitalization weighted*.

Variable life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *unit-linked life insurance*.

Variable prepaid forward A monetization strategy that involves the combination of a collar with a loan against the value of the underlying shares. When the loan comes due, shares are sold to pay off the loan and part of any appreciation is shared with the lender.

Variable universal life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *flexible-premium variable life*.

Vega A measure of the sensitivity of an option's price to changes in the underlying's volatility.

Venture capital The equity financing of new or growing private companies.

Venture capital firms Firms representing dedicated pools of capital for providing equity or equity-linked financing to privately held companies.

Venture capital fund A pooled investment vehicle for venture capital investing.

Venture capital trust An exchange-traded, closed-end vehicle for venture capital investing.

Venture capitalists Specialists who seek to identify companies that have good business opportunities but need financial, managerial, and strategic support.

Vested With respect to pension benefits or assets, said of an unconditional ownership interest.

Vintage year With reference to a private equity fund, the year it closed.

Vintage year effects The effects on returns shared by private equity funds closed in the same year.

Volatility Represented by the Greek letter sigma (σ), the standard deviation of price outcomes associated with an underlying asset.

Volatility clustering The tendency for large (small) swings in prices to be followed by large (small) swings of random direction.

Volume-weighted average price (VWAP) The average price at which a security is traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade.

Volume-weighted average price (VWAP) strategy A logical participation strategy that involves breaking up an order over time according to a prespecified volume profile.

Wealth relative The ending value of one unit of money invested at specified rates of return.

Whole life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *ordinary life insurance*.

Will A document associated with estate planning that outlines the rights others will have over one's property after death. Also called *testament*.

Within-sector selection return In attribution analysis, a measure of the impact of a manager's security selection decisions relative to the holdings of the sector benchmark.

Worst-case scenario analysis A stress test in which we examine the worst case that we actually expect to occur.

Yardeni model An equity valuation model, more complex than the Fed model, that incorporates the expected growth rate in earnings.

Yield beta A measure of the sensitivity of a bond's yield to a general measure of bond yields in the market that is used to refine the hedge ratio.

Yield curve The relationship between yield and time to maturity.

Yield to worst The yield on a callable bond that assumes a bond is called at the earliest opportunity.

Z-spread The yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. Also known as zero-volatility spread.

Zero-cost collar A transaction in which a position in the underlying is protected by buying a put and selling a call with the premium from the sale of the call offsetting the premium from the purchase of the put. It can also be used to protect a floating-rate borrower against interest rate increases with the premium on a long cap offsetting the premium on a short floor.

Zero-premium collar A hedging strategy involving the simultaneous purchase of puts and sale of call options on a stock. The puts are struck below and the calls are struck above the underlying's market price.

CUSTOMER SERVICE

68

Index

A
ABO. *see* accumulated benefit obligation
ABS. *see* asset-backed securities
accounting defeasance, 64–65
accumulated benefit obligation (ABO), 79–81
active investing
  in equities, 258–259, 276–302
    equity styles, 276–296
    long–short investing, 297–302
    sell disciplines, 302
    socially responsible investing, 296–297
    trading frequency, 302
  semiactive equity investing, 257–258, 303–305
    derivatives- vs. stock-based, 303, 305
    and Fundamental Law of Active Management, 304
active management
  defined, 93, 257
  of equity investments, 257–258
  Fundamental Law of Active Management, 304
  semiactive, 257–258
  yield curve strategies (*see* yield curve strategies)
active returns, 15–16, 258
active risk, 15–16
  and portfolio manager allocation, 307–308
  and tracking risk, 258
  true, 311–312
ADL. *see* asset-driven liabilities
ad valorem fees, 315, 321–322
agency RMBS, 237, 238
ALBI. *see* Asian Local Bond Index
ALCOs. *see* asset-liability committees
allocation
  asset
    equity total return swaps in, 275–276
    strategic, 104
    tactical, 104, 276
  equity
    for indexes, 292–293
    for pension funds, 255
ALM. *see* asset-liability management
alpha
  alpha and beta separation, 313
  defined, 297
  in long–short investing, 297–298
  portable, 298, 313
  in semiactive equity investing, 303–305
Apple, Inc., 233
Apple Corporation, 278
Argentina, 9
Asia. *see also specific countries*
Asian Local Bond Index (ALBI), 97–98
asset allocation
  equity total return swaps in, 275–276
  strategic, 104
  tactical, 104, 276
asset-backed securities (ABS)
  in credit portfolios, 239
  mortgage-backed securities
    in credit portfolios, 237–238
    defined, 236
    and negative convexity, 134
    for reducing convexity, 168–169
asset-driven liabilities (ADL), 49
asset-liability committees (ALCOs), 49
asset-liability management (ALM), 11, 48, 49. *see also* liability-based mandates
assets, as inflation hedges, 255–256
assets under management (AUM) fees, 315
AT&T, 211–212
Australia
  equity real rates of return, 256
  pension fund equity allocations, 255
Australian dollar, 135
authorized participants, 102

B
banking, in emerging market indexes, 235
bankruptcy law, international portfolios and, 236
barbell portfolio
  convexity, 108
  defined, 142
  duration-neutral, 151–160, 162–164
  extreme, 172–173
  extreme vs. less extreme, 175–177
  laddered portfolio vs., 172–175
  structure, 107, 141–145
Barclays US Aggregate Bond Index, 103
Basel III, 94
basis point value (BPV), 68
basket trades, 274
Becton Dickinson & Co., 280
Belgium, 256
benchmark(s)
  and active portfolio management, 123
  for index-based fixed-income portfolios, 104–107
  indexes as, 263–266
  Industry Classification Benchmark, 324
  investor's, 311
benchmark bonds
  and credit spreads, 200–201
  and I-spread evaluation, 202
  shortcomings, 212
benchmark spread, 200
BERC. *see* Bloomberg EUR Investment Grade European Corporate Bond Index
Best Practice Guidelines Governing Analyst/Corporate Issue Relations, 299
beta
  alpha and beta separation, 313
  and credit quality, 216
  and duration profile, 105
  and market-neutral strategies, 297–298, 301
  and RBSA, 283
  and short extension strategies, 300
  smart, 105
  and stock indexes, 260
BEUH. *see* Bloomberg EUR High Yield Corporate Bond Index
BHP Billiton Limited, 94
biases, in market-oriented investment styles, 281
bid–ask spreads
  and liquidity, 20, 22, 198
  on-the-run sovereign bonds, 19
  in secondary credit markets, 228–229
bid–offer spreads
  and bond inventory, 94
  and liquidity, 198, 199
  on-the-run Treasuries, 155
bilateral repos, 30
blend investment style, 280–281
Bloomberg Barclays, 207
Bloomberg Barclays Euro Corporate Index, 206
Bloomberg Barclays Global Aggregate Bond Index, 18–19
  bond eligibility standards, 98n.24
  bond market correlation matrix, 7
  composition of, 93
  and global credit market, 192
  and total return mandates, 11
Bloomberg Barclays Global Aggregate–Corporate Bond Index, 197
Bloomberg Barclays Global Corporate Index, 237
Bloomberg Barclays Global Credit Index, 233
Bloomberg Barclays Global High Yield Index, 197
Bloomberg Barclays Global Securitized Index, 237
Bloomberg Barclays US Aggregate Bond Index
  bond market correlation matrix, 6–8
  composition of, 93, 104–105
  consumer credit value in, 239
  origins, 95
Bloomberg Barclays US Corporate Bond Index
  bond market correlation matrix, 6, 7
  and tail risk, 231
Bloomberg Barclays US Corporate High-Yield Bond Index
  bond market correlation matrix, 6–8
  and global speculative-grade default rate, 217
Bloomberg Barclays US Credit Index, 206
Bloomberg Barclays US TIPS Index, 6, 7
Bloomberg Barclays US Treasury Bond 10-Year Term Index, 6, 7

Bloomberg EUR High Yield Corporate Bond Index (BEUH), 106
Bloomberg EUR Investment Grade European Corporate Bond Index (BERC), 106, 107
BofA Merrill Lynch US High Yield Master II Index, 206
Bogle, John, 259
bond(s). *see also specific types*
  equities vs., 94–95
  formula for price of, 148
  inflation's effects on, 256
  portfolio management (*see* fixed-income portfolio management)
bond indexes, matching portfolio to, 92–98
bond structure, 212
bonds with embedded options
  and cash flow matching, 13
  and credit spread measures, 204
  effective convexity, 131
  effective duration, 130
  expected return decomposition, 24
  immunization, 14
  interest rate exposure, 221
  and OAS, 203
  yield curve strategies, 168–169
bond yield
  covered, 240
  and credit spread, 200–201
  decomposing expected returns, 23–26
  and expected return, 23
  and interest rate risk, 195
  and liquidity, 20, 21
bottom-up approach to credit strategy, 206–215
  defined, 206
  dividing the credit universe, 206–207
  portfolio construction, 214–215
  relative value analysis, 207–211
  spread curves, 211–214
  top-down approach vs., 224
bottom-up portfolio construction, 214–215
bottom-up research approaches, 322, 323
BPV. *see* basis point value
Brazil
  government bonds, 150
  inflation-linked bonds, 9
buffering, 291
bullet portfolio, 107
  defined, 141
  duration-neutral, 151–160, 162–164
  extreme, 173–174
  structure, 141–145
"bums problem," 105
butterfly portfolios, 160–162
butterfly spread, 129
butterfly twists, 62
buy and hold strategy, 133
buying convexity (as strategy), 140–141
buy-side research, 323

C
CAC 40 (index), 93, 268, 275
callable bonds, 78–79, 134
Canada
  equity indexes, 268
  equity real rates of return, 256
  inflation-linked bonds, 9
  pension fund equity allocations, 255
  real GDP growth rate vs. speculative-grade bond default rate, 216
capital gains
  ETFs and, 271
  pass-through treatment, 33
  and sell disciplines, 302
  taxation of, 32–34, 256
capital losses
  rolldown return and, 24
  tax issues, 33, 34
  yield curve and, 180
caps, fee, 315
carry trade, 134–135
cash
  in bottom-up portfolio construction, 215
  for liquidity risk management, 230
cash flow, from fixed-income portfolio, 8–9
cash flow matching, 12–13
  duration matching vs., 14
  for multiple liabilities, 64–67
cash flow yield, 55–62, 69–71, 73, 108
cash-in-advance constraint, 65–66
CDOs. *see* collateralized debt obligations
CDS. *see* credit default swaps
CDX, 230
cell approach, 99
Central Europe. *see specific countries*
CFA Centre for Financial Market Integrity, 299
CFA Institute, 299
CFTC. *see* US Commodity Futures Trading Commission
cheapest-to-deliver (CTD) security, 74–75
Chicago Board Options Exchange, 104
Chicago Mercantile Exchange (CME)
  and ETFs, 103
  and S&P 500 futures, 274
  and Treasury futures contracts, 82
Chile, 9
China, economic slowdown in, 220
Chinese yuan, 236
Citigroup, 95. *see also* S&P/Citigroup indexes
Citi US Broad Investment Grade Index (USBIG), 155
CLOs. *see* collateralized loan obligations
CMBS. *see* commercial mortgage-backed securities
CME. *see* Chicago Mercantile Exchange
CME Group
  and ETFs, 103–104
  T-notes futures contracts, 73, 74, 76
CMOs. *see* collateralized mortgage obligations
Coca-Cola, 278
Code of Ethics (CFA Institute), 299
collar, swaption, 84–87, 89
collateral, exhaustion of, 90
collateralized debt obligations (CDOs), 239–240
collateralized loan obligations (CLOs), 239
collateralized mortgage obligations (CMOs), 137n.8
commercial mortgage-backed securities (CMBS), 237, 238
commodities, in emerging market indexes, 235
completeness funds, 312–313
consistent growth investment style, 280
constraints, long-only investing, 299–300
consultants, pension fund, 277
consumer credit, 239
Consumer Cyclical Services, 239
Consumer Price Index, 50
contingent immunization, 14, 77–78
contracts. *see* futures
contrarian investment style, 279
convexity
  of butterflies, 160–161
  buying, 140–141
  defined, 130–131
  selling, 134
  using securities with embedded options to change, 168–169
  yield curve strategies, 130–132
  for zero-coupon bonds, 131
core investment style, 280–281
core-satellite portfolios, 309–312
corporate bond portfolios
  credit mitigation risk, 194
  credit risk, 193–194
  interest rate risk, 195–198
  liquidity and trading, 198–199
  spread risk, 194–195
correlations, in scenario analysis, 232
costs
  sell disciplines based on, 302
  transaction, 12, 17, 22, 270–272
counterparty credit risk, 89–90
counterparty risk, 31
country exposure, 222–223
covered bonds, 240
cover pool, 240
creation units, 102
credit cycle
  expectations as factor in credit quality decisions, 216
  regional differences, 233
credit default swaps (CDS)
  index derivatives, 230–231
  for liquidity risk management, 230–231
  as tail risk hedge strategy instrument, 232–233
credit losses, 24
credit loss rate, 193–195
credit mitigation risk, 194
credit portfolios
  construction of (*see* credit strategies)
  defined, 191
credit quality
  in emerging markets, 235
  regional differences, 233
  in top-down approach to credit strategy, 216–219
credit quality measures
  average credit rating, 217–218
  average OAS, 218
  average spread duration, 218
  duration times spread, 219
credit ratings, in top-down strategy, 217–218
credit-related risks, 200, 207–208

credit risk
  in corporate bond portfolios, 193–194
  counterparty, 89–90
  and G-spread/I-spread evaluation, 202
  in repo agreement, 30
credit spreads, 200–206
  benchmark spread, 200
  changes as factor in credit quality decisions, 216
  excess return, 205–206
  G-spread, 200–201
  and interest rate risk, 195
  I-spread, 202
  measures in portfolio context, 204
  OAS, 203
  Z-spread, 203
credit strategies, 206–225
  about, 191–192
  bottom-up, 206–215
    dividing the credit universe, 206–207
    portfolio construction, 214–215
    relative value analysis, 207–211
    spread curves, 211–214
    top-down vs., 224
  corporate bond portfolios
    credit mitigation risk, 194
    credit risk, 193–194
    interest rate risk, 195–198
    liquidity and trading, 198–199
    spread risk, 194–195
  credit spreads, 200–206
    benchmark spread, 200
    excess return, 205–206
    G-spread, 200–201
    I-spread, 202
    measures of, 200–204
    OAS, 203
    Z-spread, 203
  ESG considerations, 225
  international portfolios, 233–236
    currency risk, 236
    emerging markets credit, 235
    legal risk, 236
    liquidity considerations, 236
    relative value, 233–235
  liquidity risk, 226–231
    management of, 230–231
    secondary market measures, 226–229
    structural industry changes, 229–230
  practice problems, 243–247
  solutions to problems, 248–249
  structured financial instruments, 236–241
    asset-backed securities, 239
    CDOs, 239–240
    covered bonds, 240
    MBS, 237–238
  tail risk, 231–233
    assessing, 231–232
    managing, 232–233
    scenario analysis, 231–232
  top-down, 215–223
    bottom-up vs., 224
    country/currency exposure, 222–223
    credit quality, 216–219
    industry sector allocation, 220–221
    interest rate measurement/management, 221–222
    spread curves in, 223
Credit Support Annex (CSA), 89–90
credit tranching, 239
credit universe
  in bottom-up approach to credit strategy, 206–207
  in emerging markets, 235
crowding risk, 135
CSA. *see* Credit Support Annex
CTD security. *see* cheapest-to-deliver security
currency exposure, 222–223
currency gains/losses, 24
currency risk, 222–223, 236
currency swaps, 236. *see also* interest rate swaps
curvature, yield curve
  defined, 129
  strategies for changes in, 135–145

D

DAX 30
  composition and characteristics, 268
  stock index futures, 275
DB pension plans. *see* defined-benefit pension plans
dealers
  bond market, 22
  and market liquidity, 199
decomposing fixed-income returns
  decomposing expected returns, 23–26
  limitations of expected return decomposition, 26–27
dedicated bond portfolio, 64
default correlations, CDOs and, 239–240
default rates, real GDP growth rate vs., 216
default risk, 193
defined-benefit (DB) pension plans, liability-driven investing for, 78–88
  interest rate immunization, 52–78
    cash flow matching, 64–67
    contingent immunization, 14, 77–78
    derivatives overlay, 73–76
    duration matching, 67–73
    for multiple liabilities, 64–78
    for single liability, 52–63
deleveraged floaters, 184
Denmark, 256
Depository Trust Company, 30
derivatives. *see also specific types, e.g.:* options
  CDS index, 230–231
  for duration management, 137–140
  fixed-income, 22
  for immunizing multiple liabilities, 73–76
  for interest rate exposure management, 222
  as tail risk hedge strategy instrument, 233
  types of, 137n.8
derivatives-based semiactive equity investing, 303, 305
derivatives overlay, 73–76, 82, 84–91
deteriorating fundamentals sell discipline, 302
Deutsche Bank, 234, 235
dispersion, defined, 56
diversification
  and DJIA history, 267
  and fixed-income portfolio management, 6–8
  indexed portfolios, 273
  for managing tail risk in credit portfolios, 231
  in value-weighted/float-weighted indexes, 262
dividend yield, 280, 288, 290, 322
DJIA. *see* Dow Jones Industrial Average
dollar, Hong Kong, 236
dollar, US
  and interest rate derivatives, 73–74
  as swap counter payment, 275
  swap curve, 202
  and yen carry trade, 135
  and yield curve trades, 178
dollar duration, 67, 130. *see also* money duration
dollar value of basis point (DV01), 68, 130. *see also* price value of a basis point
Dow Jones & Co., 324, 328
Dow Jones Industrial Average (DJIA)
  composition and characteristics, 267, 268
  as equity market gauge, 93
  price weighting, 262
Dow Jones Wilshire indexes, 292
down-from-cost sell discipline, 302
DTS. *see* duration times spread
dual-currency notes, 184
duration
  dollar, 67, 130
  effective, 50–51
    defined, 130
    empirical duration vs., 196
    as indexing risk factor, 95
    and interest rate exposure, 221
  empirical
    defined, 196
    OAS vs., 197
  and interest rate risk, 195–198
  key rate
    and bullet/barbell portfolios, 142
    defined, 130
    as indexing risk factor, 95
    and interest rate exposure, 221
  Macaulay
    defined, 55, 130
    and duration matching, 67, 68
    of single fixed-income bond, 53–56, 59, 61
    for zero-coupon bonds, 131
  modified
    defined, 130
    and duration matching, 67
    formula for, 131n.4
  money
    defined, 130
    and duration management, 138
    and duration matching, 67–69, 71
  partial, 130, 154–155, 159–160
  portfolio modified adjusted, 95
  spread, 194
    as credit quality measure, 218
    as indexing risk factor, 96
    as metric for position sizing, 214–215
    Z-spread vs., 211–212
  and yield curve strategies, 130–132

duration management
derivatives for, 137–140
yield curve strategies, 135–140
duration matching, 13–14
cash flow matching vs., 14
to immunize multiple liabilities, 67–73
duration positioning, 146–150
duration times spread (DTS), 219
DV01. *see* dollar value of basis point

E
earnings momentum investment style, 280
Eastern Europe. *see specific countries*
economic sectors
allocation in top-down approach to credit strategy, 220–221
and credit universe, 206–207
regional differences in composition of, 234
top-down vs. bottom-up approach to credit strategy, 215
effective convexity, 131, 221–222
effective duration
calculation of, 50–51
defined, 130
empirical duration vs., 196
as indexing risk factor, 95
and interest rate exposure, 221
efficient frontiers, of managers, 306, 307
efficient markets theory, 276
EFP. *see* Exchange of Futures for Physicals
Electronic Municipal Market Access (EMMA), 21
electronic trading platforms (ETPs), 226
Ellis, Charles D., 259
embedded options, bonds with
and cash flow matching, 13
and credit spread measures, 204
effective convexity, 131
effective duration, 130
expected return decomposition, 24
and immunization, 14
interest rate exposure, 221
and OAS, 203
yield curve strategies, 168–169
emerging markets
carry trade returns, 135
credit universe in, 235
liquidity problems, 236
e-mini S&P 500, 274–275
EMMA. *see* Electronic Municipal Market Access
empirical duration
defined, 196
OAS vs., 197
energy sector, regional differences in, 234
enhanced indexing. *see also* semiactive equity investing
and bond market exposure, 93–94
as equity investment approach, 258
and fixed-income portfolio management, 16–17
semiactive equity investing, 303–305
environmental, social, and governance (ESG) factors
in credit portfolio management, 225
and enhanced indexing, 99
and fixed-income mandates, 11
equal-weighted indexes, 261–263, 265–266
equities. *see also specific types*
allocation of, 255, 292–293
bonds vs., 94–95
glamour stocks, 279
industry classification of, 323–324
inflation's effects on, 255–256
large-cap, 262
real rate of returns, 256–257
small-cap, 297
equitization
defined, 303n.58
of market-neutral long–short portfolios, 299
equity index futures, 274–275
equity investment styles, 276–296
advantages of, 282
based on market capitalization, 281–282
growth, 277–278, 280
in holdings-based style analysis, 282–283, 288–291
identifying, 282–291
indexes based on, 291–294
market-oriented, 280–281
in returns-based style analysis, 283–288, 291
and style boxes, 294–295
and style drift, 295–296
value, 277–280
equity portfolio management, 253–337
about, 254
active equity investing, 276–302
equity styles, 276–296
long–short investing, 297–302
sell disciplines, 302
socially responsible investing, 296–297
trading frequency, 302
equity investment approaches in, 257
passive equity investing, 258–276
with indexes, 260–269
investment vehicles, 267, 270–276
for portfolios of managers, 306–313
alpha and beta separation, 313
completeness funds, 312–313
core-satellite portfolios, 309–312
and pension fund's performance objectives, 310–311
practice problems, 327–333
research
buy- vs. sell-side, 323
and industry classification, 323–324
top-down vs. bottom-up approaches, 322
role of equity portfolios, 255–257
selecting securities for, 322–324
semiactive equity investing, 303–305
derivatives- vs. stock-based, 303, 305
Fundamental Law of Active Management, 304
solutions to problems, 334–337
equity portfolio managers, selecting, 314–322
fee proposals, 321–322
fee structures, 315
finding suitable candidates, 314
past performance, 314
questionnaires for, 315–321
equity style indexes, 277, 291–294
equity total return swap, 275–276
equity tranche, 240
ESG factors. *see* environmental, social, and governance factors
ETFs. *see* exchange-traded funds
ETPs. *see* electronic trading platforms
EU. *see* European Union
Eurex, 103
Eurobonds, yield curves for, 127–128
Europe. *see also specific countries*
credit market (2015-2016), 234
energy industry in credit market indexes, 234
indexed portfolio regulation, 273
Pfandbriefe bond market, 240
sovereign debt crisis effects, 233
European Union (EU)
bankruptcy laws, 236
high-yield credit market, 234–235
UCITS rules, 273
evaluated pricing, 95
excess return
in credit portfolio, 205–206
in relative value analysis, 208–211
in top-down approach to credit strategy, 219
Exchange of Futures for Physicals (EFP), 275
exchange-traded funds (ETFs)
fixed-income, 22, 101–103
fixed-maturity corporate bond, 108
in indexed portfolios, 267, 270–271
in laddered portfolio, 108
for liquidity risk management, 231
and market-neutral long–short portfolios, 299
and uptick rule, 275
expected annual credit loss, 205
expected credit losses, 24, 205
expected excess return (EXR)
in credit portfolio, 205–206
in relative value analysis, 208–211
in top-down approach to credit strategy, 219
expected returns, decomposing, 178
exposures. *see* risk exposures
EXR. *see* expected excess return
extension risk, 238
extinguishing accrual notes, 184
Exxon, 263–266

F
Federal National Mortgage Association (FNMA; Fannie Mae), 168, 237
Federal Reserve
and MBS, 237
and Orange County bankruptcy, 184
and "Taper Tantrum," 198
fee(s)
ad valorem, 315, 321–322
assets under management, 315
performance-based, 315, 321–322
fee caps, 315
financial crises, as liquidity risk, 232. *see also* global financial crisis (2008)
Financial Industry Regulatory Authority (FINRA)
and bond market, 21
and TRACE, 94–95

Financial Times Stock Exchange (FTSE), 292
Finland, 256
FINRA. *see* Financial Industry Regulatory Authority
fire sale, 31
Fitch Ratings, 98n.24, 192n.2
fixed-coupon bonds, 9
fixed-income derivatives, 22
fixed-income mandates, 11–19
  liability-based, 11–15
    cash flow matching, 12–13
    contingent immunization, 14
    duration matching, 13–14
    horizon matching, 14–15
  total return, 15–19
    active management, 17
    pure/enhanced indexing, 16–17
fixed-income portfolio management, 5–45
  about, 5–6
  and bond market liquidity, 19–23
    alternatives to direct investment in bonds, 22
    among sub-sectors, 20–21
    effects of, 21–22
    portfolio construction, 21–22
    pricing, 21
  credit portfolios
    credit spreads, 200–206
    credit strategy approaches, 206–225
    defined, 191
    international, 233–236
    liquidity risk, 226–231
    structured financial instruments, 236–241
    tail risk, 231–233
  index-based investment strategies, 48, 98–110
    benchmark selection, 104–107
    laddered bond portfolios, 107–110
    passive bond market exposure methods, 98–104
  leverage, 27–31
    futures contracts, 28–29
    methods, 28–31
    repurchase agreements, 29–30
    risks, 31
    securities lending, 30–31
    structured financial instruments, 29
    swap agreements, 29
    using, 27–28
  liability-driven investing, 47–92
    about, 47–52
    for defined benefit pension plan, 78–88
    interest rate immunization, 52–78
    matching a portfolio to an index, 92–98
    risks in, 88–92
  mandates, 11–19
    liability-based, 11–15
    total return, 15–19
  model for fixed-income returns, 23–27
    decomposing expected returns, 23–26
    estimation of inputs, 26
    limitations of expected return decomposition, 26–27
  practice problems, 38–42
  roles of fixed-income securities in portfolios, 6–11
    diversification, 6–8
    inflation hedging, 9–10
    regular cash flows, 8–9
  solutions to problems, 43–45
  taxation, 32–35
    and investment vehicle choice, 33–34
    principles of, 32–33
  yield curve strategies, 123–190
    about, 123–124
    for changes in market level/slope/curvature, 135–145
    foundational concepts, 124–132
    framework for evaluating yield curve trades, 178–184
    major types, 132–146
    portfolio performance in multiple curve environments, 169–178
    positioning strategy for a given market view, 146–169
    practice problems, 187–188
    solutions to problems, 189–190
    for stable yield curve, 133–135
fixed-maturity corporate bond ETFs, 108
float adjustment, 262
floating-coupon bonds, 9
floating-rate bonds, 194–195
floating-rate notes (FRNs), 83
floating supply of shares, issue's, 261
float-weighted indexes, 261, 262, 265
FNMA. *see* Federal National Mortgage Association
forced liquidation, 31
Ford Motor Company, 94
forward contracts (forwards), 223
France
  equity index composition/characteristics, 268
  equity real rates of return, 256
  inflation-linked bonds, 9
  real GDP growth rate vs. speculative-grade bond default rate, 216
Freddie Mac (Federal Home Loan Mortgage Corporation), 237
free float, of shares, 261
FRNs. *see* floating-rate notes
FTSE. *see* Financial Times Stock Exchange
FTSE 100 Index
  composition and characteristics, 268
  long–short investing, 300–302
  stock index futures, 275
FTSE International Ltd, 324
FTSE Pfandbrief Index, 106, 107
full replication approach
  defined, 93
  for passive investing, 271–272
functional duration. *see* key rate duration
Fundamental Law of Active Management, 304
futures (futures contracts)
  for currency exposure management, 223
  for duration management, 138
  equity index, 274–275
  for fixed-income portfolios, 28–29
  T-note
    for contingent immunization, 77
    as derivatives overlay, 73–76
    and duration management, 138
    for interest rate immunization, 73–76
    and liability-driven investing, 82

G
GBI-EM Global. *see* JP Morgan Government Bond Index-Emerging Markets Global
GDP. *see* gross domestic product
General Electric, 267
Germany
  equity indexes' composition/characteristics, 268
  equity real rates of return, 256
  inflation-linked bonds, 9
  real GDP growth rate vs. speculative-grade bond default rate, 216
GICS. *see* Global Industry Classification Standard
glamour stocks, 279
global financial crisis (2008)
  CLO spreads, 239
  credit market structural changes following, 229
  and historical scenario analysis, 231, 232
  and liquidity risk, 226–227
  regional differences in effects, 233
  and yen carry trade, 135
Global Industry Classification Standard (GICS), 324
Google, 278
Government National Mortgage Association (Ginnie Mae; GNMA), 237
green bonds, 225
gross domestic product (GDP) growth rate, 216
growth-at-a-reasonable price investment style, 281
growth investment style
  consistent, 280
  indexes with, 291–293
  and Microsoft, 278
  sell disciplines, 302
  value style vs., 277–278
G-spread, 200–201
guideline constraints, 225

H
Hang Seng Index, 93
hedges, tail risk, 231–232
hedging
  currency exposure, 223, 236
  and G-spread, 200
  inflation, 9–10, 255–256
  interest rate, 88–90, 200–203 (*see also* immunization strategies)
  and liability-driven investing, 82–86
  tail risk, 232–233
hedging ratio, 83, 84, 86
high-water mark, 315
high-yield corporate bond, defined, 192
high-yield corporate bond portfolios
  credit mitigation risk, 194
  credit risk, 193–194
  interest rate risk, 195–198
  liquidity and trading, 198–199
  spread risk, 194–195
high yield investment style, 279–280

historical scenario analysis, 231–232
holding period rate of return, 58
holdings-based style analysis, 282–283, 288–294
horizon matching, 14–15
horizon yield, 58
HWM. *see* high-water mark
hypothetical scenario analysis, 231–232

I
IBM, 278
ICE. *see* Intercontinental Exchange
immunization strategies, 52–78
  cash flow matching, 12–13
  contingent, 14
  defined, 12, 48, 52
  duration matching, 13–14
  for multiple liabilities, 64–78
    cash flow matching, 64–67
    contingent immunization, 77–78
    derivatives overlay, 73–76
    duration matching, 67–73
  with single fixed-income bond, 53
  for single liability, 52–63
implied forward rate, 148
index-based investment, for fixed-income portfolios, 48, 98–110
  benchmark selection, 104–107
  laddered bond portfolios, 107–110
  passive bond market exposure methods, 98–104
indexed portfolios, 267, 270–276
indexes
  composition and characteristics of, 266–269
  equal-weighted, 261–263, 265–266
  equity style, 277, 291–294
  float-weighted, 262, 265
  passive equity investing with, 260–269
    benchmark index selection, 263–266
    composition and characteristics of major indexes, 266–269
    index weighting choices, 260–266
  price-weighted, 260–262, 264
  selecting benchmark, 263–266
  style, 277, 291–294
  value-weighted, 261, 262, 264–265
indexing
  in bottom-up portfolio construction, 215
  defined, 257
  enhanced, 16–17, 257
    as equity investment approach, 257
    semiactive equity investing, 303–305
  for equity investments, 257
  and fixed-income portfolio management, 16–17
  pure, 16
indexing risk factors, 95–96
index weighting, 260–266
industry classification, 323–324
Industry Classification Benchmark, 324
industry sectors. *see* economic sectors
inflation
  ALM and, 49
  hedging, 9–10, 255–256
inflation-linked bonds, 9–10, 50
informational advantage, 224
information coefficient, 304
information ratio, 258
institutional portfolios, indexing, 271
in-substance defeasance, 65. *see also* accounting defeasance
Intel, 263–266
Intercontinental Exchange (ICE), 76, 103
interest-only strips (IOs), 137n.8
interest rate(s)
  and currency exposure management, 222–223
  and currency risk, 236
  and duration management, 135–136
  and duration matching, 13
  and inflation-linked bonds, 9
  portfolio positioning in anticipation of change in, 150–151
interest rate derivatives
  for duration management, 137–140
  for immunizing multiple liabilities, 73–76
interest rate differential notes, 184
interest rate exposure
  managing, 223
  measuring, 221–222
interest rate risk
  in corporate bond portfolios, 195–198
  immunization (*see* immunization strategies)
  with liability-driven investing, 88–92
  MBS and, 238
interest rate swaps, 22, 29
  for DB pension plan derivatives strategy, 82–88
  and duration management, 139–140
  uncollateralized, 89–90
interest rate volatility, Z-spread and, 203
Internal Revenue Code, 273
international credit portfolios, 233–236
  currency risk, 236
  emerging markets credit, 235
  legal risk, 236
  liquidity considerations, 236
  relative value in, 233–235
International Swaps and Derivatives Association (ISDA), 89–90
inverse floaters, 29, 184
investment-grade corporate bond, defined, 192
investment-grade corporate bond portfolios
  credit mitigation risk, 194
  credit risk, 193–194
  interest rate risk, 195–198
  liquidity and trading, 198–199
  spread risk, 194–195
investment styles, 276–296
  advantages of, 282
  based on market capitalization, 281–282
  blend, 280–281
  consistent growth, 280
  contrarian, 279
  core, 280–281
  earnings momentum, 280
  growth, 277–278, 280
    consistent, 280
    indexes with, 291–293
    and Microsoft, 278
    sell disciplines, 302
    value vs., 277–278
  growth-at-a-reasonable price, 281
  high yield, 279–280
  in holdings-based style analysis, 282–283, 288–291
  identifying, 282–291
  indexes based on, 291–294
  low P/E, 279
  market-oriented, 276, 280–281
  and portfolio characteristics, 289–290
  in returns-based style analysis, 283–288, 291
  and style boxes, 294–295
  and style drift, 295–296
  style rotator, 281
  value, 277–280
    defined, 276
    growth vs., 277–278
    Microsoft and, 278
    sell disciplines, 302
investors
  benchmark of, 311
  large-cap equity, 281–282
  micro-cap equity, 281
  mid-cap equity, 281, 282
  small-stock, 281
IOs. *see* interest-only strips
Ireland, 256
ISDA. *see* International Swaps and Derivatives Association
I-spread, 202
issuance date, 212
issue size, 213
Italy, 216, 256
iTraxx, 230

J
Japan
  equity indexes' composition/characteristics, 268
  equity real rates of return, 257
  pension fund equity allocations, 255
  real GDP growth rate vs. speculative-grade bond default rate, 216
Japanese yen carry trade, 135
Johnson & Johnson, 94
JP Morgan Government Bond Index-Emerging Markets Global (GBI-EM Global), 7, 8
junior tranche, 240

K
key rate durations (KRDs)
  and bullet/barbell portfolios, 142
  defined, 130
  as indexing risk factor, 95
  and interest rate exposure, 221

L
laddered portfolio, 107–110, 169
  construction, 9, 107–108
  extreme barbell portfolio vs., 172–173
  less extreme barbell portfolio vs., 174–175
large-cap equities, 262
large-cap equity investors, 281–282
Latin America, 235. *see also specific countries*
LDI. *see* liability-driven investing; liability-driven investments

legal risk, with international credit portfolios, 236
lending of securities, 30–31, 270
leverage
  and duration management, 138–139
  with fixed-income portfolio, 27–31
    futures contracts, 28–29
    methods, 28–31
    repurchase agreements, 29–30
    risks, 31
    securities lending, 30–31
    structured financial instruments, 29
    swap agreements, 29
    using, 27–28
  in fixed-income portfolio management, 27–31
  in long–short investing, 298
liabilities
  asset-driven, 49
  classification in liability-driven investing, 50
  multiple liability immunization, 64–78
  single liability immunization, 52–63
  Type I, 50
  Type II, 50, 78–79
  Type III, 50, 79
  Type IV, 50, 79, 80
liability-based mandates, 11–15
  cash flow matching, 12–13
  contingent immunization, 14
  duration matching, 13–14
  horizon matching, 14–15
liability-driven investing (LDI), 47–92
  about, 47–52
  for defined benefit pension plan, 78–88
  interest rate immunization, 52–78
    cash flow matching, 64–67
    contingent immunization, 14, 77–78
    derivatives overlay, 73–76
    duration matching, 67–73
    for multiple liabilities, 64–78
    for single liability, 52–63
  matching a portfolio to an index, 92–98
  risks in, 88–92
liability-driven investments (LDI), 11. *see also* liability-based mandates
Libor. *see* London Interbank Offered Rate
liquid credit securities, 230
liquidity
  in bond market, 19–23
    alternatives to direct investment in bonds, 22
    effects of, 21–22
    portfolio construction, 21–22
    pricing, 21
    sub-sectors, 20–21
  in corporate bond portfolios, 198–199
  defined, 198
  and full replication, 272
  in international credit portfolios, 236
liquidity management, 108
liquidity risk, in credit portfolios, 226–231
  management of, 230–231
  secondary market measures, 226–229
  structural industry changes, 229–230
London Interbank Offered Rate (Libor)
  and equity total return swaps, 275
  and interest rate swaps, 82–84, 89, 139
  and inverse floaters, 29
  and range accrual notes, 184
  and total return swaps, 102
  and US dollar swap curve, 202
London Stock Exchange, 268
Long Bund contract, 76
longevity risk, 80
long-only constraint, 299–300
long–short investing, 297–302
  butterflies, 160–162
  equitizing a market-neutral long–short portfolio, 299
  long-only constraint, 299–300
  and market structure, 301–302
  price inefficiency on short side of market, 298–299
  short extension strategies, 300–301
long–short portfolios, market-neutral, 299
Long-Term Capital Management (LTCM) crisis, 124–125
loss given default, 193
loss severity, 193
low P/E investment style, 279
LTCM. *see* Long-Term Capital Management

M

Macaulay duration
  defined, 55, 130
  and duration matching, 67, 68
  of single fixed-income bond, 53–56, 59, 61
  for zero-coupon bonds, 131
McDonald's, 263–266
macroeconomic factors
  in top-down approach to credit strategy, 215
  and top-down approach to portfolio construction, 224
Malkiel, Burton, 259
managers, efficient frontiers of, 306, 307. *see also* portfolio managers
mandates, fixed-income, 11–19
  liability-based, 11–15
    cash flow matching, 12–13
    contingent immunization, 14
    duration matching, 13–14
    horizon matching, 14–15
  total return, 15–19
    active management, 17
    pure/enhanced indexing, 16–17
market(s)
  emerging
    carry trade returns, 135
    credit universe in, 235
    liquidity problems, 236
  over-the-counter, 199
  secondary
    bid–ask spreads in, 228–229
    evaluating liquidity in, 226–229
    spread sensitivity to fund outflows, 227–228
    trading volume in, 226–227
  structure of, 301–302
market capitalization, equity investment styles based on, 281–282
market-neutral long–short portfolios, 299
market-oriented investment styles, 276, 280–281
market value, as metric for position sizing, 214–215
Markit Boxx Asian Local Bond Index (ALBI), 97–98
matrix pricing, 95
maturity extension, 132
maturity management, 222
MBS. *see* mortgage-backed securities
Merck, 263–266
mezzanine tranche, 240
Michelin, 324
micro-cap equity investors, 281
Microsoft
  equity market data, 263–266
  free-float adjustments, 261n.10
  growth vs. value stock, 278
mid-cap equity investors, 281, 282
minimum transfer amount, 90
misfit risk, 311–312
model portfolio, in bottom-up portfolio construction, 214
model risk, 88–89
modified duration
  defined, 130
  and duration matching, 67
  formula for, 131n.4
money duration
  defined, 130
  and duration management, 138
  and duration matching, 67–69, 71
Moody's Investors Service
  bond ratings, 98n.24, 192n.2
  effective duration of bonds across rating spectrum, 196
  recovery rate for Latin American bonds, 235
Morgan Stanley Capital International (MSCI)
  equity styles, 292
  Global Industry Classification Standard, 324
  growth/allocation criteria and rebalancing rules for indexes, 292
  index composition and characteristics, 269
  stock categorization by, 328
Morningstar
  equity styles, 292
  growth/allocation criteria and rebalancing rules for indexes, 292
  style box, 294
mortgage-backed securities (MBS)
  in credit portfolios, 237–238
  defined, 236
  and negative convexity, 134
  for reducing convexity, 168–169
MSCI. *see* Morgan Stanley Capital International
MSCI International All Country World Index (MSCI ACWI), 255, 269, 330–331
MSCI World ex-Australia Index, 310–312

MSCI World Growth Index, 327
MSCI World Index, 93, 269
MSCI World Value Index, 327
multifactor model technique, 273
multifunctional duration. *see* key rate duration
Municipal Securities Rulemaking Board, 21
mutual funds
  benchmark/style discrepancies, 278n.31
  ETFs vs., 268, 270–271
  for fixed-income portfolios, 22, 101–102
  and indexing, 259
  laddered portfolios vs., 108
  pass-through treatment of capital gains, 33
  Sharpe's returns research, 277
  SRI, 297

N
NAICS. *see* North American Industry Classification System
National Investor Relations Institute, 299
negative convexity, 134
negative yields, 127
net asset value (NAV), 101
Netherlands
  equity real rates of return, 257
  pension fund equity allocations, 255
New Zealand, 257
Nikkei 225 Index
  composition/characteristics, 268
  price-weighting of, 262
  stock index futures on, 275
Nikkei Stock Average, 268
nominal interest rates, 9
normal portfolio, as benchmark, 283
North American Industry Classification System (NAICS), 324
Norway, 257
notational principal (NP), 83

O
OAS. *see* option-adjusted spread
objectives, of pension funds, 310–311
130/30 short extension strategies, 300–301
on-the-run bond, 200
on-the-run yield curve, 124–127
open-ended bond mutual funds, 101–102
opportunity costs, sell disciplines based on, 302
optimization of indexed portfolios, 272–274
option-adjusted spread (OAS), 203
  calculation for portfolio, 204
  for corporate bonds (2001-2015), 198
  as credit quality measure, 218
  empirical duration vs., 197
  US CMBS and US corporate bonds, 204
options. *see also* bonds with embedded options; *specific types, e.g.:* call options
  as tail risk hedge strategy instrument, 232–233
  yield curve strategies with, 164–169
Orange County, California, bankruptcy (1994), 184
over-the-counter markets, credit securities in, 199

P
pairs trade, 298
partial duration (partials), 130, 154–155, 159–160. *see also* key rate durations
partial DV01 (PDV01), 155
partial price value of a basis point (PPVBP), 155
passive equity investing, 258–276
  equity index futures, 274–275
  equity total return swaps, 275–276
  indexed portfolios, 267, 270–276
  with indexes, 260–269
    benchmark index selection, 263–266
    composition and characteristics of major indexes, 266–269
    index weighting choices, 260–266
  portfolio construction for, 274
passive investment
  active investment vs., 47–48
  bond market exposure methods, 98–104
  fixed-income market definition, 98
passive management, 257
pass-through treatment, 33
PBO. *see* projected benefit obligation
PDV01. *see* partial DV01
pension fund(s)
  equity allocations of, 255
  performance objectives of, 310–311
  portfolios of managers for, 306–309
pension fund consultants, 277
performance-based fees, 315, 321–322
Pfandbriefe, 240
pooled investment vehicles, 22
portable alpha, 298, 313
portfolio(s)
  barbell, 107, 108
    defined, 142
    duration-neutral, 151–160, 162–164
    extreme, 172–173
    extreme vs. less extreme, 175–177
    laddered portfolio vs., 172–175
    structure, 141–145
  benchmark, 283
  bullet, 107
    defined, 141
    duration-neutral, 151–160, 162–164
    extreme, 173–174
    structure, 141–145
  butterfly, 160–162
  core-satellite, 309–312
  corporate bond
    credit mitigation risk, 194
    credit risk, 193–194
    interest rate risk, 195–198
    liquidity and trading, 198–199
    spread risk, 194–195
  credit
    construction of (*see* credit strategies)
    defined, 191
  dedicated bond, 64
  high-yield corporate bond
    credit mitigation risk, 194
    credit risk, 193–194
    interest rate risk, 195–198
    liquidity and trading, 198–199
    spread risk, 194–195
  indexed, 267, 270–276
  institutional, 271
  international credit, 233–236
    currency risk, 236
    emerging markets credit, 235
    legal risk, 236
    liquidity considerations, 236
    relative value in, 233–235
  investment-grade corporate bond
    credit mitigation risk, 194
    credit risk, 193–194
    interest rate risk, 195–198
    liquidity and trading, 198–199
    spread risk, 194–195
  laddered, 107–110, 172–175
  management of (*see* equity portfolio management; fixed-income portfolio management)
  market-neutral long–short, 299
  OAS calculation, 204
portfolio construction
  and bond market liquidity, 21–22
  bottom-up approach, 224
  core-satellite, 309–312
  credit portfolios (*see* credit strategies)
  excess return and, 205
  G-spread and, 200
  and liquidity needs, 21–22
  for passive equity investing, 274
  top-down approach, 224
portfolio diversification. *see* diversification
portfolio managers
  portfolios of, 306–313
  questionnaires for, 315–321
  selecting, 314–322
    fee proposals, 321–322
    fee structures, 315
    finding suitable candidates, 314
    past performance, 314
    questionnaires for, 315–321
portfolio modified adjusted duration, 95
portfolio trades, 274
POs. *see* principal-only strips
position size, 230
power-reverse dual note, 184
PPVBP. *see* partial price value of a basis point
prepayment risk, 238
present value of a basis point (PVBP), 68
present value of distribution of cash flows methodology, 96
price(s)
  in bond markets, 21
  growth-at-a-reasonable price investment style, 281
price inefficiency, 298–299
price value of a basis point (PVBP)
  defined, 130
  and duration management, 138, 139, 143–144
price-weighted indexes, 260–262, 264
principal-only strips (POs), 137n.8
program trades, 274
projected benefit obligation (PBO), 79–81

pure indexing
defined, 93
and fixed-income portfolio management, 16, 17
putable bonds, 50, 134
PVBP. *see* present value of a basis point; price value of a basis point

R
range accrual notes, 184
ratchet floaters, 184
ratio analysis, 221
real interest rate, 9
real rate of returns, 256–257
rebalancing, equity styles and, 291–293
rebate rate, 31
receiver swaption, 84
regression analysis, 161n.18, 220
Regulated Investment Company (RIC) diversification, 273
regulations, indexed portfolio, 273
relative strength indicators, 280
relative value
of CDOs, 239
and ESG practices, 225
in international credit portfolios, 233–235
and Z-spread, 203
relative-value analysis, 207–214
repo rate, defined, 30
repurchase agreements (repos), 29–30
research
buy-side, 323
sell-side, 298–299, 323
top-down vs. bottom-up, 322, 323
residential mortgage-backed securities (RMBS), 237
return(s)
active, 258
fixed-income, 23–26
real rate of, 256–257
total, 15–19
with active management, 17
with indexing, 16–17
returns-based style analysis
example, 293, 294
holdings-based style analysis vs., 291
identifying investment style with, 282–288
reverse repos, 30
RIC. *see* Regulated Investment Company
riding the yield curve strategy, 133
risk
active, 15–16, 258, 307–308, 311–312
counterparty, 31, 89–90
credit
in corporate bond portfolios, 193–194
counterparty, 89–90
and G-spread/I-spread evaluation, 202
in repo agreement, 30
credit mitigation, 194
credit-related, 200, 207–208
crowding, 135
currency, 236
default, 193
extension, 238
interest-rate
in corporate bond portfolios, 195–198
immunization from (*see* immunization strategies)
with liability-driven investing, 88–92
MBS and, 238
legal, 236
with liability-driven investing, 88–92
liquidity
in credit portfolios, 226–231
management of, 230–231
secondary market measures, 226–229
structural industry changes, 229–230
longevity, 80
misfit, 311–312
model, 88–89
prepayment, 238
shaping, 130
spread, 89, 194–195
structural, 62, 71
tail, 231–233
assessing, 231–232
managing, 232–233
scenario analysis, 231–232
tracking, 16, 92, 258
true active, 311–312
risk-controlled active investing, 303–305. *see also* semiactive equity investing
risk exposures
and leverage in fixed-income portfolio management, 31
and pure indexing, 16
risk factors, bond indexing, 95–96
risk-free interest rates, 195, 196
RMBS. *see* residential mortgage-backed securities
roll down, 133
rolldown return, 23–24
Royal Dutch Shell PLC, 94
Russell 1000 Growth Index, 284–286
Russell 1000 Index, 269, 329
Russell 1000 Value Index, 284–286
Russell 2000 Growth Index, 284–286
Russell 2000 Index
composition and characteristics, 269
indexed portfolios, 272
liquidity and, 267
portfolio construction with, 274
Russell 2000 Value Index, 284–286
Russell 3000 Index, 268, 329
Russell Investments, 292
Russell Midcap Growth Index, 287, 288
Russell Midcap Value Index, 287, 288
Russell Top 200 Growth Index, 287, 288, 313
Russell Top 200 Value Index, 287, 288

S
Samuelson, Paul, 259
scenario analysis, assessing tail risk with, 231–232
SEC. *see* US Securities and Exchange Commission
secondary credit markets
bid–ask spreads in, 228–229
evaluating liquidity in, 226–229
spread sensitivity to fund outflows, 227–228
trading volume in, 226–227
secondary offerings, 257
sectors. *see* economic sectors
securities. *see also specific types of securities*
asset-backed, 239
lending of, 30–31, 270
mortgage-backed
in credit portfolios, 237–238
defined, 236
and negative convexity, 134
for reducing convexity, 168–169
selection for equity portfolios, 322–324
security selection strategy, 206. *see also* bottom-up approach to credit strategy
sell disciplines, active equity investing, 302
selling convexity, 134
sell-side research, 298–299, 323
semiactive equity investing, 257, 303–305
derivatives- vs. stock-based, 303, 305
and Fundamental Law of Active Management, 304
semiactive management, 257
senior tranches, 239–240
shaping risk, 130
Sharpe, William F., 259, 277, 283
Sharpe style weights, 283
short extension strategies, 300–301
short positions, 298
slope, yield curve
measurement, 128
strategies for changes in, 135–145
small-cap equities, 297
small-stock investors, 281
smart beta, 105
socially responsible investing (SRI), 225, 296–297
Sony, 278
South Africa, 257
sovereign ceiling, 235
sovereign government bonds
duration management, 136
liquidity, 19, 20, 226
relative value, 234
returns, 148
taxation, 32
S&P 500 Index
bond market correlation matrix, 6–7
composition and characteristics, 269
float weighting, 261
futures on, 274–275, 313
indexed portfolios, 272
mutual fund expense ratios, 270
passive equity investing, 259
portfolio trades, 274
Spain, 257
S&P/Citigroup 500 Growth Index, 287
S&P/Citigroup 500 Value Index, 287
S&P/Citigroup World indexes, 293
speculative grade bonds
default rates vs. real GDP growth rate, 216
default rates vs. US high-yield spread, 217
rating agency definitions for, 192n.2

S&P Eurozone Sovereign Bond Index, 106, 107
S&P MidCap 400 Index, 261
spread curves
  in bottom-up approach to credit strategy, 211–214
  defined, 211
  in top-down approach to credit strategy, 223
spread duration
  as credit quality measure, 218
  defined, 194
  as indexing risk factor, 96
  as metric for position sizing, 214–215
  Z-spread vs., 211–212
spread risk, 89, 194–195
spread sensitivity, 227–228
S&P SmallCap 600 Index, 261, 267
S&P TSX Composite, 268
SRI. *see* socially responsible investing
Standard & Poor's. *see also* S&P *entries*
  bond index, 95
  bond ratings, 98n.24, 192n.2
  CLOs ratings, 239
  Global Industry Classification Standard, 324
Standards of Professional Conduct (CFA Institute), 299
stock-based semiactive equity investing, 303, 305
stock index futures, 274–275
stocks. *see* equities
strategic asset allocation, 104
strategic hedging, 84
stratified sampling, 99–100, 272–273
structural risk, 62, 71
structured financial instruments, 29
  in credit portfolios, 236–241
    asset-backed securities, 239
    CDOs, 239–240
    covered bonds, 240
    MBS, 237–238
  in fixed-income portfolio, 29
structured mandates, 11. *see also* liability-based mandates
structured notes, 183–184
style box, 294–295
style drift, 295–296
style indexes, 277, 291–294
style rotator (investment style), 281
style weights, 283
subordinated tranche, 239, 240
subordination, 239
substitution, 302
supply, in relative value analysis, 212–213
surplus, in contingent immunization, 77
swap(s)
  credit default
    index derivatives, 230–231
    for liquidity risk management, 230–231
    as tail risk hedge strategy instrument, 232–233
  currency, 236
  equity total return, 275–276
  in fixed-income portfolio management, 29
  interest rate, 22, 29
    for DB pension plan derivatives strategy, 82–88
    and duration management, 139–140
    uncollateralized, 89–90
  total return, 102–103, 275–276
swap rates, I-spread, 202
swaption collar, 84–87, 89
Sweden, 9, 257
Switzerland
  equity real rates of return, 257
  pension fund equity allocations, 255

T

tactical asset allocation, 104, 276
tail risk, 231–233
  assessing, 231–232
  managing, 232–233
  scenario analysis, 231–232
tail risk hedge strategy, 231–232
"Taper Tantrum," 198
taxes
  for equity total return swaps, 275–276
  fixed-income portfolios, 32–35
    investment vehicle choice, 33–34
    principles, 32–33
  pass-through treatment, 33
  and sell disciplines, 302
tax-loss harvesting, 33, 34
tick (term), 275n.28
TIPS. *see* Treasury inflation-protected securities
Tokyo Stock Exchange, 268
top-down credit strategy approach, 215–223
  bottom-up approach vs., 224
  country/currency exposure, 222–223
  credit quality, 216–219
  defined, 206
  excess returns in, 219
  industry sector allocation, 220–221
  interest rate measurement/management, 221–222
  spread curves in, 223
top-down research approaches, 316, 322, 323
TOPIX
  alpha and beta separation, 313
  composition and characteristics, 268, 269n.a
  float weighting for, 261
  as pension fund benchmark, 306
  stratified sampling for, 272
Toronto Stock Exchange, 268
total return mandates, 11, 15–19
  active management, 17
  pure/enhanced indexing, 16–17
total return payer, 102
total return receiver, 102
total return swap (TRS), 102–103, 275–276
Toyota, 272
TRACE. *see* Trade Reporting and Compliance Engine
tracking error, 16, 92
  enhancement strategies to reduce, 99–100
  and indexing risk, 97
tracking risk, 16, 92, 258
Trade Reporting and Compliance Engine (TRACE), 94–95
  and bond market, 21
  evaluating bond liquidity with, 226
  and US bond market, 236
trades
  basket, 274
  carry, 135
  pairs, 298 (*see also* long–short investing)
  portfolio, 274
  program, 274
trading
  and corporate bond portfolio liquidity, 198–199
  frequency of, 302
trading volume, secondary credit market, 226–227
tranches, 237, 239–240
transaction costs
  with active management, 17, 22
  with cash flow matching, 12
  with indexed portfolios, 270–272
Treasury inflation-protected securities (TIPS), 50
tri-party repos, 30
TRS. *see* total return swap
true active risk, 311–312
twists in yield curve, 61–62, 71
Type I liabilities, 50
Type II liabilities, 50, 78–79
Type III liabilities, 50, 79
Type IV liabilities, 50, 79, 80

U

Undertakings for Collective Investment in Transferable Securities (UCITS), 273
United Kingdom
  capital gains treatment, 33
  equity indexes' composition/characteristics, 268
  equity real rates of return, 257
  inflation-linked bonds, 9
  pension fund equity allocations, 255
  real GDP growth rate vs. speculative-grade bond default rate, 216
United States
  bankruptcy law, 236
  bonds
    default rates, 220
    market transparency, 21
  capital gains treatment, 33
  credit market (2016), 234
  default levels in 2008-2009 financial crisis, 233
  energy industry in credit market indexes, 234
  equity indexes' composition/characteristics, 267–269
  equity real rates of return, 257
  indexed portfolio regulation, 273
  inflation-linked bonds in, 9
  liquidity of credit market, 236
  pension fund equity allocations, 255
  real GDP growth rate vs. speculative-grade bond default rate, 216
  TRACE, 94–95
  unsecured bond recovery rate, 235

US Commodity Futures Trading Commission (CFTC), 103
US dollar
as swap counter payment, 275
swap curve, 202
and yen carry trade, 135
and yield curve trades, 178
US Securities and Exchange Commission (SEC), 103
US Treasury, 50
US Treasury bills, 303
US Treasury bonds
Federal Reserve repurchase program, 198
FNMA MBS vs., 168
and I-spread, 202
MBS volumes vs., 237
portfolio structures for, 162–164
yield curve strategies with options, 164–169
US Treasury notes (T-notes)
FNMA MBS vs., 168–169
and yield curve dynamics, 125–129
US Treasury notes (T-notes) futures contracts
for contingent immunization, 77
as derivatives overlay, 73–76
and duration management, 138
for interest rate immunization, 73–76
and liability-driven investing, 82
US Treasury securities
in duration-neutral portfolio, 169
and US credit markets, 227
US Treasury STRIPS (Separate Trading of Registered Interest and Principal of Securities), 90
up-from-cost sell discipline, 302
uptick rules, 275
USBIG. *see* Citi US Broad Investment Grade Index

V
valuation-level sell discipline, 302
value. *see* relative value
value investment style, 277–280
defined, 276
growth vs., 277–278
Microsoft and, 278
sell disciplines, 302
Value Line Arithmetic Composite Index, 268
value-weighted indexes, 261, 262, 264–265
Vanguard Admiral class shares, 271
Vanguard Group, Inc., 259, 271
Vanguard Mid-Cap Growth Fund, 294–295
Verizon, 211–212
volatility management, 222
Volcker Rule, 229

W
Wal-Mart Stores
equity market data, 263–266
free-float adjustments, 261n.10
Wells Fargo, 258–259
Westpac, 194

Y
yen, Japanese, 135, 223
yen carry trade, 135
yield
bond
covered, 240
and credit spread, 200–201
decomposing expected returns, 23–26
and expected return, 23
and interest rate risk, 195
and liquidity, 20, 21
cash flow, 55–62, 69–71, 73, 108
dividend, 280, 288, 290, 322
Yield Book, 155
yield curve
defined, 124
and duration matching, 13
dynamics of, 125–129
and immunization, 59–62
and interest rate exposure, 221
and laddered bond portfolios, 107
twists in, 61–62
yield curve slope
measurement, 128
strategies for changes in, 135–145
yield curve strategies, 123–190
about, 123–124
for changes in market level/slope/curvature, 135–145
bullet and barbell structures, 141–145
buying convexity, 140–141
duration management, 135–140
duration and convexity, 130–132
duration-neutral portfolios in multiple curve environments, 169–178
baseline portfolio, 169
extreme barbell vs. laddered portfolio, 172–173
extreme bullet, 173–174
extreme vs. less extreme barbell portfolios, 175–177
less extreme barbell portfolio vs. laddered portfolio, 174–175
yield curve scenarios, 170–172
foundational concepts, 124–132
duration and convexity, 130–132
yield curve dynamics, 125–129
framework for evaluating yield curve trades, 178–184
major types, 132–146
positioning strategy, 146–169
in anticipation of a change in interest rates, 150–151
in anticipation of parallel upward shift in yield curve, 146–150
duration-neutral bullet/barbell/butterfly performance, 151–164
using options, 164–169
practice problems, 187–188
riding the yield curve, 133
selling convexity, 134
solutions to problems, 189–190
for stable yield curve, 133–135
buy and hold, 133
carry trades, 134–135
riding the yield curve, 133
selling convexity, 134
yield duration. *see* duration
yield income, 23
yield spreads, 24
yuan, Chinese, 236

Z
zero-coupon bonds
convexity, 131
and immunization, 52
zero weight (term), 212
Z-spread, 203, 211–212

CFA Institute®
CFA Program

ALTERNATIVE INVESTMENTS, RISK MANAGEMENT, AND THE APPLICATION OF DERIVATIVES

CFA® Program Curriculum
2018 • LEVEL III • VOLUME 5

WILEY

CONTENTS

How to Use the CFA Program Curriculum v

Curriculum Development Process v
Organization of the Curriculum vi
Features of the Curriculum vi
Designing Your Personal Study Program viii
Feedback ix

Portfolio Management

Study Session 13 **Alternative Investments for Portfolio Management** 3

Reading 26 **Alternative Investments Portfolio Management** 5
Introduction 6
Alternative Investments: Definitions, Similarities, and Contrasts 7
Real Estate 13
The Real Estate Market 13
Benchmarks and Historical Performance 15
Real Estate: Investment Characteristics and Roles 19
Private Equity/Venture Capital 27
The Private Equity Market 29
Benchmarks and Historical Performance 37
Private Equity: Investment Characteristics and Roles 38
Commodity Investments 45
The Commodity Market 46
Benchmarks and Historical Performance 47
Commodities: Investment Characteristics and Roles 51
Hedge Funds 55
The Hedge Fund Market 56
Benchmarks and Historical Performance 60
Hedge Funds: Investment Characteristics and Roles 71
Performance Evaluation Concerns 78
Managed Futures 84
The Managed Futures Market 85
Benchmarks and Historical Performance 86
Managed Futures: Investment Characteristics and Roles 89
Distressed Securities 94
The Distressed Securities Market 94
Benchmarks and Historical Performance 95
Distressed Securities: Investment Characteristics and Roles 97
Summary 103
Practice Problems 108
Solutions 121

◘ indicates an optional segment

Study Session 14 **Risk Management** **131**

Reading 27 **Risk Management** **133**
Introduction **134**
Risk Management as a Process **135**
Risk Governance **138**
Identifying Risks **140**
Market Risk **142**
Credit Risk **142**
Liquidity Risk **143**
Operational Risk **144**
Model Risk **145**
Settlement (Herstatt) Risk **146**
Regulatory Risk **146**
Legal/Contract Risk **147**
Tax Risk **148**
Accounting Risk **148**
Sovereign and Political Risks **149**
Other Risks **150**
Measuring Risk **151**
Measuring Market Risk **151**
Value at Risk **153**
The Advantages and Limitations of VaR **168**
Extensions and Supplements to VaR **170**
Stress Testing **171**
Measuring Credit Risk **173**
Liquidity Risk **180**
Measuring Nonfinancial Risks **180**
Managing Risk **182**
Managing Market Risk **182**
Managing Credit Risk **186**
Performance Evaluation **189**
Capital Allocation **191**
Psychological and Behavioral Considerations **193**
Summary **193**
Practice Problems **196**
Solutions **204**

Study Session 15 **Risk Management Applications of Derivatives** **211**

Reading 28 **Risk Management Applications of Forward and Futures Strategies** **213**
Introduction **213**
O Strategies and Applications for Managing Interest Rate Risk **215**
O Managing the Interest Rate Risk of a Loan Using an FRA **215**
O Strategies and Applications for Managing Bond Portfolio Risk **219**
Strategies and Applications for Managing Equity Market Risk **227**
Measuring and Managing the Risk of Equities **228**
Managing the Risk of an Equity Portfolio **230**
Creating Equity out of Cash **232**

O indicates an optional segment

	Creating Cash out of Equity	**237**
	Asset Allocation with Futures	**241**
	Adjusting the Allocation among Asset Classes	**241**
	Pre-Investing in an Asset Class	**248**
	Strategies and Applications for Managing Foreign Currency Risk	**250**
	Managing the Risk of a Foreign Currency Receipt	**252**
	Managing the Risk of a Foreign Currency Payment	**252**
	Managing the Risk of a Foreign-Market Asset Portfolio	**254**
	Futures or Forwards?	**258**
	Final Comments	**260**
	Summary	**261**
	Practice Problems	**264**
	Solutions	**269**
Reading 29	**Risk Management Applications of Option Strategies**	**275**
	Introduction	**275**
	Option Strategies for Equity Portfolios	**277**
	◘ Standard Long and Short Positions	**279**
	Risk Management Strategies with Options and the Underlying	**286**
	Money Spreads	**293**
	Combinations of Calls and Puts	**304**
	Interest Rate Option Strategies	**312**
	Using Interest Rate Calls with Borrowing	**313**
	Using Interest Rate Puts with Lending	**318**
	Using an Interest Rate Cap with a Floating-Rate Loan	**323**
	Using an Interest Rate Floor with a Floating-Rate Loan	**327**
	Using an Interest Rate Collar with a Floating-Rate Loan	**329**
	Option Portfolio Risk Management Strategies	**333**
	Delta Hedging an Option over Time	**335**
	Gamma and the Risk of Delta	**342**
	Vega and Volatility Risk	**343**
	Final Comments	**344**
	Summary	**345**
	Practice Problems	**348**
	Solutions	**352**
Reading 30	**Risk Management Applications of Swap Strategies**	**357**
	Introduction	**358**
	Strategies and Applications for Managing Interest Rate Risk	**359**
	Using Interest Rate Swaps to Convert a Floating-Rate Loan to a Fixed-Rate Loan (and Vice Versa)	**359**
	Using Swaps to Adjust the Duration of a Fixed-Income Portfolio	**363**
	Using Swaps to Create and Manage the Risk of Structured Notes	**366**
	Strategies and Applications for Managing Exchange Rate Risk	**370**
	Converting a Loan in One Currency into a Loan in Another Currency	**370**
	Converting Foreign Cash Receipts into Domestic Currency	**375**
	Using Currency Swaps to Create and Manage the Risk of a Dual-Currency Bond	**377**

Strategies and Applications for Managing Equity Market Risk **380**
Diversifying a Concentrated Portfolio **380**
Achieving International Diversification **382**
Changing an Asset Allocation between Stocks and Bonds **384**
Reducing Insider Exposure **387**
Strategies and Applications Using Swaptions **389**
Using an Interest Rate Swaption in Anticipation of a Future Borrowing **390**
Using an Interest Rate Swaption to Terminate a Swap **394**
Synthetically Removing (Adding) a Call Feature in Callable (Noncallable) Debt **398**
A Note on Forward Swaps **404**
Conclusions **404**
Summary **404**
Practice Problems **407**
Solutions **416**

Glossary **G-1**
Index **I-1**

How to Use the CFA Program Curriculum

Congratulations on reaching Level III of the Chartered Financial Analyst® (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities it develops. Your commitment to the CFA Program should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. The CFA Program represents the first step toward a career-long commitment to professional education.

The CFA examination measures your mastery of the core skills required to succeed as an investment professional. These core skills are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major topic areas covered in the CFA Program (www.cfainstitute.org/cbok);
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/level_III);
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- The CFA Program curriculum, which contains the readings and end-of-reading questions, that candidates receive upon exam registration.

Therefore, the key to your success on the CFA examinations is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, and tips for developing an effective study program.

CURRICULUM DEVELOPMENT PROCESS

The CFA Program is grounded in the practice of the investment profession. Beginning with the Global Body of Investment Knowledge (GBIK), CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the knowledge, skills, and abilities (competencies) that are relevant to the profession. Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback from the GBIK collaborative website. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

© 2017 CFA Institute. All rights reserved.

The Education Advisory Committee, consisting of practicing charterholders, in conjunction with CFA Institute staff, designs the CFA Program curriculum in order to deliver the CBOK to candidates. The examinations, also written by charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit www.cfainstitute.org.

ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into 10 topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected.

Each topic area is then divided into one or more study sessions. These study sessions—18 sessions in the Level III curriculum—should form the basic structure of your reading and preparation.

Each study session includes a statement of its structure and objective and is further divided into specific reading assignments. An outline illustrating the organization of these 18 study sessions can be found at the front of each volume of the curriculum.

The readings and end-of-reading questions are the basis for all examination questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK. These readings are drawn from content commissioned by CFA Institute, textbook chapters, professional journal articles, research analyst reports, and cases. All readings include problems and solutions to help you understand and master the topic areas.

Reading-specific Learning Outcome Statements (LOS) are listed at the beginning of each reading. These LOS indicate what you should be able to accomplish after studying the reading. The LOS, the reading, and the end-of-reading questions are dependent on each other, with the reading and questions providing context for understanding the scope of the LOS.

You should use the LOS to guide and focus your study because each examination question is based on the assigned readings and one or more LOS. The readings provide context for the LOS and enable you to apply a principle or concept in a variety of scenarios. The candidate is responsible for the entirety of the required material in a study session, which includes the assigned readings as well as the end-of-reading questions and problems.

We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfaprogram/courseofstudy/Pages/study_sessions.aspx), including the descriptions of LOS "command words" (www.cfainstitute.org/programs/Documents/cfa_and_cipm_los_command_words.pdf).

FEATURES OF THE CURRICULUM

OPTIONAL SEGMENT

Required vs. Optional Segments You should read all of an assigned reading. In some cases, though, we have reprinted an entire chapter or article and marked certain parts of the reading as "optional." The CFA examination is based only on the required segments, and the optional segments are included only when it is determined that they might help you to better understand the required segments (by seeing the required material in its full context). When an optional segment begins, you will see an icon and a dashed

vertical bar in the outside margin that will continue until the optional segment ends, accompanied by another icon. *Unless the material is specifically marked as optional, you should assume it is required.* You should rely on the required segments and the reading-specific LOS in preparing for the examination.

END OPTIONAL SEGMENT

End-of-Reading Problems/Solutions *All problems in the readings as well as their solutions (which are provided directly following the problems) are part of the curriculum and are required material for the exam.* When appropriate, we have included problems within and after the readings to demonstrate practical application and reinforce your understanding of the concepts presented. The problems are designed to help you learn these concepts and may serve as a basis for exam questions. Many of these questions are adapted from past CFA examinations.

Glossary and Index For your convenience, we have printed a comprehensive glossary in each volume. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the glossary. The curriculum eBook is searchable, but we also publish an index that can be found on the CFA Institute website with the Level III study sessions.

LOS Self-Check We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

Source Material The authorship, publisher, and copyright owners are given for each reading for your reference. We recommend that you use the CFA Institute curriculum rather than the original source materials because the curriculum may include only selected pages from outside readings, updated sections within the readings, and problems and solutions tailored to the CFA Program. Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*®, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and 11 Nobel laureates have contributed a total of 45 articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this practice-oriented publication. Candidates have full online access to the *Financial Analysts Journal* and associated resources. All you need is to log in on www.cfapubs.org using your candidate credentials.

DESIGNING YOUR PERSONAL STUDY PROGRAM

Create a Schedule An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all reading assignments and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skill, or ability described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

As you prepare for your exam, we will e-mail you important exam updates, testing policies, and study tips. Be sure to read these carefully. Curriculum errata are periodically updated and posted on the study session page at www.cfainstitute.org.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience. For each level of the curriculum, there are 18 study sessions. So, a good plan is to devote 15–20 hours per week for 18 weeks to studying the material. Use the final four to six weeks before the exam to review what you have learned and practice with topic tests and mock exams. This recommendation, however, may underestimate the hours needed for appropriate examination preparation depending on your individual circumstances, relevant experience, and academic background. You will undoubtedly adjust your study time to conform to your own strengths and weaknesses and to your educational and professional background.

You will probably spend more time on some study sessions than on others, but on average you should plan on devoting 15–20 hours per study session. You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

An interactive study planner is available in the candidate resources area of our website to help you plan your study time. The interactive study planner recommends completion dates for each topic of the curriculum. Dates are determined based on study time available, exam topic weights, and curriculum weights. As you progress through the curriculum, the interactive study planner dynamically adjusts your study plan when you are running off schedule to help you stay on track for completion prior to the examination.

CFA Institute Topic Tests The CFA Institute topic tests are intended to assess your mastery of individual topic areas as you progress through your studies. After each test, you will receive immediate feedback noting the correct responses and indicating the relevant assigned reading so you can identify areas of weakness for further study. For more information on the topic tests, please visit www.cfainstitute.org.

CFA Institute Mock Exams The three-hour mock exams simulate the morning and afternoon sessions of the actual CFA examination, and are intended to be taken after you complete your study of the full curriculum so you can test your understanding of the curriculum and your readiness for the exam. You will receive feedback at the end of the mock exam, noting the correct responses and indicating the relevant assigned readings so you can assess areas of weakness for further study during your review period. We recommend that you take mock exams during the final stages of your preparation for the actual CFA examination. For more information on the mock examinations, please visit www.cfainstitute.org.

Preparatory Providers After you enroll in the CFA Program, you may receive numerous solicitations for preparatory courses and review materials. When considering a prep course, make sure the provider is in compliance with the CFA Institute Approved

Prep Provider Program (www.cfainstitute.org/utility/examprep/Pages/index.aspx). Just remember, there are no shortcuts to success on the CFA examinations; reading and studying the CFA curriculum is the key to success on the examination. The CFA examinations reference only the CFA Institute assigned curriculum—no preparatory course or review course materials are consulted or referenced.

SUMMARY

Every question on the CFA examination is based on the content contained in the required readings and on one or more LOS. Frequently, an examination question is based on a specific example highlighted within a reading or on a specific end-of-reading question and/or problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the examination except for occasional sections marked as optional. You may read optional pages as background, but you will not be tested on them.
2. All questions, problems, and their solutions—found at the end of readings—are part of the curriculum and are required study material for the examination.
3. You should make appropriate use of the topic tests and mock examinations and other resources available at www.cfainstitute.org.
4. Use the interactive study planner to create a schedule and commit sufficient study time to cover the 18 study sessions, review the materials, and take topic tests and mock examinations.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and member feedback as we work to incorporate content, design, and packaging improvements. You can be assured that we will continue to listen to your suggestions. Please send any comments or feedback to info@cfainstitute.org. Ongoing improvements in the curriculum will help you prepare for success on the upcoming examinations and for a lifetime of learning as a serious investment professional.

CUSTOMER SERVICE

68

Portfolio Management

STUDY SESSIONS

Study Session 3	Behavioral Finance
Study Session 4	Private Wealth Management (1)
Study Session 5	Private Wealth Management (2)
Study Session 6	Portfolio Management for Institutional Investors
Study Session 7	Applications of Economic Analysis to Portfolio Management
Study Session 8	Asset Allocation and Related Decisions in Portfolio Management (1)
Study Session 9	Asset Allocation and Related Decisions in Portfolio Management (2)
Study Session 10	Fixed-Income Portfolio Management (1)
Study Session 11	Fixed-Income Portfolio Management (2)
Study Session 12	Equity Portfolio Management
Study Session 13	Alternative Investments for Portfolio Management
Study Session 14	Risk Management
Study Session 15	Risk Management Applications of Derivatives
Study Session 16	Trading, Monitoring, and Rebalancing
Study Session 17	Performance Evaluation
Study Session 18	Global Investment Performance Standards

This volume includes Study Sessions 13–15.

© 2017 CFA Institute. All rights reserved.

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; evaluate portfolio performance; and analyze a presentation of investment returns for consistency with Global Investment Performance Standards (GIPS®).

PORTFOLIO MANAGEMENT
STUDY SESSION

13

Alternative Investments for Portfolio Management

Alternative investments comprise groups of investments with risk and return characteristics that differ from those of traditional stock and bond investments. Alternative investments are typically, although not always, characterized by:

- relative illiquidity, which tends to be associated with a return premium as compensation;
- potential to diversify;
- high due diligence costs; and
- performance appraisal that is unusually difficult, due in part to the complexity of establishing valid benchmarks.

Allocations to alternative investments are often made with the expectation that they offer the potential for risk diversification and/or greater opportunities to apply active management skills and capture alpha.

READING ASSIGNMENTS

Reading 26 Alternative Investments Portfolio Management
by Jot K. Yau, PhD, CFA, Thomas Schneeweis, PhD, Edward A. Szado, PhD, CFA, Thomas R. Robinson, PhD, CFA, and Lisa R. Weiss, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

26

Alternative Investments Portfolio Management

by Jot K. Yau, PhD, CFA, Thomas Schneeweis, PhD, Edward A. Szado, PhD, CFA, Thomas R. Robinson, PhD, CFA, and Lisa R. Weiss, CFA

Jot K. Yau, PhD, CFA, is at Albers School of Business and Economics, Seattle University (USA). Thomas Schneeweis, PhD, is at S Capital Management (USA). Edward A. Szado, PhD, CFA, is at Providence College (USA). Thomas R. Robinson, PhD, CFA, is at AACSB International (USA). Lisa R. Weiss, CFA, is at Thayer Gate Advisors, Inc. (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** describe common features of alternative investments and their markets and how alternative investments may be grouped by the role they typically play in a portfolio;
☐	**b.** explain and justify the major due diligence checkpoints involved in selecting active managers of alternative investments;
☐	**c.** explain distinctive issues that alternative investments raise for investment advisers of private wealth clients;
☐	**d.** distinguish among types of alternative investments;
☐	**e.** discuss the construction and interpretation of benchmarks and the problem of benchmark bias in alternative investment groups;
☐	**f.** evaluate the return enhancement and/or risk diversification effects of adding an alternative investment to a reference portfolio (for example, a portfolio invested solely in common equity and bonds);
☐	**g.** describe advantages and disadvantages of direct equity investments in real estate;
☐	**h.** discuss the major issuers and suppliers of venture capital, the stages through which private companies pass (seed stage through exit), the characteristic sources of financing at each stage, and the purpose of such financing;
☐	**i.** compare venture capital funds and buyout funds;
☐	**j.** discuss the use of convertible preferred stock in direct venture capital investment;

(continued)

© 2017 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**k.** explain the typical structure of a private equity fund, including the compensation to the fund's sponsor (general partner) and typical timelines;
☐	**l.** discuss issues that must be addressed in formulating a private equity investment strategy;
☐	**m.** compare indirect and direct commodity investment;
☐	**n.** describe the principal roles suggested for commodities in a portfolio and explain why some commodity classes may provide a better hedge against inflation than others;
☐	**o.** identify and explain the style classification of a hedge fund, given a description of its investment strategy;
☐	**p.** discuss the typical structure of a hedge fund, including the fee structure, and explain the rationale for high-water mark provisions;
☐	**q.** describe the purpose and characteristics of fund-of-funds hedge funds;
☐	**r.** discuss concerns involved in hedge fund performance evaluation;
☐	**s.** describe trading strategies of managed futures programs and the role of managed futures in a portfolio;
☐	**t.** describe strategies and risks associated with investing in distressed securities;
☐	**u.** explain event risk, market liquidity risk, market risk, and "J factor risk" in relation to investing in distressed securities.

1 INTRODUCTION

Today, many defined-benefit pension funds, endowments, foundations, and high-net-worth individuals allocate money to alternative investments in proportions comparable to those given to traditional assets, such as bonds and common equities. In doing so, such investors may be seeking risk diversification, greater opportunities to apply active management skills, or both. Portfolio managers who understand alternative investments have a substantial advantage over those who do not.

This reading presents six groups of alternative investments: real estate, private equity, commodities, hedge funds, managed futures, and distressed securities. These six diverse asset groups cover a wide spectrum of risk and return characteristics and are the major alternative asset classes in the portfolios of most institutional and individual investors.

This reading focuses on the distinguishing characteristics of alternative investments and their potential contributions in a portfolio context. Among the questions we will address in this reading are the following:

- What types of investments are available in each market, and what are their most important differences for an investor?
- What benchmarks are available to evaluate the performance of alternative investment managers, and what are their limitations?

- What investment strategies and portfolio roles are characteristic of each alternative investment?
- What should due diligence cover? (**Due diligence** is the investigation into the details of a potential investment, including the scrutiny of operations and management and the verification of material facts.)

The reading is organized as follows: Section 2 introduces and presents an overview of the field of alternative investments. In Sections 3 through 8, we present the six alternative asset groups. For each group, we discuss the market for the investments; benchmarks and historical performance, with a focus on the group's record as a standalone investment; the portfolio role of the investments and specific strategies; and issues in performance evaluation and reporting. The final section summarizes the reading.

ALTERNATIVE INVESTMENTS: DEFINITIONS, SIMILARITIES, AND CONTRASTS

2

Alternative investments comprise groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments. Common features of alternative investments include the following:

- Relative illiquidity, which tends to be associated with a return premium as compensation
- Diversifying potential relative to a portfolio of stocks and bonds
- High due diligence costs for the following reasons: Investment structures and strategies may be complex; evaluation may draw heavily on asset-class, business-specific, or other expertise; reporting often lacks transparency
- Unusually difficult performance appraisal because of the complexity of establishing valid benchmarks

In addition, many professional investors believe that alternative investment markets are informationally less efficient than the world's major equity and bond markets and offer greater scope for adding value through skill and superior information.

Historically, **real estate** (ownership interests in land or structures attached to land), **private equity** (ownership interests in non-publicly-traded companies), and **commodities** (articles of commerce such as agricultural goods, metals, and petroleum) have been viewed as the primary alternatives to traditional stock and bond investments. However, in recent years, additional investments have increasingly been considered "modern alternatives," not only to traditional investments but also to traditional *alternative* investments. These modern alternatives include **hedge funds** (relatively loosely regulated, pooled investment vehicles) and **managed futures** (pooled investment vehicles in futures and options on futures, frequently structured as limited partnerships but also frequently available directly in separate accounts). The modern alternative investments are more akin to investment or trading strategies than to asset classes. Exhibit 1 shows alternative investments grouped according to these

distinctions. In some instances, placement of an alternative investment in more than one category can be justified. For example, we discuss **distressed securities** separately as a distinct type of alternative investment, but they could be classified differently.[1]

Exhibit 1 Alternative and Traditional Investments

The list of alternative investments discussed in this reading is representative but by no means exhaustive. For example, some investors invest in intangibles (such as fine art), and benchmarks and professional advisory services for these and some other alternative investments have long been available.

In addition to the traditional-or-modern distinction, we can separate alternative investments into three groups by the primary role they usually play in portfolios:

- Investments that primarily provide exposure to risk factors not easily accessible through traditional stock and bond investments. Real estate and (long-only) commodities might be included in this group.
- Investments that provide exposure to specialized investment strategies run by an outside manager. Hedge funds and managed futures might be placed in this category. Any value added by such investments is typically heavily dependent on the skills of the manager.
- Investments that combine features of the prior two groups. Private equity funds and distressed securities might be included in this group.

However we group alternative investments, success in this field requires discipline. The portfolio management process still applies. In addition, familiarity with quantitative approaches to the management of risk in alternative investing—particularly risk budgeting—and with non-traditional measures of risk can be helpful. Thus, the readings on risk management are also relevant here.

1 Distressed securities/bankruptcy investing can be classified (1) within private equity if private debt is considered to be private equity, (2) as a subcategory of event-driven strategies under hedge funds as an alternative investment strategy, or (3) as a separate alternative investment strategy. In this reading, we introduce distressed securities/bankruptcy investing as an event-driven substrategy of hedge funds, but we discuss it separately in Section 8.

EXAMPLE 1

Alternative Investments in a Low-Return Environment

Interest in alternative investments from institutional investors soared after the severe equity bear markets of the first years of the 21st century. The resulting investment environment for traditional investments was seen as "low return." Return expectations for equities were widely ratcheted down from pre-bear-market and long-term historical levels. In that environment, using the revised capital market expectations and established strategic asset allocations, many investors foresaw built-in shortfalls relative to return requirements. The problem was particularly acute for defined-benefit pension funds in countries such as Canada and the United States, where such funds have traditionally had a strong equity orientation. With declining interest rates increasing the present value of liabilities, many defined-benefit plans faced severe pressures.

The experience led a number of industry leaders to question prior investment practices in areas such as strategic asset allocation and to reexamine the role of alternative investments in meeting return objectives and controlling risk. Many institutional investors made new and/or larger allocations to alternative investments. Vehicles such as hedge funds proliferated to meet the demand. This trend raised issues of capacity—that is, given the market opportunities, the ability of alternative investment managers to meet performance expectations with more assets.[2] In the private wealth marketplace, alternative investments also began to be packaged and marketed to new segments, such as the "mass affluent," raising issues of suitability and appropriate due diligence processes for such investors.[3]

Who are the major investors in alternative investments? The list includes both high-net-worth individuals (who were among the pioneer investors in hedge funds) and institutional investors (such as endowments, foundations, and sovereign wealth funds), although some institutional investors (such as banks and insurers) may face regulatory and other restrictions on allocating assets to alternative investments. The themes already mentioned play different roles for different investors. The potential risk diversification benefits of alternative investments have broad appeal across investor types. The possibility of enhancing returns also draws many investors to seriously consider alternative investments. Illiquidity is frequently a factor that limits the size of the allocation to alternative investments for investors with short investment horizons. In contrast, investors with long investment horizons, such as endowments and some defined-benefit pension funds, may be well placed to earn illiquidity premiums and to make large allocations.

The costs of due diligence in alternative investments may be a limiting factor for smaller portfolios. Deutsche Bank's Global Prime Finance group's 2014 Operational Due Diligence Survey, with a range of respondents serving the institutional and private markets, was revealing. In the case of hedge funds, the survey found that the majority of respondents spend between two and eight weeks on due diligence prior to making an investment decision and 70% of respondents perform annual follow-up reviews. On average, survey respondents conducted 33 new investment reviews over the year

2 See Christopher Wright, "Ripe for the Picking," *CFA Institute Magazine* (September/October 2005): 27–35. The article's title refers to the question it colorfully poses: Does alpha grow on trees, and if so, is it being overharvested?

3 **Mass affluent** is an industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services (such as separately managed accounts) at many investment counseling firms. In the United States, as of this writing, individuals with investable assets between US$100,000 and US$1 million would fall into this group.

surveyed, with institutional investors evaluating three times as many managers, on average, as fund-of-funds and high-net-worth investors.[4] In alternative investments, as in traditional investments, expenses—whether management fees or trading or operational expenses—require justification and management.

For both traditional and alternative investments, selecting active managers is a process of attempting to identify those with superior skills or information. As Example 2 illustrates, the set of questions the investor needs to raise in selecting active managers in any investment field has a compellingly simple logic.

EXAMPLE 2

How One University Endowment Evaluates Alternative Investments

In 2005, the then chief investment officer (CIO) of the University of Virginia Investment Management Company UVIMCO, Christopher J. Brightman, CFA, summarized the chief points of UVIMCO's active manager selection process as follows:[5]

1. *Market Opportunity*. What is the opportunity, and why is it there? We start by studying capital markets and the types of managers operating within those markets. We identify market inefficiencies and try to understand their causes, such as regulatory structures or behavioral biases. We can rule out many broad groups of managers and strategies by simply determining that the degree of market inefficiency necessary to support a strategy is implausible. Importantly, we consider a past history of active returns meaningless unless we understand why markets will allow those active returns to continue into the future.
2. *Investment Process*. Who does this best, and what's their edge? We identify groups of managers that seek to exploit these inefficiencies. Few, if any, important opportunities are exploited by a single manager. We study investment process and identify best practices and competitive advantages among similar managers.
3. *Organization*. Are all the pieces in place? Is the firm well organized and stable? Are research, trading, risk management, and operations properly staffed given the investment process and scale? Is compensation fair? Has there been turnover? What is the succession plan?
4. *People*. Do we trust the people? We speak at length to the principals face to face. We look for experience, intelligence, candor, and integrity. Then, we do reference checks; we speak to former bosses, colleagues, and business partners as well as current and past clients. We have real conversations with people who know the managers well and are willing to speak openly and at length. We also perform general Google and LexisNexis searches.
5. *Terms and Structure*. Are the terms fair? Are interests aligned? Is the fund or account structured appropriately for the opportunity? How much money can or should be invested in the space? Details here vary by market, asset class, and strategy.

4 Deutsche Bank Global Prime Finance, "Operational Due Diligence Survey" (2014): https://www.managedfunds.org/wp-content/uploads/2014/07/Third-Annual-Deutsche-Bank-Operational-Due-Diligence-Survey-Summer-2014.pdf.

5 Based on an e-mail communication of 19 December 2005.

6 *Service Providers*. Who supports them? We verify lawyers, auditors, prime brokers, lenders, and so on. We investigate those with whom we are not familiar.

7 *Documents*. Read the documents! We read the prospectus or private placement memorandum. If we do not understand everything in the documents, we hire lawyers who do. We also read the audits.

8 *Write-Up*. Prior to making a manager selection decision, we produce a formal manager recommendation discussing the above steps. The write-up ensures organized thought, informs others, and formally documents the process.

Notably, the framework of questions to which UVIMCO seeks answers applies not only to alternative investments but also to active managers in general, reflecting the unity of the investment process.

Some questions in due diligence and alternative investment selection are more crucial for advisers of private wealth clients than for institutional investors. These issues include the following:

- *Tax issues*. Taxes are a pervasive issue in investing for individuals. In contrast to equities and bonds, alternative investments frequently require the adviser to deal with partnerships and other structures that have distinct tax issues.
- *Suitability*. This issue is often more complex for an adviser to an individual client or family than for an institutional investor. The adviser often addresses multistage time horizons and liquidity needs. Client-relevant facts—for example, the time horizon—may change more suddenly for an individual than for, say, a pension fund with thousands of participants. The private client adviser also may be faced with questions of emotional as well as financial needs.
- *Communication with the client*. After exploring the suitability of an alternative investment for a client as part of his or her fiduciary responsibilities, the adviser then faces the difficult problem of discussing the possible role in the portfolio (and risk) of an often complex investment with a non-professional investor.
- *Decision risk*. As defined by one authority on investing for private wealth clients, **decision risk** is the risk of changing strategies at the point of maximum loss.[6] Many advisers to private wealth clients are familiar with the issue of clients who are acutely sensitive to positions of loss at stages prior to an investment policy's stated time horizon(s). Of course, advisers need to perform continuing evaluation of investments, but the point is that the adviser must evaluate whether an alternative investment promises not only to be rewarding over a given time horizon but also to be acceptable at all intermediate points in time.[7] In effect, the issue relates to downside risk at all points within a time horizon and investors' reactions to that downside risk. Many alternative investments—for example, many hedge fund strategies—have complex risk characteristics. Decision risk is increased by strategies that by their nature have
  - frequent small positive returns but, when a large return occurs, are more likely to have a large negative return than a large positive one[8] or

6 Brunel (2004).
7 Brunel (2003).
8 Technically, such a strategy would be said to have *negatively skewed returns*.

- extreme returns (relative to the mean return) with some unusual degree of frequency.[9]

■ *Concentrated equity position of the client in a closely held company*. For some clients, ownership in a closely held company may represent a substantial proportion of wealth. The adviser needs to be particularly sensitive to an investment's effect on the client's risk and liquidity position. For example, is a private equity fund suitable for the investor? The issues of concentrated risk and illiquidity also arise for concentrated positions in public equities with built-in capital gains, although hedging and monetization strategies are available. (These strategies are discussed in the reading on monitoring and rebalancing.) Although a client's residences are often viewed separately from the client's investable portfolio, a similar issue arises in real estate investment vis-à-vis wealth represented by residences. Problems of this type combine suitability, tax, and asset allocation issues.

In discussing individual alternative investments, we will sometimes provide a perspective on what effect an alternative investment would have on the risk and expected return characteristics of a stock/bond portfolio in which some of the money is shifted to the alternative investment. In some cases, we can also refer to evidence on the effects of the addition of the new alternative investment to a portfolio that already includes stocks, bonds, and a different major alternative investment. This approach reflects the situation faced by many investors and is a type of exercise that can be informative.

In many cases, we give evidence based on data relating to the period 1996–2015.[10] *Here a word of caution is appropriate:* In any forward-looking exercise, the investor needs to evaluate the differences between current or forecasted economic fundamentals and those of any selected historical period used in the analysis. In addition, the results for any relatively short period can be affected by short-term dislocations, such as currency crises.

Overall, the 1996–2015 period was a time of historically low and relatively stable interest rates and inflation in the United States and many other developed markets. The period began with an expansion in these developed countries (with the notable exception of Japan), but at least three dislocations with worldwide effects occurred.[11] In the United States and some other major markets, an exceptionally long equity bull market (1991–1999 inclusive) was followed by an extended bear market.[12] The year 2001 was recessionary in the United States, whereas 2002–2004 were recovery years. The years 2008 and 2009 were also recessionary in the United States and were followed by a tepid recovery. The period 2001 to 2008 covered one full business cycle for the United States and many other developed markets.

---

9 Technically, such a strategy would be said to have *high kurtosis*. To summarize using the language of statistics, many investors are presumed to want *positive skewness* and *moderate or low kurtosis* (the standard for "moderate" is the kurtosis of a normal distribution). For more details on these statistical concepts, see chapter 3 in DeFusco, McLeavey, Pinto, and Runkle (2015). In discussions of alternative investments in trade publications, as well as in outlets such as the *Financial Analysts Journal* and the *Journal of Wealth Management*, the practitioner will encounter these statistical terms, which are covered in the CFA Institute curriculum, and we will use them occasionally in this reading.

10 Hedge funds have reliable data going back only to 1990. We chose a consistent starting point for the sake of relevance and comparability across investment types.

11 The dislocations were the Asian financial crisis of 1997, the Russian debt crisis of 1998, and the global financial crisis of 2007.

12 US equities experienced a record nine-year string of positive-return years (1991–1999), including six years (1991 and 1995–1999) with returns higher than 20%. This period was followed by a string of three negative-return years (2000–2002), a post-1941 record.

EXAMPLE 3

Alternative Investments and Core–Satellite Investing

The approach to asset allocation known as **core–satellite** seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles. A traditional core–satellite perspective places competitively priced assets, such as government bonds and/or large-capitalization stocks, in the core. Because alpha is hard to obtain with such assets, the core may be managed in a passive or risk-controlled active manner. (Informally, *alpha* is the return to skill.) In the satellite ring would go investments designed to play special roles, such as to add alpha or to diminish portfolio volatility via low correlation with the core. Alternative investments would be in the satellite ring for most investors.[13]

In a 2005 paper, Leibowitz and Bova championed an approach that would place alternative investments in an "alpha core" at their maximum allowable percentages and then add stocks and bonds as "swing assets" to produce a portfolio that best reflected the desired balance between return and risk.[14] The standard viewpoint takes traditional assets as the centerpiece, whereas the Leibowitz–Bova position builds the portfolio around alternative investments. The Leibowitz–Bova approach is an example of the ferment in investment thinking mentioned in Example 1.

Having provided a bird's-eye view of the field of alternative investments, we use the following sections to analyze each in detail, beginning with real estate.

REAL ESTATE

3

As one of the earliest of the traditional alternative investments, real estate plays an important role in institutional and individual investor portfolios internationally. The focus of our discussion is *equity investments* in real estate (covered in the definition given earlier). Instruments such as mortgages, securitizations of mortgages, and hybrid debt/equity interests (e.g., mortgages in which the lender's interest includes participation in any appreciation of the underlying real estate) are not covered here.

3.1 The Real Estate Market

Both individual and institutional investors have had long-standing involvement in the real estate market. For centuries, individual investors have owned interests in real estate, primarily in the form of residential and agricultural properties. In the United States, institutional investors ventured into real estate in the late 1970s and early 1980s as they sought to diversify their portfolios and hedge against inflation. By the late 1980s, the performance of real estate had become lackluster as a result of volatile changes in US tax policies, deregulation in the savings and loan industry, and the onset of risk-based capital regulations. These events culminated in the real estate crash of the late 1980s and early 1990s. This crash was followed by a recovery and an extended period of strong growth prior to another major crash and the global

13 See Singleton (2005).

14 In the approach used by Leibowitz and Bova (2005), the term *alpha* in *alpha core* strictly refers not to a return to skill or risk-adjusted excess return, as in standard finance theory, but to a type of return–risk enhancement that may be available relative to a more traditional asset allocation approach.

financial crisis in the late 2000s. Since the crisis, real estate has recovered and significantly surpassed pre-crisis levels in most markets. Outside the United States as well, real estate investment is frequently an important part of both institutional and individual portfolios.

3.1.1 *Types of Real Estate Investments*

Investors may participate in real estate both directly and indirectly (indirect investment is sometimes called "financial ownership"). Direct ownership includes investment in residences, business (commercial) real estate, and agricultural land.

Indirect investment includes investing in the following:

- Companies engaged in real estate ownership, development, or management, such as homebuilders and real estate operating companies (which are in the business of owning such real estate assets as office buildings): Such companies would be in the real estate management and development subsector of the Global Industrial Classification System (GICS) and FTSE's Industry Classification Benchmark (ICB).
- **Real estate investment trusts (REITs)**, which are publicly traded equities representing pools of money invested in real estate properties and/or real estate debt
- **Commingled real estate funds (CREFs)**, which are professionally managed vehicles for substantial commingled (i.e., pooled) investments in real estate properties
- Separately managed accounts, which are often offered by the same real estate advisers sponsoring CREFs
- **Infrastructure funds**, which, in cooperation with governmental authorities, make private investments in public infrastructure projects—such as roads, tunnels, schools, hospitals, and airports—in return for rights to specified revenue streams over a contracted period

Investments in real estate management and development subsector shares and in REITs are both made through the public stock markets. REITs, however, unlike real estate management and development shares, essentially function as conduits to investors for the cash flows from the underlying real estate holdings. The list of markets in which REITs are available includes Australia, Belgium, Canada, China, France, Hong Kong, Japan, the Netherlands, Singapore, South Korea, and the United States.

Equity REITs own and manage such properties as office buildings, apartment buildings, and shopping centers. Shareholders receive rental income and income from capital appreciation if the property is sold for a gain. Mortgage REITs own portfolios in which more than 75% of the assets are mortgages. Mortgage REITs lend money to builders and make loan collections; shareholders receive interest income and capital appreciation income from improvement in the prices of loans. Hybrid REITs operate by buying real estate and by acquiring mortgages on both commercial and residential real estate.

REITs securitize illiquid real estate assets; their shares are traded on stock exchanges and over the counter. REITs permit smaller investors to gain real estate exposure. Exchange-traded funds, mutual funds, and traded closed-end investment companies allow investors to obtain a professionally managed, diversified portfolio of real estate securities with a relatively small outlay.

CREFs include both open-end funds and closed-end funds (i.e., funds that are closed to new investment after an initial period). Institutional and wealthy individual investors use these private real estate funds to access the expertise of a professional real estate fund manager in selecting, developing, and realizing the value of real estate properties. In contrast to open-end funds, closed-end funds are usually leveraged and

have higher return objectives; they operate by opportunistically acquiring, repositioning, and disposing of properties. Individually managed separate accounts are also an important choice for larger investors.

In an infrastructure investment, a private company or, more frequently, a consortium of private companies, designs, finances, and builds the new project (e.g., a road or hospital) for public use. The consortium maintains the physical infrastructure over a period that often ranges from 25 to 30 years. The public sector (via the government) leases the infrastructure and pays the consortium an annual fee for the use of the completed project over the contracted period. Thus, the public sector avoids the need to issue debt or raise taxes to finance infrastructure development. The public sector staffs the infrastructure and ensures safety. The projects are financed through bond issuance by the consortium as well as by an equity investment. When the consortium wants to pull its equity capital out of a project for reinvestment in other projects, it can sell its interest to investors through a variety of investment structures. Public/private infrastructure investment has been classified under real estate, under private equity, and also as a distinct alternative investment class. Infrastructure investment was pioneered in the United Kingdom in 1992 (with the Private Finance Initiative) and is a rapidly growing alternative investment segment in North America, Western Europe, and Asia. One estimate, as of mid-2014, is that in the United Kingdom alone, there were more than 700 public/private infrastructure projects underway with a total value of £50 billion.[15]

3.1.2 *Size of the Real Estate Market*

It has been estimated that real estate represents one-third to two-thirds of the world's wealth, although these figures are hard to document. In the United States, as of the end of 2014, real estate owned by households and non-profit organizations was valued at US$23.7 trillion[16] and represented approximately one-third of total assets (tangible and financial) of US households. In 2016, Savills estimated that global developed real estate—comprising commercial properties, residential properties, agriculture, and forestry—represents about 60% of all mainstream assets, with residential properties representing 75% of the value of all developed properties globally.[17]

According to the National Association of Real Estate Investment Trusts (NAREIT), the market capitalization of all publicly traded REITs in the United States was almost US$940 billion in 2015 and the market capitalization of REITs traded in Canada was about US$13 billion in the same year.

3.2 Benchmarks and Historical Performance

In this section, we use publicly available information to discuss the performance measurement of real estate investments. Performance of private equity in real estate may vary and does not necessarily correlate closely with the benchmarks discussed here. More importantly, it has been observed that the real estate market lags behind publicly traded real estate securities.

15 UK Trade & Investment, "Investing in UK Infrastructure" (July 2014): www.gov.uk/government/uploads/system/uploads/attachment_data/file/357135/infrastructure_pitchbook_28072014.pdf.
16 Board of Governors of the Federal Reserve System, "Households and Nonprofit Organizations; Real Estate at Market Value (HNOREMV)" (https://fred.stlouisfed.org/series/HNOREMV).
17 Savills, "Around the World in Dollars and Cents," Savills World Research (2016): http://pdf.euro.savills.co.uk/global-research/around-the-world-in-dollars-and-cents-2016.pdf.

3.2.1 *Benchmarks*

Exhibit 2 shows some of the popular real estate indexes for selected countries. The principal benchmark used to measure the performance of direct real estate investment in the United States is the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index. The NCREIF index is a quarterly benchmark for real estate covering a sample of commercial properties owned by large US institutions. The NCREIF index is essentially value weighted and includes sub-indexes grouped by real estate sector (e.g., apartment, industrial, office, and retail) and geographical region. Property appraisals largely determine the values in the NCREIF index because real estate properties change ownership relatively infrequently. Property appraisals are also conducted infrequently (typically once a year), so appraisal-based property values exhibit remarkable inertia. Therefore, returns calculated solely on percentage changes in the index suffer from a number of deficiencies, including the tendency to underestimate volatility in underlying values.[18] However, methods have been developed to "unsmooth" the index or correct for this bias.[19] A transaction-based index has been developed using NCREIF data and econometrics to address the issue of infrequent market transactions. In addition, NCREIF offers a variety of indexes focused on the returns to real estate–based mutual funds, closed-end funds, timberland funds, and separate accounts.

Exhibit 2 Selected Real Estate Benchmarks

Country	Name	Type	Begin Date	Frequency
Australia	The Property Council/IPD Australia All Property Index	Appraisal based	1998	Quarterly
Canada	REALpac/IPD Canada Quarterly Property Index	Appraisal based	1985	Quarterly
France	IPD France Annual Property Index	Appraisal based	1998	Annual
United Kingdom	IPD	Appraisal based	1980	Quarterly and monthly
United States	NCREIF Property Index	Individual properties; appraisal based	1978	Quarterly
	Transaction-Based Index (TBI) for Institutional Commercial Property Performance (MIT Center for Real Estate)	Individual properties; based on transaction prices of properties sold from the NCREIF index database	1984	Quarterly
	S&P BMI US REIT Index	REITs	1997	Daily
	NAREIT Index	REITs	1972	Real time
	MSCI US REIT Index	REITs	1996	Real time
	Wilshire real estate indexes	REITs and real estate operating companies	1978	Daily

18 For details of the deficiencies, see Geltner (2000) and Geltner and Ling (2001).
19 The approach used to unsmooth the NCREIF index is based on the assumption that real estate returns follow a first-order autoregressive process, as described in CISDM (2005b).

Exhibit 2 (Continued)

Country	Name	Type	Begin Date	Frequency
	Dow Jones REIT indexes	REITs	1998	Real time
World	FTSE EPRA/NAREIT Global Real Estate Index	REITs and real estate operating companies	1989	Daily

Sources: Schneeweis, Kazemi, and Szado (2016a); Hoesli, Lekander, and Witkiewicz (2004); http://web.mit.edu/cre; www.ftse.com/indexes.

The principal benchmark used to represent indirect investment in real estate is the index compiled by NAREIT. Begun in 1972, the NAREIT Index is a real-time, market-cap-weighted index of all REITs actively traded on the New York Stock Exchange and the American Stock Exchange. NAREIT also computes a monthly index based on month-end share prices of REITs that own and manage real estate assets (equity REITs). NAREIT publishes several other indexes, including a monthly index of REITs that specialize in acquiring various types of mortgage loans on many types of properties (mortgage REITs) and a monthly index based on share prices of hybrid REITs, which operate by buying real estate and by acquiring mortgages on both commercial and residential real estate. REIT indexes are also published by various institutions, such as Standard & Poor's, Dow Jones, Wilshire Associates, and Morgan Stanley. The FTSE EPRA/NAREIT Global Real Estate Index listed in Exhibit 2 is an example of a global index of securitized real estate investments.

Both direct and indirect investments have significant measurement issues associated with them.

3.2.2 *Historical Performance*

In the United States, direct and indirect real estate investments, as represented by the major (unhedged) indexes, produced better risk-adjusted performance over the 1996–2015 period than did general stocks, private equity, and commodities, as shown in Exhibit 3. In Exhibit 3, the "hedged" REIT return series has been purged of its overall equity market return component, as represented by the S&P 500 Index. Such an adjustment is meaningful only for equity REITs because mortgage and hybrid REITs have different risk characteristics. However, equity REITs represent close to 95% of the composition of the index.[20] S&P GSCI is the Goldman Sachs Commodity Index, which is discussed further in the section on commodities.

Exhibit 3 Real Estate Performance, 1996–2015

	FTSE NAREIT	FTSE NAREIT Hedged	NCREIF Property	NCREIF Property Unsmoothed	S&P 500	Bloomberg Barclays US Aggregate	Private Equity	CISDM EW Hedge Fund	S&P GSCI	CISDM CTA EW
Annualized total return	10.3%	4.0%	9.9%	8.3%	8.5%	5.4%	8.2%	9.1%	–1.0%	7.2%
Annualized standard deviation	20.1%	16.3%	4.6%	16.3%	16.9%	3.5%	35.1%	9.1%	25.2%	8.1%

(continued)

20 The data and methodology are described in CISDM (2005b).

Exhibit 3 (Continued)

	FTSE NAREIT	FTSE NAREIT Hedged	NCREIF Property	NCREIF Property Unsmoothed	S&P 500	Bloomberg Barclays US Aggregate	Private Equity	CISDM EW Hedge Fund	S&P GSCI	CISDM CTA EW
Mean return-to-volatility ratio	0.51	0.24	2.14	0.51	0.50	1.55	0.23	1.00	–0.04	0.90
Maximum drawdown	–64.6%	–49.5%	–23.9%	–63.4%	–45.8%	–2.4%	–75.4%	–19.2%	–79.4%	–7.9%
Correlation with NAREIT	1.00	0.81	0.20	0.50	0.59	0.03	0.54	0.47	0.25	–0.02
Correlation with NAREIT hedged	0.81	1.00	0.10	0.34	0.00	0.29	0.10	0.01	0.17	0.13
Correlation with NCREIF	0.20	0.10	1.00	0.52	0.21	–0.09	0.11	0.07	0.18	–0.01
Correlation with NCREIF unsmoothed	0.50	0.34	0.52	1.00	0.38	–0.08	0.36	0.30	0.27	–0.16

Notes: Based on quarterly returns. CTA is "commodity trading adviser" and refers to managed commodity futures. EW is "equally weighted."
Source: Schneeweis, Kazemi, and Szado (2016a).

Note that the NCREIF index represents non-leveraged investment only. In contrast, debt often represents 50% or more of the capital structure of REITs, so REITs are a levered exposure to real estate. This contrast is important for understanding the higher standard deviation of (unhedged) REITs compared with the unsmoothed NCREIF index. The NCREIF index is most representative of the performance of private real estate funds because these funds are the major contributors of data to NCREIF.

The performance properties of direct and securitized real estate investment differ significantly. REITs exhibit a relatively high return (10.3%) and high standard deviation (20.1%), whereas appraisal-based real estate returns are slightly lower (9.9%) with low volatility (4.6%). The extremely low standard deviation of NCREIF index returns is indicative of the volatility dampening associated with the smoothing effect of stale valuations. After the correction for smoothing, the NCREIF index's volatility more than triples to 16.3%. However, the average return decreases from 9.9% for the NCREIF index to 8.3% for the unsmoothed NCREIF index. The correlation between these two indexes is 0.52. The correlations between the unhedged NAREIT Index and the NCREIF index and the unsmoothed NCREIF index are both low (0.20 and 0.50, respectively), suggesting that securitized real estate investment is a poor substitute for direct investment.

In this period, the volatility of the hedged NAREIT Index is the same as that of the NCREIF index unsmoothed, 16.3%. Even though the hedging correction is imperfect, the hedged NAREIT Index may be a more realistic representation of the underlying real estate market.

3.2.3 *Interpretation Issues*

When NAREIT and NCREIF indexes are used as benchmarks for real estate investments or in asset allocation studies, the problems associated with the construction of the indexes mentioned previously must be taken into account.[21] Importantly for performance appraisal, the NCREIF index is not an investable index.

EXAMPLE 4

Timberland and Farmland

Timberland and farmland investments represent ownership in working timberland and farms. Although these investments provide limited liquidity, they have the potential for significant income in addition to capital appreciation. Wan, Mei, Clutter, and Siry (2013) found that private equity investments in timberland provided effective hedging of expected and unexpected inflation, particularly over the long term and during boom periods. Public equity timberland investments, however, exhibited inconsistent inflation-hedging abilities.

Farmland returns are largely driven by the value of land and the prices of agricultural commodities. Timberland returns depend on land values and the price of lumber, which is driven largely by housing starts on the demand side and by environmental conditions on the supply side.[22]

Timberland as an investment began to take shape in the mid-1980s with the emergence of timberland investment management organizations (TIMOs), which invested in timberland on behalf of institutional clients. Another popular method for investors to access timberland investments is through timberland REITs. As of 2014, almost 10 million acres of timberland were owned by financial investors, with TIMOs owning almost twice as much land as was owned by REITs. About one-half of timberland investments were held by public pension funds in 2014.[23]

It is estimated that as of 2014, of the US$2.5 trillion of US farmland, only US$10 billion was owned by investment funds.[24]

3.3 Real Estate: Investment Characteristics and Roles

Real estate accounts for a major portion of many individuals' wealth. For example, equity in primary residential property represented about 30% of the net worth in the United States in 2010.[25] One estimate suggests that real estate represented about 35% of household wealth in the United Kingdom over the 2010–2012 period.[26] Most advisers to private clients do not include the clients' residences as "marketable" in the sense of assets that the adviser includes in a strategic asset allocation.

21 For details, see Geltner (2000) and Geltner and Ling (2001).
22 See Corriero, Healy, and Bond (2013) for a discussion of the impact of the pine beetle and other factors influencing lumber prices.
23 UNECE, "Forest Products Annual Market Review 2014-2015" (https://www.unece.org/fileadmin/DAM/timber/publications/2015-FPAMR-E.pdf).
24 Liz Moyer, "More Individuals Are Looking to Invest in Farmland and Timberland," *Wall Street Journal* (18 July 2014): http://www.wsj.com/articles/more-individuals-are-looking-to-invest-in-farmland-and-timberland-1405706090.
25 Michael Neal, "Housing Remains a Key Component of Household Wealth," *Eye on Housing*, NAHB (4 September 2013): http://eyeonhousing.org/2013/09/housing-remains-a-key-component-of-household-wealth/.
26 Department for Work and Pensions, "Statistics on Household Wealth" (September 2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/359271/household-wealth.pdf.

3.3.1 *Investment Characteristics*

In contrast to such alternative investments as hedge funds, real estate investments may provide intrinsic benefits to individuals or businesses beyond the returns they generate. For example, an individual can receive significant benefits from his or her primary residence even if the residence generates zero capital gains. In addition, investment in commercial real estate properties includes a substantial income component through contractually fixed rental income, which increases the stability of the investment's returns.

A variety of investment characteristics affect the returns to real estate. The physical real estate market is characterized by a relative lack of liquidity, large lot sizes, relatively high transaction costs, heterogeneity, immobility (with the asset fixed at a location), and relatively low information transparency (so the seller often knows more than the buyer). Physical real estate has rarely been traded on a centralized exchange. These characteristics can create the market opportunity for relatively high risk-adjusted returns for investors who can obtain cost-efficient, high-quality information.

The lack of reliable, high-frequency transaction data for properties necessitates the use of appraisal-based valuations. Later, we will discuss the points that a quantitative analysis of the returns to real estate must cover when the data result from appraisals.

Various market and economic factors affect real estate. For instance, interest rates directly or indirectly affect a multitude of factors associated with the supply and demand for real estate, such as business financing costs, employment levels, saving habits, and the supply and demand for mortgage financing. Worldwide, the returns to real estate are positively correlated with changes in gross national product.[27] Population growth is, in the long term, a positive factor for real estate returns, but the real estate investor needs to research the demographics affecting the particular investment (such as migration into or out of the area and changes in the wealth profile of the locality).

Investigators have come to mixed conclusions about the inflation-hedging capabilities of real estate investment. Research suggests that inflation-hedging ability varies significantly by geographic location, market segment, and time period. In particular, the inflation-hedging potential of real estate may be more difficult to detect if the high-inflation period of the late 1970s and early 1980s is excluded from the period of study.[28] Bond and Seiler (1998) found that US residential real estate provided a significant inflation hedge in the 1969–94 period. Hoesli, MacGregor, Matysiak, and Nanthakumaran (1997) found that UK real estate provided a better short-term inflation hedge than bonds but a worse hedge than stocks. Stevenson and Murray (1999) did not find evidence that Irish real estate provided a significant inflation hedge. Liu, Hartzell, and Hoesli (1997) found that real estate provided a worse hedge than stocks in some countries but a comparable hedge in others. Analyzing US REITs specifically, Chatrath and Liang (1998) found some long-run but no short-run inflation-hedging ability. Similarly, Lee and Lee (2014) found no evidence of short-term inflation hedging for developed or emerging markets in Europe; however, they found that real estate exhibited long-term inflation-hedging abilities in developed European markets but not in emerging European markets.

Real estate values are affected by idiosyncratic variables, such as location. There appear to be strong continent-specific factors in real estate returns for Europe and North America.[29] The implication is that complete diversification in real estate can be achieved only by investing internationally. Practically, most such diversification benefits can be achieved by targeting one country from each continent.

---

27 See Case, Goetzmann, and Rouwenhorst (2000).
28 See Peyton (2011).
29 See Eichholtz, Huisman, Koedijk, and Schuin (1998); Eichholtz, Mahieu, and Schotman (1999).

The following is a list of the general advantages and disadvantages of direct equity real estate investing.[30] Most of these advantages and disadvantages apply to both individual and institutional investors.

Advantages

- To the extent that the law allows mortgage interest, property taxes, and other expenses to be deducted from taxable income, taxable owners of real estate may benefit from tax subsidies.
- Mortgage loans permit most real estate borrowers to use more financial leverage than is commonly available in security investing.
- Direct real estate investors have direct control over their property and may take action, such as expanding or modernizing, to increase the market value of the property. In contrast, an investor who owns a small position in the equity of a publicly traded company has virtually no voice in the management of the company.
- Geographical diversification can be effective in reducing exposure to catastrophic risks (e.g., the risk of hurricanes or floods). The values of real estate investments in different locations can have low correlations; substantial geographical distance is often not necessary to achieve risk reduction benefits.

Disadvantages

- Most parcels of real estate are not easy to divide into smaller pieces. As a result, when such properties are a relatively large part of an investor's total portfolio, real estate investing may involve large idiosyncratic risks. Owners of single-family residences and large institutional investors that buy shopping centers may both experience this problem.
- The cost of acquiring information is high because each piece of real estate is unique.
- Real estate brokers charge high commissions relative to security transaction fees.
- Real estate involves substantial operating and maintenance costs (e.g., for administration, leasing, repairs, and replacements) and hands-on management expertise, which are expenses or requirements not faced by investors in securities.
- Real estate investors are exposed to the risk of neighborhood deterioration, which may be caused by conditions that are beyond the investor's control.
- Any income tax deductions from which a taxable investor in real estate may benefit are subject to political risk—that is, they may be discontinued.

3.3.2 *Roles in the Portfolio*

According to the 2014 MSCI Asset Owner survey, strategic allocations to real estate average about 3% of total assets in Asia, 9% in the United States, 12% in Canada, and 8% to 13% across major European countries. The range of allocations is broadly consistent with what a quantitative approach to asset allocation would suggest.[31] Over one-half of Canadian capital and one-third of UK capital, and less than 10% of

30 In part, this list reflects Francis and Ibbotson (2001).

31 For example, Kallberg, Liu, and Greig (1996), using a mean–variance optimization framework, found that a 9% allocation to real estate is optimal in a portfolio that includes stocks, bonds, and cash.

American and Australian capital is reportedly committed to direct investment in land and buildings. The survey also indicates a generally strong home bias in real estate investments, with over 90% domestic allocation in the United Kingdom and 79% in the United States, while the Asian domestic allocation is only 8%.

Because real estate may follow many economic fundamentals, real estate markets follow economic cycles. From a tactical asset allocation point of view, accurate forecasting of economic cycles should thus result in improved dynamic strategies for reallocating among different assets on the basis of expected stages of their respective cycles. Among the variables to focus on as systematic determinants of real estate returns are growth in consumption, real interest rates, the term structure of interest rates, and unexpected inflation.[32]

The Role of Real Estate as a Risk Diversifier In addition to its potential to add value through active management, real estate has historically been viewed as an important risk diversifier because its returns are typically not highly correlated with returns to other asset classes. High-quality, income-producing commercial real estate can be a relatively stable investment, with income derived from tenants' lease payments. Thus, some real estate investments can be good income enhancers.[33]

To illustrate the potential diversification benefit of real estate investments in a portfolio context, Exhibit 4 presents performance results using an approach that is also used in subsequent parts of this reading and elsewhere.[34] The exhibit shows statistics for a 50%/50% US stock/US bond portfolio (Portfolio A), which is a simple baseline portfolio. Then, the allocation to US stocks and bonds is reduced by 10 percentage points and a 10% allocation to the alternative investment under discussion (in this case, real estate) is added to create Portfolio B. Portfolio C is a second baseline portfolio created by reducing Portfolio A's allocation to US stocks and bonds by 25 percentage points and adding a 25% allocation to four different alternative investments (in this case, hedge funds, private equity, commodities, and managed futures). To this second baseline portfolio (Portfolio C), a 10% allocation to real estate can be added to create Portfolio D. This method of presentation provides information on the effect of holding the alternative investment under discussion in conjunction with various other asset classes that the investor might hold. A particular investor may have a different baseline portfolio, but the investor can adapt the approach shown here to his or her needs. In Section 2, we highlighted the additional concerns involved in evaluating an analysis based on a given historical sample. In real estate, data series extend much further back than 1996. We have selected 1996 as the starting point for reasons of comparability, as discussed in Section 2.

Exhibit 4 Real Estate Performance in Portfolios, 1996–2015

Portfolios	A	B	C	D
Annualized return	7.26%	7.70%	7.26%	7.69%
Standard deviation	7.83%	8.36%	8.11%	8.62%
Mean return-to-volatility ratio	0.93	0.92	0.89	0.89
Maximum drawdown	–27.11%	–31.34%	–31.11%	–34.77%
Correlation with real estate	0.60		0.61	

32 See Naranjo and Ling (1997).
33 See Downs, Fung, Patterson, and Yau (2003).
34 See Schneeweis and Spurgin (1997a); Ankrim and Hensel (1993).

Exhibit 4 (Continued)

Portfolios	A	B	C	D
Portfolio A	Equal weights S&P 500 and Bloomberg Barclays US Aggregate			
Portfolio B	90% Portfolio A and 10% real estate			
Portfolio C	75% Portfolio A and 25% managed futures/commodities/private equity/hedge funds			
Portfolio D	90% Portfolio C and 10% real estate			

Source: Schneeweis, Kazemi, and Szado (2016a).

Exhibit 4 is the first of a number of exhibits in this reading that present a simple risk-adjusted performance metric: the ratio of mean return achieved in a given time period divided by the volatility (standard deviation) of returns. Comparing Portfolio B (REITs, US equities, and US bonds) with Portfolio A (only US equities and US bonds), one can see that the addition of REITs slightly decreases the mean return-to-volatility ratio from 0.93 to 0.92. The reason for this lack of improvement despite the moderate correlation between Portfolio A and real estate (0.60) is the high volatility of the REIT returns (over 20%) in the sample period. When REITs are added to the more diversified group of assets included in Portfolio C to produce Portfolio D, similar results are observed: The mean return-to-volatility ratio is actually the same for Portfolios C and D.

Overall, for the sample period, REITs provided no diversification benefits relative to a stock/bond portfolio. This is in strong contrast to that for other alternative investments, such as hedge funds, that did provide diversification benefits when added to a stock/bond portfolio.

These results may indicate that real estate is an *ex post* redundant asset in the presence of hedge funds and other alternative assets.

Diversification within Real Estate Itself Investors also seek diversification by type and geographical location within real estate investing. Investments in different real estate sectors differ in regard to risk and return. The property types that have higher levels of embedded risk, such as large office assets, have generated lower risk-adjusted returns than other sectors and are likely to have more pronounced market cycles. Conversely, those sectors that offer higher risk-adjusted returns, such as retail real estate, appear to be less volatile and offer more defensive characteristics. As Exhibit 5 shows, unsmoothed retail offered the highest risk-adjusted returns (10.20% return and 11.05% standard deviation) and office assets showed low returns (7.63%) and high volatility (18.17%) in the 1996–2015 period. This exhibit suggests that targeting the retail sector of the commercial real estate market over these two decades would have yielded better results than simply diversifying across all sectors.

Exhibit 5 Unsmoothed Performance of Direct Real Estate Indexes, 1996–2015

	NCREIF Property Unsmoothed	NCREIF Apartment Unsmoothed	NCREIF Industrial Unsmoothed	NCREIF Office Unsmoothed	NCREIF Retail Unsmoothed
Annualized total return	8.25%	8.23%	8.91%	7.63%	10.20%
Annualized standard deviation	16.32%	16.15%	15.11%	18.17%	11.05%
Mean return-to-volatility ratio	0.51	0.51	0.59	0.42	0.92
Maximum drawdown	–63.41%	–61.17%	–54.97%	–66.94%	–33.09%
Correlation with NAREIT	0.50	0.50	0.45	0.51	0.25

(continued)

Exhibit 5 (Continued)

	NCREIF Property Unsmoothed	NCREIF Apartment Unsmoothed	NCREIF Industrial Unsmoothed	NCREIF Office Unsmoothed	NCREIF Retail Unsmoothed
Correlation with NAREIT hedged	0.34	0.40	0.32	0.36	0.09
Correlation with NCREIF	0.52	0.50	0.53	0.52	0.46
Correlation with NCREIF unsmoothed	1.00	0.92	0.89	0.92	0.73

	NCREIF Property	NCREIF Apartment	NCREIF Industrial	NCREIF Office	NCREIF Retail
Annualized total return	9.90%	9.81%	10.21%	9.84%	10.49%
Annualized standard deviation	4.62%	4.79%	4.74%	5.29%	4.18%
Mean return-to-volatility ratio	2.14	2.05	2.15	1.86	2.51
Maximum drawdown	–23.88%	–24.70%	–24.40%	–26.82%	–16.56%
Correlation with NAREIT	0.20	0.26	0.19	0.17	0.18
Correlation with NAREIT hedged	0.10	0.17	0.11	0.06	0.07
Correlation with NCREIF	1.00	0.97	0.97	0.97	0.86
Correlation with NCREIF unsmoothed	0.52	0.52	0.49	0.49	0.49

Source: Schneeweis, Kazemi, and Szado (2016a).

Exhibit 6 shows the correlation matrix of total returns for the four geographical NCREIF (unsmoothed) indexes and the combined index. The correlations are quite high for all pairs of geographical sub-indexes. This finding suggests that successful geographical diversification should take into account finer subdivisions, such as metropolitan areas or cities.

Exhibit 6 Correlation of Direct Real Estate Returns by US Geographical Region, 1996–2015

	NCREIF Property Unsmoothed	NCREIF East Unsmoothed	NCREIF Midwest Unsmoothed	NCREIF South Unsmoothed	NCREIF West Unsmoothed
NCREIF unsmoothed	1.00	0.96	0.90	0.94	0.95
NCREIF East unsmoothed		1.00	0.84	0.87	0.85
NCREIF Midwest unsmoothed			1.00	0.84	0.81
NCREIF South unsmoothed				1.00	0.88
NCREIF West unsmoothed					1.00

Source: Schneeweis, Kazemi, and Szado (2016a).

The characteristics of real estate return distributions are important for the portfolio manager because they provide key inputs into the asset allocation process. Many return observations in indexes of direct investment tend to be close to zero as a result of the illiquid market. In US markets and elsewhere, equity real estate returns—for both direct investments[35] and indirect investments[36]—generally have been found not to follow a normal distribution. Furthermore, the direct market exhibits a high degree of persistence in returns (positive following positive and negative following negative), whereas the indirect market does not show such persistence. The explanation for these facts is a matter of continuing investigation.[37]

Investment in Real Estate Worldwide The advantages of international real estate investment have been researched, and overall, the evidence indicates that investors may benefit from including both domestic and non-domestic investments in real estate in their portfolios.

Historically, real estate has been found to be an effective portfolio risk diversifier for seven countries (Australia, France, the Netherlands, Sweden, Switzerland, the United Kingdom, and the United States) on three continents, and including both domestic and international real estate assets increases the benefits.[38] The results presented in Exhibit 7 suggest that, for the United States, the correlation between REIT returns and common stock returns appears to have increased substantially since 2000 (although correlations have dropped off somewhat since 2013), indicating the possibility that real estate's diversification potential has declined.

Exhibit 7 Five-Year Rolling Correlation of S&P 500 and NAREIT, 2000–2015

Note: Based on data from 1996–2015.
Source: Schneeweis, Kazemi, and Szado (2016a).

Research has also suggested that US REITs may be an attractive addition to domestic stocks and bonds for investors from Canada and the United Kingdom.[39] Example 5 applies some of the facts and methods discussed in the text.

35 See Young and Graff (1995); Miles and McCue (1984); Hartzell, Hekman, and Miles (1986).
36 See Lizieri and Satchell (1997); Seiler, Webb, and Myer (1999); Mei and Hu (2000); Lizieri and Ward (2000).
37 See Lizieri and Ward (2000).
38 See Hoesli et al. (2004). This study was based on data from 1987–2001. More recent analysis was not available as of the date of this reading.
39 See Mull and Soenen (1997), who studied the 1985–94 period.

EXAMPLE 5

Adding Real Estate to the Strategic Asset Allocation

As CIO of The Annette Hansen Charitable Foundation (TAHCF), a US-based foundation supporting medical research, Maryann Dunn will present to the trustees a recommendation that they revise the foundation's strategic asset allocation to include direct investment in real estate.

- The foundation's current portfolio and strategic asset allocation is 50% common stocks/50% bonds, and 12% of the common stock allocation (6% of the total portfolio) is invested in REITs.
- The risk-free rate of interest is 2.5%.
- The forecasted inflation rate is 2%.
- TAHCF's overall investment objective is to preserve the long-run real (inflation-adjusted) purchasing power of assets. Its spending rate is 5% of 12-month average asset value.
- TAHCF's cost of earning investment returns is 20 bps per year.

Exhibit 8 shows Dunn's expectations for the current and proposed asset allocations. Dunn's expectations for direct real estate investment are based on unsmoothed NCREIF historical data adjusted for her current economic outlook.

Exhibit 8 Forecast Data

Measure	50/50 Stocks/Bonds (%)	45/45/10 Stocks/Bonds/US Direct Real Estate Investment (%)
Expected return	4.5	4.9
Std. dev. of return	11.8	10.8

Dunn expects opposition to her proposal to come from a trustee, Bob Enicar. Enicar has stated at a prior board meeting, "TAHCF's allocation to equity includes substantial investment in REITs. REITs typically provide risk diversification comparable to that of direct equity investments for a balanced portfolio of stocks and bonds while offering substantially more liquidity."

1. State and explain two financial justifications that Dunn could present for revising TAHCF's asset allocation to 45/45/10 stocks/bonds/US direct real estate investment.
2. State and explain one disadvantage of the proposed revised strategic asset allocation.
3. Contrast unsmoothed and smoothed NCREIF indexes and justify Dunn's choice of the unsmoothed NCREIF index in formulating expectations for direct real estate investment.
4. Draft a response to Enicar's critique.

Solution to 1:

The financial justifications for adding direct real estate investment to the strategic asset allocation include the following:

- The Sharpe ratio of the 45/45/10 stocks/bonds/US direct real estate investment portfolio, at (4.9% – 2.5%)/10.8 = 0.22, is greater than that of the current 50/50 stocks/bonds allocation, at (4.5% – 2.5%)/11.8 = 0.17.
- Direct real estate investment's inflation-hedging qualities are consistent with TAHCF's stated objective of preserving the real purchasing power of its assets.

Solution to 2:

The proposed strategic asset allocation's expected return of 4.9% falls well short of the (1.05)(1.02)(1.0020) – 1.0 = 7.31% return objective based on the description of the problem.

Solution to 3:

The NCREIF index is based on property appraisals rather than market values. Appraised values tend to be less volatile than market values because of an effect known as smoothing. As a result of smoothing, volatility and correlations with other assets will tend to be understated, leading to an overstatement of the benefits of real estate in the portfolio. Using the unsmoothed NCREIF index gives a more accurate picture of the benefits of real estate investment.

Solution to 4:

Enicar is correct that securitized real estate is more liquid than direct real estate investment. However, direct real estate's correlations with US equities and US bonds are lower than those of REITs, making direct real estate a stronger risk diversifier when added to a portfolio of stocks and bonds.

Example 5 reviewed a strategic asset allocation involving direct real estate investment that did not promise to fulfill the investor's return requirement.

3.3.3 *Other Issues*

Due diligence in active direct real estate investment should cover the points outlined in Example 2: market opportunity, investment process, organization, people, terms and structure, service providers, documents, and write-up. Some of these points will involve investment-specific issues, such as valuation methods, financing, legal issues (e.g., zoning, title checks), and for taxable investors especially, tax issues.

In the next section, we discuss another major type of alternative investment, private equity.

PRIVATE EQUITY/VENTURE CAPITAL

4

Private equity is an ownership interest in a private (non-publicly traded) company. The term "private equity" refers to any security that is used to raise equity capital via a private placement rather than through a public offering. As private placements, private equity securities are not registered with a regulatory body or traded on an exchange. To qualify as private placements, securities are generally offered for sale to

either institutions or high-net-worth individuals (accredited investors). Private equity investments can be made directly with the company needing financing or indirectly through private equity funds.

A variety of investment activities can take place in the investment structures known as **private equity funds**—the pooled investment vehicles through which many investors make (indirect) investments in generally highly illiquid assets. These investment activities include the financing of private businesses, leveraged buyouts of public companies, distressed debt investing, and the private financing of public infrastructure projects. Thus, many different investing activities requiring distinct expertise are often gathered under the rubric of private equity. In this section, we focus on the two historically most important fields of private equity activity: the equity financing of new or growing private companies—an activity often called **venture capital**—and the buyout of established companies via private equity funds known as buyout funds.[40] Through venture capital, a company that starts out as private may eventually become publicly owned via an initial public offering (IPO). The converse process—taking a publicly owned company private through a buyout of publicly held interests or the private purchase of a division of a public corporation—constitutes the chief sphere of activity of buyout funds, along with buyouts of established private companies. Private investments may also occur with public companies, such as private placements of equity (relatively rare) or bonds (more common).

EXAMPLE 6

Private Investment in Public Equity (PIPE)

The range of activities conducted via the structure of a private equity fund continues to evolve and grow. An example is PIPE—private investment in public equity. If the share price of a publicly traded company has dropped significantly from its value at the time of going public, the company may seek new sources of capital via a PIPE. Through a PIPE, an investor makes a relatively large investment in a company, usually at a price less than the current market value.

On 16 January 2004, Novatel Wireless, Inc., a publicly traded company, sold 1,142,855 shares of newly issued common stock to a group of private investment firms (a PIPE). The shares included warrants entitling the investors to purchase an additional 228,565 shares at a price of US$8.833 per share. Novatel raised net capital of US$7,525,000 in the initial transaction. On 13 February 2004, Novatel filed a registration statement with the US SEC that would entitle these private investors to sell their shares on the open market. At the time of the original transaction, Novatel's shares were trading for US$9.00. At the time the registration statement was filed, the shares were trading for US$16.48.

Sources: BusinessWeek (10 May 2004): 118–120; Novatel Wireless, SEC Form S-3, filed 13 February 2004.

40 "Venture capital" is widely used to refer to early-stage financing of companies. Yet practitioners also talk of late-stage venture capital, referring to the period prior to exiting from the investment. According to Lerner (2000, p. 522), outside the United States, the term "venture capital" is often used as a synonym for "private equity." Confusingly, practitioners sometimes use "private equity" to refer to investment buyout funds rather than venture capital funds. In short, terminology varies, but the reader can infer the meaning from the context.

Private equity represents an important asset class that has received much interest from pension plans, endowments, foundations, and corporations, as well as from family offices and other advisers to the private wealth market. In some countries, such as the United Kingdom and the United States, exposure to this investment type is also available through exchange-traded vehicles.

In a number of countries, including the United States, private equity is one type of alternative investment that practitioners often point to as facing serious capacity issues. The high failure rate of young businesses is an indication that the combination of winning ideas for products/services and the entrepreneurial and/or managerial skill, experience, and commitment to realize those ideas is in limited supply at any given time. The venture or business that is in a position of strength with respect to those factors will be scrutinizing the potential investor for qualities needed in a partner/collaborator as closely as the investor scrutinizes the business.

Most professional investors have broad familiarity with public equity markets. Although public and private equity investments have common elements, private equity investment makes use of distinct knowledge and experience. The contrast is greatest in the case of direct private equity investment, which often calls on the investor's skills as a businessperson, as Exhibit 9 shows.

Exhibit 9 Investment Processes of (Direct) Private Equity Investment and Investment in Publicly Traded Equities

Private Equity Investments	Publicly Traded Securities
Structure and Valuation	
Deal structure and price are negotiated between the investor and company management.	Price is set in the context of the market. Deal structure is standardized. Variations typically require approval from securities regulators.
Access to Information for Investment Selection	
Investor can request access to all information, including internal projections.	Analysts can use only publicly available information to assess investment potential.
Post-Investment Activity	
Investors typically remain heavily involved in the company after the transaction by participating at the board level and through regular contact with management.	Investors typically do not sit on corporate boards or make ongoing assessments based on publicly available information and have limited access to management.

Source: Prepared by Andrew Abouchar, CFA, of Tech Capital Partners.

The following section discusses some prominent characteristics of the private equity marketplace and private equity funds.

4.1 The Private Equity Market

The first question to address is why the market opportunities for private equity arise. Take the case of venture capital investment first: A closely held business is characterized by a small number of owners and is not publicly traded. Often, the owners of a closely held business are family members, but closely held businesses can also have unrelated owners. Such businesses may seek outside investors for a variety of reasons. For example, the original owners may not have adequate capital to fund growth or even current operations. Entrepreneurs frequently lack the professional managerial skills and experience to manage the enterprise they started after it reaches a certain size. Venture capital firms may be able to supply valuable assistance in the transition

to professional management.[41] The original owners may also want to diversify their wealth. For an individual investor, a closely held business can represent a significant portion of his or her overall wealth. The liquidity afforded by markets for publicly traded shares allows such investors to diversify their portfolios at a lower cost. Venture capitalists also can assist in the initial public offering (IPO) of shares, which permits the original owners to eventually realize public market valuations for their holdings.[42]

Formative-stage companies usually raise money through marketing an effective business plan to potentially interested parties. The business plan describes the intended products and/or services, the market that will be served, the business strategy, the dates of expected financial milestones (such as the achievement of profitability), the expected cash consumption by the business ("burn rate"), the additional rounds of financing that the company expects to need, and other relevant information.

In the case of funds raised through an agent, a document called a **private placement memorandum** may be used. This document should discuss a myriad of factors affecting the company. It should describe the company's business and competitive position and discuss how it intends to use the proceeds from the offering. It should also contain financial statements—although not necessarily audited financial statements—and projections.

The Demand for Venture Capital Issuers of venture capital include the following:

- *Formative-stage companies.* This group includes newly formed companies, young companies beginning product development ("start-ups"), and companies that are just beginning to sell a product. Worldwide, probably more than a million new businesses are formed every year, but venture capitalists frequently are not interested in companies at that earliest stage. In the United States, venture capitalists that do invest in formative-stage companies might be looking for companies with, for example, projected revenues in the US$10 million to US$50 million range within a five-year horizon.[43]
- *Expansion-stage companies.* This group includes young companies that need financing for expanding sales, established companies with significant revenues (middle-market companies), and companies that are preparing for an IPO of stock.

Most private companies pass through the following financing stages:[44]

Early-Stage Financing

- Seed money: Generally, seed money is a relatively small amount of money provided to the entrepreneur to form a company and prove that an idea has a reasonable chance of commercial success.

---

41 As will be discussed in more detail shortly, **venture capital firms** represent dedicated pools of capital providing equity or equity-linked financing to privately held companies.

42 An **initial public offering** is the initial issuance of common stock registered for public trading by a formerly private corporation.

43 This comment gives an idea of the stage at which venture capitalists become active; the numbers can be expected to change over time and may be different elsewhere.

44 There is some variation in terminology. For example, after the seed and start-up stages, some practitioners distinguish Series A from Series B in reference to the series of preferred shares being issued in the transaction.

- Start-up financing: At the start-up stage, the company has been formed and an idea has been proven but the company needs money to bring the product or idea to commercialization. This is a pre-revenue stage.
- First-stage financing: If the company has exhausted its seed and start-up financing, it may seek additional funds. Obviously, the company must have made progress from earlier stages to warrant an investment at this stage.

Later-Stage Financing This is the financing of promising existing companies that need funds for expanding sales.

The Exit Because private equity is by definition not publicly traded, the exit (the liquidation or divestment of a private equity investment) is often difficult and is a major item of strategy. The investor can realize the value of the holding in several ways:

- merger with another company;
- acquisition by another company (including a private equity fund specializing in this process); or
- an IPO, whereby the company becomes publicly traded.

Of course, it is also possible that the venture will not succeed and the business will be closed without any recovery of the original investment by the equity holder. Exhibit 10 summarizes the venture capital timeline.

Exhibit 10 Venture Capital Timeline

	Formative-Stage Companies			Expansion-Stage Companies		
	Early Stage			Later Stage		Pre-IPO
	Seed	Start-Up	First Stage	Second Stage	Third Stage	Mezzanine
Stage characteristics	Idea incorporation, hiring of first personnel, prototype development	Movement into operation, initial revenues		Revenue growth		Preparation for IPO
Stage financing (buyers of private equity)	Founders, FF&F,[a] angels, venture capital	Angels, venture capital		Venture capital, strategic partners		
Purpose of financing	Supports market research and establishment of business	**Start-up financing** supports product development and initial marketing **First-stage financing** supports such activities as initial manufacturing and sales		**Second-stage financing** supports the initial expansion of a company already producing and selling a product **Third-stage financing** provides capital for major expansion **Mezzanine** (bridge) **financing** provides capital to prepare for the IPO—often a mix of debt and equity		

[a] FF&F = founder's friends and family.
Note: The sources of financing are listed in typical order of importance.

The Supply of Venture Capital Suppliers of venture capital include the following:

- *Angel investors.* An **angel investor** is an accredited individual investing chiefly in seed- and early-stage companies, sometimes after the resources of the founder's friends and family have been exhausted. Angel investors are often the first outside investors in a company, even before a company is organized or there is

a real product. The investments made by angels are relatively small. However, because they generally occur at the earliest point, such investments are among the riskiest.

- *Venture capitalists.* **Venture capital** (VC) refers broadly to the pools of capital managed by specialists known as **venture capitalists**, who seek to identify companies that have great business opportunities but need financial, managerial, and strategic support. Venture capitalists invest alongside company managers; they often take representation on the board of directors of the company and provide significant expertise in addition to capital. An individual pool is a **venture capital fund** (VC fund). An industry of investment firms sponsors series of such funds and sometimes a variety of similarly structured vehicles that take advantage of different opportunities. These firms may be private partnerships, closely held corporations, or sometimes, publicly traded corporations. In the United Kingdom, **venture capital trusts** (VCTs), which are exchange-traded, closed-end vehicles, represent an example of other opportunities that are available.
- *Large companies.* A variety of major companies invest their own money in promising young companies in the same or a related industry via corporate private equity. This activity is known as **corporate venturing**, and the investors are often referred to as "strategic partners." Corporate venturing funds are not available to the public.

EXAMPLE 7

The IPO of Google

The IPO of Google, Inc., illustrates the timeline for private equity. Google was incorporated in 1998 with an initial investment of US$1 million by family, friends, and angel investors. In early 1999, Google received US$25 million in venture capital funds. The two venture capital firms that provided capital in 1999 each owned about 10.2% of the company. In April 2004, Google filed for an IPO. The IPO date was 19 August 2004, with Morgan Stanley and Credit Suisse First Boston as the lead underwriters in an unusual (for equities) Dutch auction, which affords more access to shares by smaller investors. The offering was for approximately 19.6 million shares of Class A common stock. Of that number, approximately 4.5 million shares were from selling shareholders realizing part of the cash value of their holdings, including company founders Larry Page and Sergey Brin. The offering was at US$85 per share and raised about US$1.2 billion for Google and US$464 million for the selling shareholders. After the offering, about 33.6 million Class A shares and about 237.6 million privately held Class B shares were outstanding. The Class B shares, held by the founders and other executives and investors, had 10 votes per share (versus 1 vote per share for the Class A shareholders). This dual-stock structure was viewed as unusual in technology IPOs, but it had been used by media companies, such as the *New York Times.* It permitted insiders to maintain voting control over Google and, according to Google executives, protected the company from pressures felt by public companies to produce short-term performance. At the same time, the Class B shares were convertible to the registered Class A shares, so the investing group could access public markets to realize the cash values of their holdings in the future. The August 2004 IPO was oversubscribed, and the shares rose about 18% in initial trading. In September 2005, Google made a follow-on offering of about 14.2 million shares at US$295 per share that raised US$4.18 billion. In 2006, Google was added to the S&P 500. In 2014, a new Class C share with no

voting rights was created through a 2:1 stock split of A and B shares with the objective of protecting the voting control of Class B shareholders. In a restructuring in 2015, a holding company, Alphabet Inc., was created that included as subsidiaries Google and companies that had been purchased by Google.

Sources: Reuters; Emily Chasan, "Google's Multi-Class Stock Structure Made Alphabet Move Unique," 12 Aug 12, 2015 at http://blogs.wsj.com/cfo.

Most private equity investors participate through private equity funds. Among these funds, buyout funds constitute a larger segment than VC funds, as measured by either assets under management or the size of capital commitments. The capital commitments to buyout funds in many years have been two to three times the size of those to VC funds.

Buyout funds may be separated into two major groups, mega-cap buyout funds and middle-market buyout funds. **Mega-cap buyout funds** take public companies private. **Middle-market buyout funds** purchase private companies whose revenues and profits are too small to allow them to access capital from the public equity markets. Middle-market buyout funds typically purchase established businesses, such as small privately held companies (including those that may have received venture capital support) and divisions spun off from larger companies. The buyout fund manager seeks to add value by:

- restructuring operations and improving management;
- opportunistically identifying and executing the purchase of companies at a discount to intrinsic value; and
- capturing any gains from the addition of debt or restructuring of existing debt.

To further their ability to add value through restructuring operations and improving management, large buyout organizations maintain a pool of experienced operating and financial executives who can be inserted into the companies if necessary and appropriate. These organizations look to cut costs and increase revenues. As the owner/managers of companies, buyout organizations have well-developed processes for installing incentive compensation structures and management reporting systems. They have experience restructuring both supply chains and distribution channels. Buyout firms often make the argument that they add value by substituting a highly focused private governance model, in which expert owners have complete control, for a public governance model with dispersed ownership, conflicts of interest, and high regulatory compliance costs.

Buyout funds can realize value gains through a sale of the acquired company, an IPO, or a dividend recapitalization. A **dividend recapitalization** involves issuing debt to finance a special dividend to owners (and sometimes refinancing existing debt in the process). Dividend recapitalizations have at times allowed buyout funds to recoup all or most of the cash used to acquire a company within two to four years of the buyout while still retaining ownership and control of the company. However, dividend recapitalization has the potential to weaken the company as a going concern by overleveraging it.

The major investors in private equity funds are public pension funds, corporate defined-benefit pension plans, endowments, foundations, and family offices. In the United States, public pension plans are currently the most important players as

measured by dollars committed; they are followed by the other major investors in the order listed. Endowments and foundations have among the largest allocations in their policy portfolios. Family offices are a growing influence.[45]

4.1.1 *Types of Private Equity Investment*

Both direct and indirect investors in private equity need to understand the basics of direct private equity investment in order to have an informed grasp of its return and risk characteristics.

Direct venture capital investment is typically structured as convertible preferred stock rather than common stock. The terms of the preferred stock require that the corporation pay cash equal to some multiple (e.g., 2×) of preferred shareholders' original investment before any cash can be paid on the common stock, which is the equity investment of the founders. Preferred stock is senior to common stock also in its claim on liquidation value. This financing structure mitigates the risk that the company will take on the venture capital investment and distributes it to the owners/founders. It also provides an incentive for the company to meet the return goals of the outside investors.

Investors in subsequent rounds usually have rights to cash flows that are senior to the rights of preferred stock issued in previous financing rounds. All else being equal, therefore, shares issued in later rounds are more valuable than shares issued in earlier rounds, which in turn are more valuable than the founders' common shares. Nevertheless, these differences may be slight and are frequently ignored in valuation. Existing shareholders also generally have the right to purchase shares in subsequent rounds to maintain their percentage ownership of the business. For convertible preferred shares issued in any round, an event such as a buyout or an acquisition of the common equity at a favorable price will trigger conversion of the preferred into the common shares of the company.

Indirect investment is primarily through private equity funds, including VC funds and buyout funds. Private equity funds are usually structured as limited partnerships or limited liability companies (LLCs) with an expected life of 7–10 years and an option to extend the life for another 1–5 years.[46] The fund manager's objective is to realize the value of all portfolio investments by the fund's liquidation date. There is typically an offering period during which capital commitments are solicited.

The limited partnership and LLC forms are attractive because income and capital gains flow through to the limited partners or (in the case of an LLC) the shareholders for tax purposes, thus avoiding the possible double taxation that can occur in the corporate form. The limited partners or shareholders do not bear any liability beyond the amount of their investments. The limited partners (or shareholders) commit to a specific investment amount that the general partner (in an LLC, the managing director) "takes down" over time in a series of capital calls to make specific investments or to pay expenses; private equity funds usually do not maintain a pool of uninvested capital. The general partner (or managing director) is the venture capitalist, the party selecting and recommending investments. The general partner may be an individual or another entity (such as a corporation or partnership) and also often commits its own capital. In this way, the interests of the outside investors and the fund manager/general partner/managing director are closely aligned.

The LLC form, available in the United States and in some other countries under different names and with different requirements, is a hybrid of the corporate and partnership forms. It provides investors with more influence over the fund's operations than does a limited partnership interest—in particular, more control over the raising

45 See Boyer (2005).
46 Anson (2002a, p. 273).

of additional committed capital. The LLC is often the preferred form when raising funds from a relatively small group of substantial and knowledgeable investors who may want to be proactive.

Private equity funds of funds are also available. Such funds invest in other private equity funds. Management fees of fund-of-funds vehicles range from 0.5% to 2% of the net assets managed; these fees are on top of fees charged by the underlying funds.

In contrast to the structure of private equity funds, in venture capital, the company receiving support is organized in a corporate form because one desirable exit is a successful initial offering of shares to the public. Examples of the corporate form of publicly traded companies include the UK public limited company (PLC), the corporation in the United States, the *kabushiki kaisha* (KK) in Japan, the *sociedad anónima* in Spain, the *société anonyme* in France, and the *Aktiengesellschaft* (AG) in Germany. The European Union has developed a new structure, the European company or *societas Europaea* (SE), that will permit companies to operate throughout the EU under one set of rules and with a uniform management system.

The compensation to the fund manager of a private equity fund consists of a management fee plus an incentive fee. The management fee is usually a percentage of limited partner *commitments* to the fund. (If the investor has made a capital commitment of US$50 million but has actually invested only US$10 million, the investor generally pays a management fee on the US$50 million committed.) Management fees are often in the 1.5%–2.5% range and often scale down in the later years of a partnership to reflect a reduced workload or the return of capital from exiting investments.

The fund manager's incentive fee, the **carried interest**, is the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital (which may be specified as the capital committed or the capital invested). Carried interest is usually expressed as a percentage of the total profits of the fund. A common value is 20%. In such a structure, the fund manager will receive 20% of the profits and distribute the remaining 80% of the profits to investors. In some funds, the carried interest is computed on only those profits that represent a return in excess of a hurdle rate (the hurdle rate is also known as the **preferred return**). A hurdle rate of 6% means that only the private equity fund's profits in excess of an annualized return of 6% are subject to the 20% carried interest. Because early investments by the fund may achieve high rates of return but later investments may perform poorly, private equity funds sometimes have a **clawback provision** that specifies that money paid to the fund manager be returned to investors if at the end of a fund's life investors have not received back their capital contributions and contractual share of profits.

In distributing cash flows to investors and the fund manager, a private equity fund first distributes to investors their invested capital and preferred return (if any is specified). Sometimes, the fund manager is allowed to take a small percentage of early distributions. Typically, following the period in which all or most distributions go to investors, there is a catch-up period in which the fund manager receives all or the major share of profits. After the fund manager has caught up to its specified share of profits according to the contract, subsequent profits are distributed according to the carried interest percentage—for example, 80% to investors and 20% to the fund manager. Some of the manager's profits may be put in an escrow account to satisfy any clawback liability.

The investor in a private equity fund expects to receive the benefits of the general manager's ability to select worthy investments and maintain active involvement in the investments. The fund manager's team is relied upon to shore up weaknesses in the companies' management and execute a successful exit strategy that realizes the maximum potential value of the investments.

4.1.2 *Size of the Private Equity Market*

A reliable estimate of direct private equity investment worldwide is hard to obtain, but as of mid-2015, approximately US$2.4 trillion was invested in private equity VC, buyout funds, and similar strategies worldwide.[47] In the United States, a quarterly study of venture capital activity is performed through a joint effort of PricewaterhouseCoopers, Thomson Venture Economics, and the National Venture Capital Association (NVCA). Exhibit 11 presents a summary of the annual results through 2015.

Exhibit 11 US Venture Capital Activity: MoneyTree™ Survey

Year	Investment Amount (US$)	Number of Deals
1995	8,016,523,400	1,897
1996	11,285,423,000	2,635
1997	15,071,554,600	3,232
1998	21,561,531,400	3,744
1999	54,908,597,400	5,605
2000	104,997,847,800	8,041
2001	40,938,601,200	4,596
2002	22,202,552,700	3,217
2003	19,681,635,600	3,037
2004	22,852,191,000	3,236
2005	23,245,367,700	3,302
2006	27,865,382,100	3,896
2007	32,136,712,900	4,233
2008	30,431,761,700	4,206
2009	20,334,511,300	3,181
2010	23,517,919,600	3,682
2011	29,905,393,300	4,062
2012	27,703,005,800	4,000
2013	30,282,784,000	4,300
2014	50,992,864,200	4,471
2015	59,698,500,200	4,497

Source: www.pwcmoneytree.com.

PricewaterhouseCoopers, Thomson Venture Economics, and the European Private Equity and Venture Capital Association collaborate on similar surveys of private equity activity across continental Europe and the United Kingdom. Exhibit 12 summarizes the investment activity of VC and buyout funds. As in the United States, activity dropped off after 2000. Unlike in the United States, activity subsequently peaked in 2007.

47 See Preqin, "Preqin Global Private Equity and Venture Capital Report" (2016): https://www.preqin.com/docs/reports/2016-Preqin-Global-Private-Equity-and-Venture-Capital-Report-Sample_Pages.pdf.

Exhibit 12 Pan-European Private Equity Activity (€ billions)

Year	Venture Capital Fund Investment	Buyout Fund Investment	Total
2000	19.6	15.3	34.9
2001	13.3	11.0	24.3
2002	10.7	16.9	27.6
2003	10.7	18.4	29.1
2004	11.2	25.7	36.9
2005	15.0	32.1	47.1
2006	20.9	50.3	71.2
2007	15.7	57.2	72.9
2008	16.2	38.4	54.6
2009	12.3	12.7	25.0
2010	13.6	29.7	43.3
2011	12.5	34.5	47.0
2012	9.6	28.1	37.7
2013	10.1	28.0	38.1
2014	10.6	31.2	41.8
2015	11.1	36.3	47.4

Note: Numbers for venture capital are rounded to make venture capital activity and buyout activity sum to the reported totals.
Source: www.evca.com.

4.2 Benchmarks and Historical Performance

As with many other alternative investment types, events that indicate the market value of a private equity investment generally occur infrequently. Typical market price–revealing events include the raising of new financing, the acquisition of the company by another company, an IPO, or failure of the business. Infrequent market pricing poses a major challenge to index construction. How can returns be calculated without market transactions?

When measuring the performance of a private equity investment, investors typically calculate an internal rate of return (IRR) based on cash flows since inception of the investment and the ending valuation of the investment (the net asset value or residual value). Similarly, major venture capital benchmarks, such as Cambridge Associates,[7] provide IRR estimates for private equity funds that are based on fund cash flows and valuations.

4.2.1 *Benchmarks*

Major indexes serving as benchmarks for US and European private equity include those provided by Cambridge Associates, Preqin, and LPX. These indexes often consist of an overall private equity index representing two major segments, VC funds and buyout funds, plus a number of sub-indexes. Custom benchmarks are also frequently used by private equity investors.

4.2.2 *Historical Performance*

Exhibit 13 gives US private equity's end-to-end returns as of 2014, net of fees, expenses, and carried interest, as compiled by the National Venture Capital Association and Cambridge Associates. In Exhibit 13, "multi-stage VC funds" are funds that make both early-stage and late-stage investments.

Exhibit 13 US Private Equity Returns as of 30 September 2014 (%)

	Venture Capital Funds					
Period	**Early-Stage**	**Late-Stage**	**Multi-Stage**	**Growth Equity**	**NASDAQ**	**S&P 500**
3 Years	15.7	13.7	15.0	17.9	23.0	23.0
5 Years	15.5	17.5	13.3	17.2	16.2	15.7
10 Years	9.3	13.2	10.0	14.0	9.0	8.1
20 Years	53.9	11.5	13.4	n/a	9.3	9.6

Source: NVCA and Thomson Venture Economics, "Venture Capital Outperformed Major Stock Indices during Third Quarter of 2014," press release (30 January 2015. http://nvca.org/pressreleases/venture-capital-outperformed-major-stock-indices-third-quarter-2014/

Private equity returns have exhibited a low correlation with the returns to publicly traded securities, making private equity an attractive addition to a portfolio. However, because of a lack of observable market prices for private equity, short-term return and correlation data may be subject to the smoothing effects of stale prices. Emery (2003) showed that the correlation between venture capital and NASDAQ returns increased substantially when annual or biannual (i.e., calculated every two years) data were used rather than quarterly data.[48] Emery reported that venture capital returns demonstrated a 0.69 correlation with NASDAQ returns and a 0.40 correlation with S&P 500 returns based on quarterly data. When biannual data were used, the correlation was 0.93 with the NASDAQ and 0.64 with the S&P 500.

4.2.3 *Interpretation Issues*

The private equity investor thinks of returns in terms of IRR calculations based, generally, on estimates of the value of the investor's interest. However, the fund manager's appraisals (usually supplied on a quarterly basis) represent estimates, not market prices. Appraised values are often slow to adjust to new circumstances (because they use stale data) and focus only on company-specific events, so the returns may be inaccurate. Furthermore, there is no generally accepted standard for appraisals.

In evaluating records of past returns of private equity funds, investors often make comparisons among funds closed in the same year (the funds' **vintage year**). This practice helps ensure that funds are compared with other funds at a similar stage in their life cycle. The effects of the vintage year on returns are known as "**vintage year effects**" and include, in addition to the effects of the life-cycle stage, the influence that economic conditions and market opportunities associated with a given vintage year may have on various funds' probabilities of success.

4.3 Private Equity: Investment Characteristics and Roles

Like public equity but to a greater degree, private equity plays a growth role in investment portfolios. On the one hand, at the company level, the highest earnings growth rates are usually achievable early on, when the markets for the company's products

48 See Emery (2003, pp. 43–50).

may be largely untapped and competition may be slight. When a promising private company comes to market, its prospective growth may be capitalized at an above-market-average multiple. On the other hand, investment in established companies via buyout funds generally involves less risk and earlier returns. The private equity investor hopes to gauge and control the risk through appropriate due diligence processes. The following section provides more information about investment characteristics.

4.3.1 *Investment Characteristics*

The general investment characteristics of private equity investments include the following:

- *Illiquidity*. Private equity investments are generally highly illiquid. Convertible preferred stock investments do not trade in a secondary market. Private equity fund investors have more restricted opportunities to withdraw investments from the fund than do hedge fund investors. This situation is natural because the underlying investments are not liquid.
- *Long-term commitments.* Private equity investment generally requires long-term commitments. For direct VC investments, the time horizon also can be quite uncertain.
- *Higher risk than seasoned public equity investment.* The returns to private equity investments, on average, show greater dispersion than seasoned public equity investments, although they may be roughly comparable to those of publicly traded microcap shares.[49] The risk of complete loss of the investment is also higher. The failure rate for new and young businesses is high.
- *High expected IRRs are required.* Private equity investors target high rates of return as compensation for the risk and illiquidity of such investments.

For venture capital investments, the following also holds:

- *Limited information*. Because new ventures operate in product or service markets that may break new ground in some way, projections concerning cash flows are often based on limited information or make many assumptions. Although limited information is a risk factor, it is also related to the potential for unusual profits from successful ventures.

Venture capitalists often target rates of return of 25%–30% or more in individual investments. Dramatic venture capital success stories include companies such as Apple, Intel, Microsoft, and Google. However, many investments do not work out. For bearing the additional risks of private equity compared with public equity, the private equity fund investor aims to earn a substantial premium over expected public equity returns.

The illiquidity of private equity, of course, affects the value of an investor's interest. The value that is determined by using models such as the venture capital method or the discounted cash flow method may be used as the estimate of the value for a marketable controlling interest.[50] If the owner has a minority interest and the equity interest does not have a ready market, then discounts are often applied to reflect the diminished value for a minority-interest holder with a non-marketable interest. The discount for a minority interest (also called the discount for lack of control) reflects the investor's lack of control over the business and distributions. The discount for lack of marketability (marketability discount, for short) takes account of the lack of liquidity in the investment and depends on a number of factors, such as the size of the interest and the level of dividends paid. If the interest to be valued is a controlling interest,

49 See Cochrane (2004).

50 The venture capital method of valuation involves discounting at a high interest rate a projected future value of the company, where the projected future value assumes that the company is successful.

only the marketability discount needs to be considered. For a majority interest, the discount for lack of marketability might reflect both the cost of going public and a discount for owning a large block of shares. Example 8 illustrates the valuation of a non-marketable minority interest. A cautionary note here is that the valuation of a non-marketable minority interest can figure in the value of an estate and therefore affect the estate taxes due for a deceased private wealth client. The calculation shown is not intended as a guide to estate planning in any given jurisdiction.

EXAMPLE 8

A Non-marketable Minority Interest

Brent Smith has determined that his company will make a small investment in a private company, Clark Computing. The investment will be a non-marketable minority interest. Smith's investment banker estimates that the value of Clark equity, if it were publicly traded, would be £500 million. Smith's company's interest in Clark will be 10% of Clark's equity. Smith's investment banker determines that a minority-interest discount of 20% and a marketability discount of 25% are appropriate. What is the value of the non-marketable minority interest?

Solution:

The money amounts shown are in millions of pounds sterling.

Marketable controlling interest value: (10% × 500) = 50.

Minority-interest discount: (20% × 50) = –10.

Marketable minority interest: (50 – 10) = 40.

Marketability discount: (25% × 40) = –10.

Non-marketable minority interest: (40 – 10) = 30.

Smith's investment banker values the investment at £30 million.

VC funds and buyout funds have some expected differences in their return characteristics.[51]

- *Buyout funds are usually highly leveraged.* The capital raised by the fund may be 25%–40% of the capital used to purchase the equity of the target company, with the balance coming from debt collateralized by the target company's assets. The operating cash flows of the target company, typically an established company, are used to service the debt payments. In contrast, VC funds use no debt in obtaining their equity interests.
- *The cash flows to buyout fund investors come earlier and are often steadier than those to VC fund investors.* Because buyout funds purchase established companies, buyout fund investors usually realize returns earlier than VC fund investors, whose investments may still be in the cash-burning stage. The expected pattern of interim returns over the life of a successful venture capital fund has sometimes been described as a J-curve, in which early returns (e.g., over the

51 Emery (2003).

first five or six years) are negative as the portfolio of companies burns cash but later returns accelerate as companies are exited. In general, the earlier the stage at which a fund invests in companies, the greater the risk and the potential.

- *The returns to VC fund investors are subject to greater measurement error.* The interim return calculations of private equity funds depend not only on cash flow transactions with the fund but also on the valuations of the portfolio companies. These valuations are subject to much less uncertainty for buyout funds investing in established companies.

Thus, venture capital investing may be expected to involve more frequent losses than buyouts in return for higher upside potential when investments are successful.

EXAMPLE 9

An Investment in Private Equity

The Lee Foundation was established 10 years ago to provide grants to minority- and woman-owned enterprises. A well-diversified asset allocation has resulted in successful growth in the value of the foundation's investments. The trustees have thus decided to allocate US$5 million to private equity. Their objectives are to earn significant returns on a high-growth investment and to take an active and dominant role in controlling the company in which they decide to invest. They understand that such an investment requires a high level of risk tolerance and a multi-year time horizon.

1. Evaluate the suitability of the following three potential investments, with specific reference to short- and long-term returns, sources of risk, and degree of investor control:
   - **A** Seed investment in a new medical device recently developed by three doctors
   - **B** A venture capital trust that invests exclusively in 15–20 start-up companies at any given time
   - **C** Second-stage (follow-on) investment in a company that successfully patented a new medical device two years ago and seeks to expand its manufacturing facilities
2. Recommend and justify the investment that is most likely to satisfy the goals of the foundation's proposed US$5 million investment.

Solution to 1:

A The seed investment is an investment in an early-stage company with no proven "track record" or history of revenues. Therefore, there will likely be no immediate or short-term returns because the next stage is marketing and manufacturing this new device. If the sales of this unique device are successful, however, future long-term returns could be significant. Sources of risk include the failure of the device, future competition from similar companies, lack of follow-on funds for marketing and manufacturing, and the possibility that the device will not receive a patent. Consequently, the level of risk is high. Because the foundation is likely to be the first outside investor, the likelihood of taking an active role in the company, possibly as outside board members, is high.

B The venture capital trust is diversified over many start-up companies and is thus probably providing some current return, with the potential for additional return in the future. Although there is considerable risk

associated with start-up companies, the trust is well diversified over many companies, which should mitigate the impact of the failure of one or two of the start-ups. There is no outside investor control available because the trust makes all the decisions and is traded on a public exchange.

C The second-stage investment is most likely already showing positive cash flow and net income because it is seeking financing to expand an existing manufacturing facility. Therefore, short-term returns may be attractive and projections probably indicate potential for additional long-term returns, although the level of these returns may be muted in comparison with those of a seed or start-up investment because some of the early money has already been made. Investors at the second stage may be able to negotiate some active control, although the founders and seed/start-up investors are probably directly involved in company decisions also.

Solution to 2:

The seed company is most consistent with the foundation's objectives of earning a significant return in a high-growth opportunity and being able to take an active role in the company. Additionally, the foundation is willing to accept a high degree of risk and a longer-term outlook for future returns.

4.3.2 *Roles in the Portfolio*

The moderately high average correlation of private equity returns with publicly traded share returns that has been documented has a plausible economic explanation: All types of businesses have some exposure to economic and industry conditions, so correlations between public and private equity returns may be expected to be positive. Furthermore, venture capital uses public equity markets as one main exit route, so returns to VC fund investors can be expected to be higher when public equity market values are advancing.

Private equity probably can play a moderate role as a risk diversifier. However, many investors look to private equity investment for long-term return enhancement.

Given the capacity issues already mentioned and private equity's generally high illiquidity, target allocations of around 5% are commonplace. For example, in 2015, US public sector pension plans averaged allocations to private equity of 7%.[52]

Among the issues that must be addressed in formulating a strategy for private equity investment are the following:[53]

- *Ability to achieve sufficient diversification.* Suppose an investor's allocation to private equity is 5%. Given that institutional partnership commitments are typically not smaller than US$5 million, a reasonably diversified portfolio (5–10 investments) means commitments totaling 5 × US$5 million = US$25 million to 10 × US$5 million = US$50 million. These amounts imply that the assets of the institutions investing in private equity typically need to exceed US$500 million (= US$25 million ÷ 5%). For smaller investors, a private equity fund of funds is a possible diversification choice, although it involves a second layer of fees.
- *Liquidity of the position.* Direct private equity investments are inherently illiquid. Consequently, private equity funds are also illiquid. Investors in funds must be prepared to have the capital tied up for 7–10 years. Although a limited

52 See Angela Sormani, "An Analysis of US-Based Public Pension Fund Allocations to Private Equity," Preqin Blog (11 June 2015): https://www.preqin.com/blog/0/11528/us-public-pension-funds.
53 Andrew Abouchar, CFA, contributed to this section.

secondary market for private equity commitments exists, the investments trade at highly discounted prices, which makes selling the positions an unattractive option.

- *Provision for capital commitment.* An investor in a private equity fund makes a commitment of capital. The cash is advanced over a period of time known as the **commitment period**, which is typically five years. Therefore, the investor needs to make provisions to have cash available for future capital calls.
- *Appropriate diversification strategy.* An investor contemplating an exposure to private equity should be clear on both the stand-alone risk factors of an investment and the effect of that investment on the overall risk of the portfolio. Each private equity fund will have a different investment focus, which, when combined with other funds in the portfolio, modifies the overall risk. Diversification may be by
  - industry sector (information technology, biotechnology, alternative energy, etc.);
  - stage of company development (early stage, expansion, buyout, etc.); and
  - geographical location (locally focused, internationally focused, etc.).

The element shared by all private equity investment is the identification of promising private businesses with committed and talented owner/managers.

For the many private equity investors pursuing indirect investment, the search is for fund managers who are expert in evaluating and managing private equity investments. Indirect investment can include not only investment in newly formed private equity funds but also secondary-market private equity fund purchases from limited partners seeking liquidity.

4.3.3 *Other Issues*

Among the major requirements for private equity investing is careful due diligence. The framework discussed in Example 2 applies, of course; in general, due diligence items for private equity can usually be placed into one of the following three bins:

1. Evaluation of prospects for market success
2. Operational review, focusing on internal processes, such as sales management, employment contracts, internal financial controls, product engineering and development, and intellectual property management
3. Financial/legal review, including the examination of internal financial statements, audited financial statements, auditor's management letters, prior-year budgets, documentation of past board of directors meetings, board minutes, and corporate minute books, as well as an assessment of all legal proceedings, intellectual property positions, contracts, and contingent liabilities

Some practical details and comments are as follows:

1. Evaluation of prospects for market success
   - *Markets, competition, and sales prospects.* The private equity investor needs to form a judgment about the prospects for success of the company in the targeted product/service market. This review includes an evaluation of markets, competition, and sales prospects. The information in the business plan is a starting point in making such an appraisal.
   - *Management experience and capabilities.* Quality of management is often considered the single biggest factor in the success of a venture. Due diligence includes a background check on the managers and other key personnel, which should include not only references provided by the company but also independently gathered information from the investor's own sources.

The investor should use all available information in assessing the management team's acumen. Moreover, the assessment of management does not stop when the initial investment is made; it is ongoing.

- *Management's commitment*. Much of the success of a private equity company depends on its managers. Therefore, a potential investor will want to gauge how committed the managers are to the company. There are several factors to use in assessing management's commitment:
  - Percentage ownership. How much of the company is owned by the management team? Ownership of a large portion of the company is an indication of high commitment to the company.
  - Compensation incentives. If management is key to the company's success, an investor will want to ensure that the current managers' interests align with those of the shareholders through the company's compensation arrangements.
- *Cash invested*. How much cash, or "skin," has management invested in the company? Investors generally regard the fact that the managers have invested a large portion of their net worth in the company as a particularly good indicator of a highly committed management team. Conversely, if the managers have invested little of their own cash in the company, the presumption is that they are less than wholly committed to the company's success.
- *Opinion of customers.* When the company is already marketing a product or service, the investor should attempt to learn customers' opinions of the company and its product or service.
- *Identity of current investors*. Current investors can give an indication of the company's future success. For example, if a company's product is a medical device dealing with the heart, it is meaningful if several leading cardiologists have already invested in the company.

2 Operational review

- *Expert validation of technology.* If the company intends to market a new technology, the investor needs to obtain expert confirmation that the technology is valid and represents an advance.
- *Employment contracts*. Do key employees have contracts to ensure that they stay with the company? Do non-key employees have contracts with severance clauses that could burden the company's finances?
- *Intellectual property*. In many companies, the ability to succeed hinges on proprietary information (formulas, processes, designs). In such cases, an investor should determine whether the company holds (or at least has applied for) relevant patents. The intellectual property covered by these patents could be, for example, a design for a machine, a new application of an existing technology, a drug, or a medical device. Potential investors should have reasonable assurance that the company has the ability to conduct business without infringing another company's patents. Often in this area, an investor will want to consult with patent experts.

3 Financial/legal review

- *Potential for dilution of interest.* Potential investors also want to investigate the stock options that have been issued to managers and other potential means by which investor interests may be diluted and to ensure contractually that their investment will not be significantly diluted.
- *Examination of financial statements.* Early-stage companies, in particular, may not have audited financial statements to show. Thus, investors may want to ask for tax returns or conduct their own audits of financial records.

Due diligence for private equity funds includes the managers' experience, capabilities, and commitment; the compensation arrangements; and compliance of the fund with the Global Investment Performance Standards® in reporting performance. Fund selection is largely an exercise in evaluating the capabilities of the general manager's management team. Factors that should be considered include the following:

- historical returns generated on prior funds
- consistency of returns: Has the team had one successful fund or many?
- roles and capabilities of specific individuals at the fund: The investor will want to evaluate whether the fund manager has the needed human resources to effectively select and guide private equity investments.
- stability of the team: Did the current senior personnel generate the track record of the fund manager, or has there been significant personnel turnover?

As the discussion of due diligence makes clear, many characteristics—including people, structure, and costs—can differentiate among private equity investments focused on a similar market opportunity. In contrast, different examples of a commodity, such as natural gas, have highly similar characteristics. Commodity investments are the subject of the next section.

COMMODITY INVESTMENTS

5

A commodity is a tangible asset that is typically relatively homogeneous in nature. Because of their relative homogeneity, commodities lend themselves to contracts to buy and sell that have standardized terms (as in futures market contracts).[54] Commodity investments are direct or indirect investments in commodities.

The question of whether commodities represent a separate asset class has been extensively debated in both the academic and practitioner literature.[55] Practically, the question is not whether commodity investment is an asset class but whether commodity investment is appropriate for a given investor. If it is, what is the best approach for implementing the investment and what is the appropriate allocation? In some statements of strategic asset allocation, commodities may be included under the heading of "real assets" or "real assets: resources," in which case, they may not be distinguished from such real investments as timberland.

Historically, commodity-related businesses have been the major players in the cash and futures commodity markets. Individual investors in many countries have long been active in the cash markets for precious metals. In some markets, **commodity trading advisers** (CTAs, registered advisers to managed futures funds) are another active group. Historically and currently, institutional investors have been more

54 The relative homogeneity of commodities distinguishes them from tangible assets such as fine art and other collectibles.

55 See Huberman (1995); Strongin and Petsch (1995); Greer (1994); Froot (1995); Schneeweis and Spurgin (1997b); Geman (2005); Erb and Harvey (2006).

active in financial futures markets than in commodity futures markets. Investment in publicly traded equities of commodity-linked businesses has probably been the most common way for both individual and institutional investors to obtain exposure, albeit indirectly, to commodities. However, only investment in commodities via cash and the derivatives markets constitutes alternative investing. Those markets are the focus of this treatment.

5.1 The Commodity Market

Investors can gain direct exposure to commodities in spot (cash) markets or in markets for deferred delivery, such as futures and forwards markets. Spot commodity trading can be traced back thousands of years, and commodity futures trading is at least as old as the rice futures trading in Japan, which began several hundred years ago.

Commodity futures markets developed as a response to an economic need on the part of suppliers and users of various agricultural and non-agricultural goods to transfer risk. Moreover, commodity futures markets tend to improve the functioning of the spot and forward markets. For instance, commodity futures may permit greater commodity production and trade because the use of futures hedges reduces the risk of holding spot inventories. By facilitating risk management and trading, commodity futures have become an essential part of the production and marketing of agricultural and non-agricultural goods. Other types of commodity derivatives include options on commodity futures and swap markets.

Commodity futures are traded on agricultural products, metals, and energy resources. A commodity futures transaction may involve physical delivery (i.e., actual delivery of the underlying commodity) or may be "cash settled," which means that no delivery takes place but a settlement in cash occurs at maturity equal to the gain that a delivery transaction would have entailed. Although physical delivery is possible for some futures contracts, in practice, most positions in futures contracts are offset prior to maturity.

5.1.1 *Types of Commodity Investments*

There are two broad approaches to investing in commodities: direct and indirect. **Direct commodity investment** entails the cash market purchase of physical commodities—agricultural products, metals, and crude oil—or exposure to changes in spot market values via derivatives, such as futures. Cash market purchases involve actual possession and storage of the physical commodities and incur carrying and storage costs. Thus, investors have generally preferred to use derivatives or indirect commodity investment.

Indirect commodity investment involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production. As mentioned previously, indirect commodity investment is historically the principal means by which most investors have obtained exposure to commodities. There is increasing evidence, however, that indirect commodity investment—in particular, equity instruments in commodity-linked companies—does not provide effective exposure to commodity price changes.[56] To the degree that companies hedge a major portion of their commodity risk, even commodity-linked companies may not be exposed to the risk of commodity price movement.[57] This fact has spurred the creation of investable commodity indexes and a current preference for gaining exposure to commodities

56 See Schneeweis and Spurgin (1997a).
57 See Chung (2000).

through derivatives markets. In some markets, such as the United States, even small investors can access the commodity markets via mutual funds or exchange-traded funds.

5.1.2 *Size of the Commodity Market*

With billions of dollars' worth of commodities recorded by so many countries in international trade over a given year, spot commodity markets are enormous in scope and value. Globally, the notional value of open interest in commodity futures across the top 10 exchanges was estimated at US$1.2 trillion as of the fourth quarter of 2014, with energy futures (natural gas, crude oil, heating oil, and gasoline) the dominant segment.[58]

5.2 Benchmarks and Historical Performance

Although the physical markets for commodities are not centralized, information about commodity prices is transmitted around the world through commodity-based financial products. Thus, the performance of commodity investments can be evaluated by using commodity indexes that form the basis for many products. The development of active markets for indexed commodity investments has been a major force in broadening investor interest in commodity investment.

5.2.1 *Benchmarks*

A variety of indexes based on futures prices can be used as benchmarks for the performance of futures-based commodity investments. These include the Reuters/Jefferies Commodity Research Bureau (RJ/CRB) Index, the S&P Goldman Sachs Commodity Index (GSCI), and the Bloomberg Commodity Index (BCOM).

Commodity indexes attempt to replicate the returns available to holding long positions in commodities. The S&P GSCI, the BCOM, and the RJ/CRB Index provide returns comparable to those of passive long positions in listed futures contracts. Because the cost-of-carry model ensures that the return on a fully margined position in a futures contract mimics the return on an underlying spot deliverable, futures contract returns are often used as a surrogate for cash market performance. (The cost-of-carry model relates the futures price to the current spot price and the cost of holding the spot commodity.) All of these indexes are considered investable.

The major indexes contain some common groups of underlying assets. For example, the RJ/CRB Index, the BCOM, and the S&P GSCI all include energy (oil and gas), metals (industrial and precious), grains (corn, soybeans, and wheat), and soft commodities (cocoa, coffee, cotton, and sugar). However, beyond these basic groupings, they and other commodity indexes vary greatly in their composition and weighting schemes.

A market-cap weighting scheme, so common for equity and bond market indexes, cannot be carried over to indexes of commodity futures. Because every long futures position has a corresponding short futures position, the market capitalization of a futures contract is always zero. The RJ/CRB Index, for example, groups commodities into four sectors and gives unequal fixed weights to these sectors to reflect the perceived relative importance of each. The S&P GSCI uses world-production weighting: The weights assigned to individual commodities in the S&P GSCI are based on a five-year moving average of world production. Weights are published each November and are made effective the following January.

58 See Grégoire Naacke, Eleanor Penistone, and Tatiana Chekanova, "WFE/IOMA 2014 Derivatives Market Survey," WFE/IOMA (August 2015): https://www.world-exchanges.org/home/index.php/files/19/Derivatives/33/2014%20IOMA%20Derivatives%20Market%20Survey.pdf.

Commodity index providers use either arithmetic or geometric averaging to calculate the index return from the component returns. For example, the RJ/CRB Index is based on arithmetic averaging of the monthly component returns; the S&P GSCI uses an arithmetic measure of the performance of actively traded, dollar-denominated nearby commodity futures contracts. All contracts are rolled on the fifth business day of the month prior to the expiration month of the contract.

Sub-indexes of the S&P GSCI are calculated for agricultural, energy, industrial, livestock, and precious metals contracts. Three versions of the indexes are available: a total-return version, which assumes that capital sufficient to purchase the basket of commodities is invested at the risk-free rate; an "excess return" version that includes price change and roll impact; and a spot version, which tracks movements in the futures prices only.

In addition to varying the selection of contract maturities, third-generation commodity indexes also vary the commodities selected at each roll based on systematic or discretionary signals. These techniques may utilize technical or fundamental signals and may take both long and short positions.

5.2.2 *Historical Performance*

Exhibit 14 presents the annualized return, standard deviation of returns, mean return-to-volatility ratio, maximum drawdown, and correlation of the S&P GSCI with a sample of stock, bond, hedge fund, and other alternative indexes for the period January 1996 through December 2015.

Exhibit 14 Commodity Index and Asset Class Performance, 1996–2015

Stock, Bond, and Commodity Index Performance	S&P GSCI TR	S&P	Bloomberg Barclays US Government	Bloomberg Barclays US Aggregate	Bloomberg Barclays US Corporate High Yield
Annualized total return	–1.01%	8.51%	5.02%	5.37%	6.75%
Annualized standard deviation	22.79%	15.31%	4.08%	3.47%	9.09%
Mean return-to-volatility ratio	–0.04	0.56	1.23	1.55	0.74
Maximum drawdown	–79.44%	–50.95%	–4.64%	–3.83%	–33.31%
Correlation with commodity index		0.25	–0.10	–0.01	0.28

Alternative Investment and Commodity Index Performance	S&P GSCI TR	CISDM EW Hedge Fund	CISDM CTA EW	FTSE NAREIT	Private Equity
Annualized total return	–1.01%	9.15%	7.22%	10.32%	8.23%
Annualized standard deviation	22.79%	7.36%	8.54%	19.47%	27.17%
Mean return-to-volatility ratio	–0.04	1.24	0.85	0.53	0.30
Maximum drawdown	–79.44%	–21.71%	–11.93%	–67.89%	–80.44%
Correlation with commodity index		0.42	0.14	0.16	0.33

Source: Schneeweis, Kazemi, and Szado (2016b).

The measured performance of commodity indexes is sensitive to the time period of study as well as the choice of index. Differences in performance between commodity indexes can be explained, at least in part, by differences in the components of the

indexes and different approaches to determining the weights of individual commodity futures contracts in each index. For example, the performance of energy has played a dominant role in results for the S&P GSCI because that index's portfolio weights are based on the value of worldwide production for each included commodity. Based on that criterion, the weight of energy-related futures has exceeded two-thirds.[59] The BCOM's weights primarily reflect futures contract liquidity data, which are supplemented by production data, and the influence of energy on the BCOM's results, although important, is less than on the S&P GSCI.[60] Each index represents a somewhat distinct view of the global commodity marketplace.

On a stand-alone basis, as judged by the mean return-to-volatility ratio and raw returns, commodities have underperformed US bonds and equities as well as hedge funds, private equity, and managed futures. In terms of the maximum drawdown, the S&P GSCI registered –79.44%, which is surpassed only by private equity at –80.44%.

The correlations of the commodity indexes with the traditional asset classes are very low, indicating potential as a risk diversifier.

Exhibit 15, which presents the performance statistics for seven S&P GSCI sector sub-indexes, shows considerable variation in stand-alone risk and return among them (particularly between the S&P GSCI Energy Index and the other sub-indexes). Energy plays a major role in the high volatility of the S&P GSCI shown in Exhibit 15.

Exhibit 15 Performance of S&P GSCI Sub-indexes, 1996–2015

Performance (1996–2015)	Annualized Return	Std Dev	Mean Return-to-Volatility Ratio	Max Drawdown	Skew	Kurtosis
S&P GSCI Petroleum TR Index	2.6%	32.3%	0.08	–86.2%	–0.01	0.89
S&P GSCI Energy TR Index	–0.5%	31.9%	–0.02	–87.4%	0.06	0.83
S&P GSCI Agriculture TR Index	–4.9%	21.0%	–0.23	–69.2%	0.28	0.92
S&P GSCI Livestock TR Index	–2.9%	14.0%	–0.21	–56.0%	–0.42	0.22
S&P GSCI Grains TR Index	–6.2%	24.9%	–0.25	–77.1%	0.27	0.54
S&P GSCI Industrial Metals TR	1.8%	20.7%	0.09	–61.7%	–0.14	2.00
S&P GSCI Precious Metals TR	5.4%	17.6%	0.30	–47.6%	0.02	0.85
S&P 500	8.5%	15.3%	0.56	–50.9%	–0.64	1.03
Bloomberg Barclays US Government Bond Index	5.0%	4.1%	1.23	–4.6%	–0.10	1.21

(continued)

59 See Erb and Harvey (2006, Table 1). As of 2016, energy-related futures continue to have such weights.
60 Erb and Harvey (2006, Table 3) showed a weight for energy in the BCOM (formerly, the DJ-AIGCI) of less than 40% as of May 2004.

Exhibit 15 (Continued)

Performance (1996–2015)	Annualized Return	Std Dev	Mean Return-to-Volatility Ratio	Max Drawdown	Skew	Kurtosis
Bloomberg Barclays US Aggregate Bond Index	5.4%	3.5%	1.55	–3.8%	–0.27	0.98
Bloomberg Barclays US Corporate High Yield Bond Index	6.7%	9.1%	0.74	–33.3%	–1.04	8.85

Source: Schneeweis, Kazemi, and Szado (2016b).

Another implication of Exhibit 15 is that one cannot think of commodities as a homogeneous market of similar investments. In data not reported here, the average correlation of S&P GSCI commodity sector returns is low.

Performance in 2008 Exhibit 16 shows that during 2008, the S&P GSCI underperformed US equities and bonds as well as all other indexes reported, with the exception of private equity. The stand-alone comparisons with traditional asset classes appear to be time period dependent. The consistent feature in the evidence is correlation. Although the commodities' correlations with equities and high-yield bonds have gone up in comparison with the longer (1996–2015) period, the generally low correlations among commodities and traditional asset classes in Exhibit 16 are consistent with the evidence for the longer time period.

Exhibit 16 Commodity Index Performance in 2008

Stock, Bond, and Commodity Index Performance	S&P GSCI TR	S&P 500	Bloomberg Barclays US Government	Bloomberg Barclays US Aggregate	Bloomberg Barclays US Corporate High Yield
Total return	–46.49%	–37.00%	12.39%	5.24%	–26.16%
Standard deviation	42.85%	21.02%	6.14%	6.09%	21.68%
Mean return-to-volatility ratio	–1.08	–1.76	2.02	0.86	–1.21
Maximum drawdown	–62.16%	–37.66%	–2.48%	–3.83%	–32.46%
Correlation with commodity index		0.52	–0.34	–0.02	0.56

Alternative Asset Performance	S&P GSCI TR	CISDM EW Hedge Fund	CISDM CTA EW	FTSE NAREIT	Private Equity
Total return	–46.49%	–19.16%	21.76%	–37.34%	–64.15%
Standard deviation	42.85%	11.04%	10.64%	43.40%	38.07%
Mean return-to-volatility ratio	–1.08	–1.74	2.04	–0.86	–1.69
Maximum drawdown	–62.16%	–19.92%	–4.42%	–49.20%	–64.15%
Correlation with commodity index		0.73	0.13	0.39	0.63

Source: Schneeweis, Kazemi, and Szado (2016b).

5.2.3 *Interpretation Issues*

The use of commodity indexes as benchmarks assumes that commodities are approved in the investor's investment policy statement as a distinct asset class in which the investor may invest. If commodities do not receive separate treatment but are included within some broader asset class, such as real assets, evaluation of performance should be based on a customized benchmark that reflects the other assets included in the asset class.

In interpreting historical results, such as those presented here, the investor should also be sensitive to differences in economic conditions between the historical period and current and forecasted future periods.

5.3 Commodities: Investment Characteristics and Roles

Some experts are now advising investors to afford commodities a larger allocation in their portfolios than they have previously had. (Allocations to commodities in most institutional and individual portfolios have typically been well under 5%.) In the following sections, we discuss the characteristics of commodities as investments.

For the reasons discussed earlier, for most investors, direct investment in commodities will be via the futures markets. For investors seeking passive exposure to commodities, the liquidity of the market for futures contracts on a given commodity index will be a major consideration. The three most widely used futures contracts are those based on the S&P GSCI, the BCOM, and the RJ/CRB Index, with the S&P GSCI representing the overwhelming majority of the combined open interest of these contracts as of the time of this writing.

5.3.1 *Investment Characteristics*

The discussion of the historical performance of commodities highlighted the need for active investors to understand the investment characteristics of commodities on a sector or individual commodity level. However, there are some common themes. The chief two relate to characteristics that affect the use of commodities in managing portfolio risk and hedging inflation.

Special Risk Characteristics With some consistency, commodities have tended to have correlations with equities and bonds that are unusually low even in the realm of alternative investments. But the risk characteristics of commodities are more nuanced than simple correlation statistics can reveal and indicate several attractive features of commodities. In periods of financial and economic distress, commodity prices tend to rise, potentially providing valuable diversification benefits in such times. Long-term growth in world demand for certain commodities in limited supply (such as petroleum-related commodities) may be a factor in their long-term trend growth.

Nevertheless, commodities are generally sensitive to the business cycle. The reason commodities behave differently under different economic conditions has to do with the sources of their returns. The determinants of commodity returns include the following:

1 *Business cycle–related supply and demand*. Commodity prices are determined by the supply and demand of the underlying commodities. Because these supply and demand conditions are determined by different economic fundamentals from those affecting stocks and bonds, commodity prices are expected to be sensitive to the business cycle but to have little or even negative correlation with stocks and bonds. For example, the variation in spot and futures prices of industrial metals has a strong business-cycle component.[61] Anson (2002a)

61 See Fama and French (1988); Schneeweis and Spurgin (1997b); CISDM (2005a).

suggested three reasons commodity returns have been weakly correlated with stock and bond returns. First, commodities correlate positively with inflation whereas stocks and bonds are negatively correlated with inflation. Second, commodity prices and stock/bond prices react differently in different phases of the business cycle. Commodity futures prices are more affected by short-term expectations, whereas stock and bond prices are affected by long-term expectations. Third, commodity prices tend to decline during periods of weakness in the economy.

2 *Convenience yield*. The theory of storage splits the difference between the futures price and the spot price into three components: the forgone interest from purchasing and storing the commodity, storage costs, and the commodity's convenience yield.[62] Convenience yield reflects an embedded consumption-timing option in holding a storable commodity. Furthermore, the theory predicts an inverse relationship between the level of inventories and convenience yield: At low inventory levels, convenience yields are high, and vice versa. A related implication is that the term structure of forward price volatility generally declines with the **time to expiration** of the futures contract—a phenomenon known as the Samuelson effect. This effect is caused by the expectation that, although at shorter horizons mismatched supply and demand forces for the underlying commodity increase the volatility of cash prices, these forces will fall into equilibrium at longer horizons.

3 *Real options under uncertainty*. Oil futures markets are often backwardated; in these markets, futures prices are often below the current spot price. This situation may be caused by the existence of real options under uncertainty.[63] A **real option** is an option involving decisions related to tangible assets or processes. In other words, producers are holding valuable real options—options to produce or not to produce—and will not exercise an option to produce unless spot prices start to climb. Production occurs only if discounted futures prices are below spot prices, and **backwardation** results if the riskiness of future prices is sufficiently high. A major consequence of a downward-sloping term structure of futures prices is the opportunity to capture a positive roll return as investment in expiring contracts is moved to cheaper new outstanding contracts.

The role of commodities in regard to protecting portfolio value against unexpected inflation has been a continuing theme of the discourse on commodities as investments. Among the reasons for including commodities in a portfolio are that they are:[64]

- "natural" sources of return (i.e., related to economic fundamentals) over the long term, as discussed above, and
- providers of protection for a portfolio against unexpected inflation.

The premise that investments in physical commodities may hedge inflation is natural. The prices of some commodities, such as crude oil, may have significant links to the component costs of official price indexes, and certain commodities, such as gold, have been traditionally demanded as stores of value by investors during inflationary times.

Correlations of Sub-indexes Exhibit 17 provides correlations for S&P GSCI sub-indexes.

62 See Kaldor (1939); Working (1948, 1949); Telser (1958).
63 See Litzenberger and Rabinowitz (1995).
64 See Strongin and Petsch (1995), who also included pricing inefficiencies (opportunities for active management), a feature that is particularly relevant to managed futures investing, which is discussed later.

Exhibit 17 Correlations, 1996–2015

Correlation	S&P GSCI Energy TR	S&P GSCI Agriculture TR	S&P GSCI Livestock TR	S&P GSCI Grains TR	S&P GSCI Industrial Metals TR	S&P GSCI Precious Metals TR	Average Correlation
S&P 500	0.19	0.26	0.02	0.23	0.44	0.08	0.20
Bloomberg Barclays US Government Bond Index	–0.08	–0.01	–0.09	0.04	–0.23	0.17	–0.03
Bloomberg Barclays US Aggregate Bond Index	0.00	0.08	–0.07	0.11	–0.09	0.22	0.04
Bloomberg Barclays US Corporate High Yield Bond Index	0.22	0.24	0.02	0.20	0.42	0.16	0.21

Source: Schneeweis, Kazemi, and Szado (2016b).

The commodity sub-indexes generally exhibit very low or negative correlations with bonds and moderate correlations with equity and high-yield bonds. Storable commodities directly related to the intensity of economic activity exhibit positive correlations with equities and high-yield bonds (e.g., 0.44 and 0.42, respectively, for industrial metals).

5.3.2 *Roles in the Portfolio*

The principal roles that have been suggested for commodities in the portfolio are:

- as a portfolio risk diversifier and
- as an inflation hedge, providing an expected offset to the losses on such assets as conventional debt instruments, which typically lose value during periods of unexpected inflation.[65]

There is support both in the historical record and in economics for these roles. Research also indicates a link between the two roles, which suggests that most investable commodity indexes provide diversification advantages to stock and bond investments primarily during periods of unexpected changes in inflation.[66] To the degree that inflation is already incorporated into the yield structure of bonds and the cash flow of companies—that is, inflation is fully anticipated—the economy may have periods of high or increasing commodity prices together with positive stock and bond returns. Halpern and Warsager (1998) observed that commodity indexes add the most value as inflation hedges in traditional stock and bond portfolios during periods of unexpected changes in inflation. However, a number of researchers have found that the inflation-hedging characteristics of commodities may have disappeared since the global financial crisis as a result of the financialization of commodities.[67]

More ambiguous is the role of passive long-only commodity futures investments in increasing the expected return vis-à-vis a portfolio of traditional and other alternative investments. Erb and Harvey (2006) claimed that the average historical excess returns of individual commodity futures is approximately zero. They suggested that

65 See Bodie (1983); Greer (1978); Halpern and Warsager (1998); Becker and Finnerty (2000).
66 See, for example, Halpern and Warsager (1998).
67 See, for example, Büyükşahin, Haigh, and Robe (2010); Zaremba (2015).

the measured positive excess return of portfolios of these futures for some time periods is the result not of a risk premium but of the portfolio weighting selected and the rebalancing to it.

Long-term investors with liabilities indexed to inflation, such as defined-benefit plans, may be able to improve their risk–return trade-off by including commodities in the portfolio.[68] For university endowments, which support the inflation-sensitive costs of operating a university, commodities can serve as a good risk diversifier in a portfolio that needs inflation protection.

Below, using the methodology familiar from the section on real estate, we provide some quantitative information on the *ex post* role of commodities as a risk diversifier.

In Exhibit 18, the benefits of commodity investment are examined by using the S&P GSCI (a long-only, futures-based, investable commodity index) in combination with equities, bonds, private equity, real estate, managed futures, and hedge funds in various weights for the period January 1996 through December 2015.

Exhibit 18 Commodities Performance in Portfolios, 1996–2015

Portfolios	A	B	C	D
Annualized return	7.26%	6.65%	7.92%	7.22%
Standard deviation	7.83%	7.91%	8.38%	8.50%
Mean return-to-volatility ratio	0.93	0.84	0.94	0.85
Maximum drawdown	–27.11%	–30.13%	–32.08%	–34.31%
Correlation with hedge funds	0.24		0.29	
Portfolio A	Equal weights S&P 500 and Bloomberg Barclays US Aggregate Bond Index			
Portfolio B	90% Portfolio A and 10% commodity index			
Portfolio C	75% Portfolio A and 25% CTA/hedge funds/private equity/real estate			
Portfolio D	90% Portfolio C and 10% commodity index			

Source: Schneeweis, Kazemi, and Szado (2016b).

As Exhibit 18 shows from a stand-alone perspective, whether risk-adjusted or not, commodities underperformed US bond and equity markets during this sample period. The low or negative correlations of S&P GSCI returns with returns to the S&P 500 (0.25), the Bloomberg Barclays US Government Bond Index (–0.10), and the Bloomberg Barclays US Aggregate Bond Index (–0.01) suggest diversification benefits from including commodities, as well as the potential for improvement in the mean return-to-volatility ratio. However, the results for the period under study do not support those conclusions.

Exhibit 19 examines the evidence for a shorter time period. When added to a portfolio of US stocks and bonds, the S&P GSCI slightly increases the standard deviation of the portfolio from 7.54% (Portfolio A) to 7.81% (Portfolio B). Additionally, risk-adjusted performance (mean return-to-volatility ratio) decreases from 0.74 (Portfolio A) to 0.61 (Portfolio B). Similarly, when added to a portfolio of stocks, bonds, and alternatives, the S&P GSCI slightly increases volatility from 8.45% (Portfolio C) to 8.68% (Portfolio D) and decreases the mean return-to-volatility ratio from 0.74 to 0.62.

68 See Nijman and Swinkels (2003, pp. 1–36).

Exhibit 19 Commodities Performance, 2001–2015

Portfolios	A	B	C	D
Annualized return	5.54%	4.77%	6.24%	5.39%
Standard deviation	7.54%	7.81%	8.45%	8.68%
Mean return-to-volatility ratio	0.74	0.61	0.74	0.62
Maximum drawdown	–27.11%	–30.13%	–32.08%	–34.31%
Correlation with commodity index	0.30		0.34	
Portfolio A	Equal weights S&P 500 and Bloomberg Barclays US Aggregate Bond Index			
Portfolio B	90% Portfolio A and 10% commodity index			
Portfolio C	75% Portfolio A and 25% CTA/hedge funds/private equity/real estate			
Portfolio D	90% Portfolio C and 10% commodity index			

Source: Schneeweis, Kazemi, and Szado (2016b).

This discussion has focused on passive long-only exposures. Commodities also offer potential for active management that may involve short as well as long positions. For example, research for the United States has indicated that the benefits to adding commodity futures, particularly metals and agricultural futures (both managed and unmanaged), to a portfolio occur almost exclusively when the US Federal Reserve (the central bank) is following a restrictive monetary policy.[69] Such results suggest an active strategy based on central bank actions and monetary conditions. As another example, an investor who believes that a commodity's price will revert to the underlying production costs might implement an active long–short commodity program based on divergences from production cost value. Many current active programs involve momentum strategies that typically go long after recent prior returns have been positive and short after recent prior returns have been negative.

Active programs may be executed within a separately managed account or a private commodity pool. Private commodity pools will be the focus of the section on managed futures programs, later in the reading.

In the next section, we discuss one of the most important types of alternative investments, the hedge fund.

HEDGE FUNDS

6

Hedge funds as a group have become an important segment of the alternative investment market, with appeal to many segments of the private wealth and institutional investor markets. The impact of hedge funds has been broad in scope. The trading activity of hedge funds constitutes a substantial portion of trading volume in a number of traditional investment markets. Services to hedge funds, known as "prime brokerage" have become an important and actively contested revenue source among major sell-side investment firms.[70] The competition from hedge funds has caused an increasing number of equity and bond mutual funds to seek approval from

69 See Jensen, Mercer, and Johnson (2002).

70 **Prime brokerage** (or prime brokering) is a suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

shareholders to make increased use of derivative strategies and short selling.[71] The number of mutual funds that follow option-based investment strategies has grown significantly, particularly since 2005.[72]

The first hedge fund was established in the late 1940s as a long–short hedged equity vehicle. More recently, institutional investors—corporate and public pension funds, endowments and trusts, and bank trust departments—have included hedge funds as one segment of a well-diversified portfolio.

There is no precise legal or universally accepted definition of a hedge fund, and hedge funds can take many forms. Originally, hedge funds were private partnerships that took long and short equity positions to reduce net market exposure in exchange for accepting a lower rate of investment return. In other words, they were "hedged" funds. Today, the term "hedge fund" is much broader. Rather than indicating the use of hedging in the portfolio, a hedge fund is defined by its organizational characteristics and structural characteristics of its portfolio.

Traditionally, hedge funds intentionally adopted structures that permitted them to be loosely regulated pooled investment vehicles, although the Dodd–Frank Act of 2010 eliminated the private adviser exemption for many hedge fund advisers.[73] The nature of hedge funds as private pools has permitted this investment vehicle to avoid certain reporting and other requirements, as well as some restrictions on incentive fees, that apply to many other investment vehicles. For example, unlike traditional mutual funds, most hedge fund vehicles can take aggressive long or short positions and use substantial leverage.

Managed futures are now frequently classified as hedge funds. However, this reading will discuss managed futures in a separate section to give them adequate coverage.

Each hedge fund strategy is constructed to take advantage of certain market opportunities. Hedge funds use different investment strategies and thus are often classified according to investment style. There is substantial diversity in risk attributes and investment opportunities among styles, which reflects the flexibility of the hedge fund format. In general, this diversity benefits investors by increasing the range of choices among investment attributes. However, additional due diligence is required to fully understand the risk and opportunities associated with each manager's investment approach. We will explain the diversity in more detail.

6.1 The Hedge Fund Market

The hedge fund market experienced fast growth from 1996 to 2015 and keeps evolving. The market has witnessed a proliferation of hedge funds and products offered by hedge funds. As more hedge funds with similar strategies entered the market, returns on their once-unique strategies started to shrink. Liquidity and capacity constraints have affected some hedge funds and driven some of them to become—voluntarily or involuntarily—defunct. Some have been able to return the money to their investors, but others, unfortunately, could not and did not. Nevertheless, new hedge funds continue to be established to try their new strategies, with the successful ones being mimicked by imitators. Although many hedge funds maintain that their strategies seek "absolute returns" that require no benchmark, some institutional investors that invest in hedge funds are asking for relative performance evaluation, which requires some benchmarking.

71 See Laise (2006, pp. D1, D2).
72 See Black and Szado (2016).
73 See SEC, "Advisers to Hedge Funds and Other Private Funds" (https://www.sec.gov/spotlight/dodd-frank/hedgefundadvisers.shtml).

6.1.1 *Types of Hedge Fund Investments*

Many style classifications of hedge funds exist; the following classification of hedge fund styles will be the basis for most of our discussion. Keep in mind that industry usage applies the term "arbitrage" somewhat loosely to mean, roughly, a "low-risk" rather than a "no-risk" investment operation.

- *Equity market neutral:* Equity market–neutral managers attempt to identify overvalued and undervalued equity securities while neutralizing the portfolio's exposure to market risk by combining long and short positions. Portfolios are typically structured to be market, industry, sector, and dollar neutral. This result is accomplished by holding long and short equity positions with roughly equal exposure to the related market or sector factors. The market opportunity for equity market–neutral programs comes from (1) their ability to take short as well as long positions in securities without regard to the securities' weights in a benchmark and (2) the existence of pockets of inefficiencies (i.e., mispricing relative to intrinsic value) in equity markets, particularly as related to overvalued securities. Because many investors face constraints relative to shorting stocks, situations of overvaluation may be slower to correct than those of undervaluation.
- *Convertible arbitrage:* Convertible arbitrage strategies attempt to exploit anomalies in the prices of corporate convertible securities, such as convertible bonds, warrants, and convertible preferred stock. Managers in this category buy or sell these securities and then hedge part or all of the associated risks. The simplest example is buying convertible bonds and hedging the equity component of the bonds' risk by shorting the associated stock. The cash proceeds from the short sale remain with the hedge fund's prime broker but earn interest, and the hedge fund may earn an extra margin through leverage when the bonds' current yield exceeds the borrowing rate of money from the prime broker. The risks include changes in the price of the underlying stock, changes in the expected volatility of the stock, changes in the level of interest rates, and changes in the credit standing of the issuer. In addition to collecting the coupon on the underlying convertible bond, convertible arbitrage strategies typically make money if the expected volatility of the underlying asset increases or if the price of the underlying asset increases rapidly. Depending on the hedge strategy, convertible arbitrage will also make money if the credit quality of the issuer improves.
- *Fixed-income arbitrage:* Managers dealing in fixed-income arbitrage attempt to identify overvalued and undervalued fixed-income securities, primarily on the basis of expectations of changes in the term structure of interest rates or the credit quality of various related issues or market sectors. Fixed-income portfolios are generally neutralized against directional market movements because the portfolios combine long and short positions. For example, a credit long–short strategy takes long and short exposures to credit-sensitive fixed-income securities based on credit analysis of the securities and underlying issuers, incorporating credit market forecasts.
- *Distressed securities:* Portfolios of distressed securities are invested in both the debt and equity of companies that are in or near bankruptcy. Distressed debt and equity securities are fundamentally different from non-distressed securities. Most investors are unprepared for the legal difficulties and negotiations with creditors and other claimants that are common with distressed companies. Traditional investors prefer to transfer those risks to others when a company is in danger of default. Furthermore, many investors are prevented by charter

from holding securities that are in default or at risk of default. Because of the relative illiquidity of distressed debt and equity, short sales are difficult, so most funds are long.

- *Merger arbitrage:* Merger arbitrage, also called "deal arbitrage," seeks to capture the price spread between current market prices of corporate securities and their value upon successful completion of a takeover, merger, spin-off, or similar transaction involving more than one company. In merger arbitrage, the opportunity typically involves buying the stock of a target company after a merger announcement and shorting an appropriate amount of the acquiring company's stock.
- *Hedged equity:* Hedged equity strategies attempt to identify overvalued and undervalued equity securities. Portfolios are typically not structured to be market, industry, sector, and dollar neutral, and they may be highly concentrated. For example, the value of short positions may be only a fraction of the value of long positions and the portfolio may have a net long exposure to the equity market. Hedged equity is the largest of the various hedge fund strategies in terms of assets under management and number of funds.[74]
- *Global macro:* Global macro strategies primarily attempt to take advantage of moves in major financial and non-financial markets through trading in currencies, swaps, futures, and option contracts, although they may also take major positions in traditional equity and bond markets. For the most part, they differ from traditional hedge fund strategies in that they concentrate on major market trends rather than on individual security opportunities. Many global macro managers use derivatives, such as swaps, futures, and options, in their strategies. Managed futures are sometimes classified under global macro as a result. Global macro strategies may be systematic or discretionary. Systematic strategies are often algorithmic trend-following or mean reversion–based strategies driven by computer models. In contrast, discretionary strategies rely on manager skill and analysis for market timing and security selection.
- *Emerging markets:* These funds focus on the emerging and less mature markets. Because short selling is not permitted in most emerging markets and because futures and options are not available, these funds tend to be long. Such investments may be focused on emerging market equity, debt, or a combination of the two. Currency exposure may also be part of the strategy.
- *Fund of funds:* A **fund of funds** (FOF) is a fund that invests in a number of underlying hedge funds. A typical FOF invests in 10–30 hedge funds, and some FOFs are even more diversified. FOF investors can achieve diversification among hedge fund managers and strategies and sometimes gain access to funds that are closed to new money, but they have to pay two layers of fees—one to the hedge fund managers and another to the manager of the FOF.[75]

The compensation structure of hedge funds consists of a percentage of net asset value (NAV) as a management fee plus an incentive fee. The management fee is also known as an "assets under management" fee, or **AUM fee**. The management fee generally ranges from 1% to 2%. The incentive fee is a percentage of profits as specified by the terms of the investment. It has traditionally been 20% but as of early 2016 averaged approximately 18%. At the same time, roughly 70% of hedge funds were using a

74 As of April 2016, long–short equity strategies made up 21% of the AUM and 33% of the number of hedge funds in the Morningstar hedge fund database.

75 Returns on FOFs have been found to be more positively correlated with equity markets than are returns on individual hedge funds; see Kat (2005, pp. 51–57).

management fee of 1% to 2%, combined with an incentive fee of 20%.[76] As a general rule, the more common the strategy (e.g., hedged equity), the lower the management fee and sometimes the incentive fee.

The great majority of funds have a high-water-mark provision that applies to the payment of the incentive fee. A **high-water mark** (HWM) is a specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager. Once the first incentive fee has been paid, the highest month-end NAV establishes a high-water mark. If the NAV then falls below the HWM, no incentive fee is paid until the fund's NAV exceeds the HWM; then the incentive fee for a "1 plus 20" structure (a 1% management fee plus a 20% incentive fee) is 20% of the positive difference between the ending NAV and the HWM NAV. The new, higher NAV in turn establishes a new HWM, and so on. A minority of funds also specify that no incentive fee is earned until a specified minimum rate of return (hurdle rate) is achieved.

The purpose of a HWM provision is to ensure that the hedge fund manager earns an incentive fee only once for a given gain. For the hedge fund manager, the HWM is like a call option on a fraction of the increase in the fund's NAV. Many hedge fund managers depend on earning the incentive fee. Given a 15% gain, a 1 and 20 fund would earn about 4% of net assets versus 1% if no incentive fee were earned.

Hedge fund investors also often take the opportunities offered to them to withdraw capital from a fund on a losing streak. A hedge fund far under its HWM is frequently dissolved because earning an incentive fee appears unlikely. According to Credit Suisse/Tremont, more than 20% of hedge funds were liquidated in 2003, after a year in which more than 70% of hedge funds in that database failed to earn an incentive fee.

In their second layer of expenses, FOFs impose management fees and incentive fees. A "1.5 plus 10" structure is not uncommon.

Much debate has surrounded the fee structures of hedge funds. One perspective is that because a hedge fund investor is not paying for "beta" (exposure to systematic risk), as the investor might do with a traditional long-only mutual fund, a higher fee structure is warranted. Another rationale is that to the extent that a hedge fund contributes to controlling a portfolio's downside risk, somewhat like a protective put, the fund manager should earn a premium, similar to an insurance premium.

All else being equal, given two similarly sized hedge funds following the same strategy, the expectation is that the fund charging the lower management fee will deliver superior performance, unless the higher-fee manager can make a convincing case that he or she can deliver superior investment performance in the future. Not uncommonly, hedge fund managers with superior track records ask for and obtain higher-than-average fees (such as 3 and 30 or even higher). For these kinds of fees, investors need to ask themselves whether the hedge fund manager will continue to be a substantial winner.

Hedge funds also prescribe a minimum initial holding or **lock-up period** for investments during which no part of the investment can be withdrawn or withdrawn without penalty. A hard lock-up strictly prohibits early withdrawal. In contrast, a soft lock-up allows funds to be redeemed early if a redemption fee penalty is paid. Lock-up periods of one to three years are common, depending on the strategy. Thereafter, the fund will redeem the investments of investors only within specified exit windows—for example, quarterly after the lock-up period has ended—and possibly up to specific maximum amounts (called "gates"). The rationale for these provisions is that the hedge fund manager and remaining investors should be insulated against the unfavorable unwinding of positions. FOFs usually do not impose lock-up periods and may permit more frequent investor exits. However, to offer that additional liquidity, the FOF manager must hold a cash buffer that may reduce expected returns.

76 Based on Morningstar hedge fund data as of early 2016, excluding managed futures and funds of funds.

6.1.2 *Size of the Hedge Fund Market*

According to AIMA, approximately 8% of pension funds and 25% of endowments and foundations had allocations to hedge funds in 2013.[77] It is estimated that assets under management for hedge funds grew from less than US$200 billion in 1995 to approximately US$2.8 trillion in 2014, while the number of hedge funds increased from fewer than 2,400 to more than 10,000.[78]

6.2 Benchmarks and Historical Performance

Many investors are concerned that hedge funds do not provide a means for monitoring and tracking these investments that are available for other, more traditional investments.[79] In the traditional stock and bond markets, Morningstar and Lipper provide active manager-based benchmarks of mutual fund performance. Similarly, in the alternative investment industry, Morningstar, Hedge Fund Research (HFR), Credit Suisse, Bloomberg, BarclayHedge, and many others provide monthly or daily indexes that track the performance of active manager-based benchmarks of hedge fund performance.

Research has also focused on developing indexes for strategies (e.g., tracking portfolios) that try to separate the contribution to performance of the strategy from the contribution to performance of the manager's specific talent.[80] In most cases, evidence exists for abnormal returns based on such indexes. However, investors should be cautioned that abnormal returns simply reflect the fact that the reference benchmark is not a complete tracking portfolio for hedge funds, so the abnormal returns are merely the result of additional, non-measured risks.

6.2.1 *Benchmarks*

Hedge fund benchmarks include both monthly and daily series. A sample of monthly hedge fund indexes includes the following (in alphabetical order):

- *CISDM*. The CISDM hedge fund and managed futures indexes are based on managers' reporting to the CISDM hedge fund and managed futures databases. The indexes cover a broad set of hedge fund and managed futures trading strategies. Publication of returns in each style classification began in 1994, with data beginning in 1990. The broadest CISDM hedge fund index is equally weighted—the CISDM Equal Weighted Hedge Fund Index.
- *Credit Suisse.* These indexes cover more than 10 strategies. The Credit Suisse Hedge Fund Index discloses its construction methods and identifies all the funds within it. Credit Suisse accepts only funds (not separate accounts) with a minimum of US$50 million under management, a one-year record, and an audited statement. The Credit Suisse Hedge Fund Index was launched in 1999 with data beginning in 1994 and is asset weighted (i.e., weights depend on assets under management).
- *Hedge Fund Intelligence*. Hedge Fund Intelligence supplies a wide range of hedge fund indexes, including the EuroHedge and AsiaHedge series of equally weighted indexes. The EuroHedge series consists of hedge funds that are at least 50% managed in developed European countries or that are solely invested in

77 See AIMA Investor Steering Committee, "Beyond 60/40: The Evolving Role of Hedge Funds in Institutional Investor Portfolios," AIMA (May 2013): http://www.aima.org/en/document-summary/index.cfm/docid/77A589A0-3BEA-4559-B0F0EE38CF21B1CF.

78 See Schneeweis, Kazemi, and Bird (2016).

79 Siegel (2003) found it surprising, given that the inherent nature of hedge fund investing is hostile to benchmarking, that hedge funds or their clients would need benchmarks.

80 See Schneeweis and Kazemi (2001).

developed European countries. The series began in 2002. The AsiaHedge series contains hedge funds that are at least 50% managed in the Asia-Pacific area or that are solely invested in the Asia-Pacific area. The series began in 1998.

- *HedgeFund.net.* Acquired by eVestment in 2011, the HedgeFund.net (HFN) indexes cover more than 40 strategies. They are equally weighted indexes based on the HFN database.
- *HFR.* This company provides the HFRI asset-weighted and equally weighted composite hedge fund indexes and equally weighted hedge fund sub-indexes based on managers' reporting to the HFR database of hedge fund returns. FOFs are not included in the composite index but are covered in a separate index. The indexes were launched in 1994, with data beginning in 1990. Funds are assigned to categories based on the descriptions in their offering memoranda. HFRX daily indexes are also available from HFR. These indexes are based on managers' reporting to HFR. The indexes cover a number of categories and subcategories and were launched in 2003.
- *Morningstar MSCI.* These indexes are classified according to five basic categories and include a composite index. Within each category, indexes are segregated on the basis of asset class and geographical region. Funds included need to have a minimum of US$15 million in AUM, although there is no restriction on whether a fund is open or closed. The indexes are supported by a platform that allows subscribers to access the data at a more detailed level (industry focus, fund size, open versus closed, etc.). Indexes are equally weighted except at higher levels of aggregation, where both equally weighted and asset-weighted versions are available.

Comparison of Major Manager-Based Hedge Fund Indexes The various hedge fund index series are generally distinguished by whether they report monthly or daily, are investable or non-investable, and list the actual funds used in benchmark construction. Of the major current indexes, only HFR provides a daily return series. Daily indexes are generally constructed from the managed accounts of an asset manager rather than from the funds themselves.

For the monthly return series, the HFR, Hedge Fund Intelligence, and HedgeFund.net indexes have many different classifications and sub-classifications, whereas Credit Suisse, Morningstar MSCI, and CISDM have relatively few classifications.

It is natural to want to express the performance of hedge funds with a single number. However, defining the hedge fund universe is a difficult and unproductive exercise. There is no general agreement among institutional investors regarding which investment strategies should be considered hedge fund strategies and what weights should be given to each strategy.

There are many variations in the construction of the major manager-based hedge fund indexes. Principal differences are as follows:

- *Selection criteria.* Decision rules determine which hedge funds are included in the index. Examples of selection criteria include length of track record, AUM, and restrictions on new investment. For example, Morningstar MSCI has a very specific rule-based process for manager selection.
- *Style classification.* Indexes have various approaches to how each hedge fund is assigned to a style-specific index and different rules about whether or not a fund that fails to satisfy the style classification methodology is excluded from the index.

- *Weighting scheme.* Indexes have different schemes to determine how much weight a particular fund's return is given in the index. Common schemes are equal weighting and dollar weighting on the basis of AUM. Many indexes report both equal-weighted and asset-weighted versions.
- *Rebalancing scheme.* Rebalancing rules determine when assets are reallocated among the funds in an equally weighted index. For example, some indexes are rebalanced monthly; others use annual rebalancing.
- *Investability.* An index may be directly or only indirectly investable. The majority of monthly manager-based hedge fund indexes are not investable, whereas most of the daily hedge fund indexes are investable.

Alpha Determination and Absolute Return Investing Performance appraisal has emerged as a major issue in the hedge fund industry. Hedge funds have often been promoted as absolute return vehicles. **Absolute return vehicles** have been defined as investments that have no direct benchmark portfolios; they are presented as seeking to produce positive returns. Estimates of alpha, however, must be made relative to a benchmark portfolio.[81] Problems in alpha determination have been widely discussed; for example, differences in the selected benchmark can result in large differences in reported alpha.[82] One perspective is that all active management is about performance relative to some investable benchmark.[83] Another important issue in evaluating claims of alpha is whether account is being taken of all sources of systematic risk the fund may be exposed to. Alpha is the residual after returns to systematic risks have been removed. Simple models for systematic risk that have been applied to long-only equity portfolios may not be relevant for a hedge fund strategy.

The lack of a clear hedge fund benchmark, however, is not indicative of an inability to determine comparable returns for a hedge fund strategy. Hedge fund strategies within a particular style often trade similar assets with similar methodologies and are sensitive to similar market factors. Two principal means of establishing comparable portfolios are (1) using a single-factor or multifactor methodology and (2) using optimization to create tracking portfolios with similar risk and return characteristics.

6.2.2 *Historical Performance*

In this section, we provide summary information about the performance of various hedge fund strategies. Exhibit 20 shows the performance of a number of assets and combinations of assets (traditional assets and hedge funds) over the period 1996–2015. These include CISDM's Hedge Fund Composite Index and several measures of US and global stock and bond performance.

Exhibit 20 Hedge Fund Performance, 1996–2015

Measure	Hedge Funds	S&P 500	Bloomberg Barclays US Aggregate	Commodities	CISDM CTA EW	Real Estate	Private Equity
Annualized return	9.15%	8.51%	5.37%	–1.01%	7.22%	10.32%	8.23%
Annualized std. dev.	7.36%	15.31%	3.47%	22.79%	8.54%	19.47%	27.17%

81 Alpha is defined as the return relative to an investment's expected return given a benchmark portfolio and the investment's beta with respect to the benchmark.
82 Refer to the reading on evaluating portfolio performance for the alpha determination in traditional investments; see Schneeweis (1998) for alpha determination in hedge funds.
83 See Waring and Siegel (2005).

Exhibit 20 (Continued)

Measure	Hedge Funds	S&P 500	Bloomberg Barclays US Aggregate	Commodities	CISDM CTA EW	Real Estate	Private Equity
Mean return-to-volatility ratio	1.24	0.56	1.55	–0.04	0.85	0.53	0.30
Maximum drawdown	–21.71%	–50.95%	–3.83%	–79.44%	–11.93%	–67.89%	–80.44%
Correlation with hedge funds	1.00	0.74	0.00	0.25	–0.05	0.57	0.75

Source: Schneeweis, Kazemi, and Bird (2016).

For the entire period, hedge funds had superior return performance relative to the other asset classes, with the exception of real estate. The maximum drawdown for hedge funds for the entire period, at –21.71%, represents a smaller loss than those of the S&P 500, commodities, real estate, and private equity. Hedge funds had a higher mean return-to-volatility ratio than any of the other reported assets, with the exception of bonds. Note that hedge funds' correlation of 0.74 with the S&P 500 is consistent with substantial net long equity market exposure as well as the modest potential for risk diversification benefits (because the correlation is below 1).

Exhibit 21 shows the performance of hedge funds and other asset classes in 2008. Although hedge funds outperformed the S&P 500, commodities, real estate, and private equity, hedge funds exhibited a relatively high correlation with US equities and other asset classes during the financial crisis. Thus, the diversification benefits that many investors may have expected from hedge funds were not apparent in the financial crisis.

Exhibit 21 Hedge Fund Performance in 2008

Measure	Hedge Funds	S&P 500	Bloomberg Barclays US Aggregate	Commodities	CISDM CTA EW	Real Estate	Private Equity
Total return	–19.16%	–37.00%	5.24%	–46.49%	21.76%	–37.34%	–64.15%
Standard deviation	11.04%	21.02%	6.09%	42.85%	10.64%	43.40%	38.07%
Maximum drawdown	–19.92%	–37.66%	–3.83%	–62.16%	–4.42%	–49.20%	–64.15%
Correlation with hedge funds	1.00	0.82	0.38	0.73	–0.02	0.57	0.67

Source: Schneeweis, Kazemi, and Bird (2016).

The risk and return benefits of a wide range of hedge fund indexes and their correlations with stock and bond indexes are presented in Exhibit 22. As the dispersion of the mean return-to-volatility ratios and of correlations of hedge fund styles with stocks and bonds in Exhibit 22 shows, in 1996–2015, there was considerable variation in the risk and return characteristics among styles. As expected, those hedge fund groups whose strategies call for eliminating stock or bond market risk (e.g., equity market neutral or fixed-income arbitrage) have low correlations with, respectively, stock or bond indexes. Those hedge fund strategies with equity exposure (e.g., event driven and hedged equity) have moderate correlations with the S&P 500.

Exhibit 22 Performance of Hedge Fund Strategies and Traditional Assets, 1996–2015

	Annualized Return	Standard Deviation	Mean Return-to-Volatility Ratio	Maximum Drawdown	Correlation with Hedge Funds	Correlation with S&P 500	Correlation with Bloomberg Barclays US Aggregate	Correlation with Bloomberg Barclays US Corp High Yield
CISDM Equal Weight Hedge Fund Index	9.15%	7.36%	1.24	–21.71%	1.00	0.74	0.00	0.64
CISDM Equity Market Neutral Index	7.38%	2.21%	3.35	–2.79%	0.62	0.40	0.08	0.34
CISDM Convertible Arbitrage Index	8.03%	5.00%	1.61	–22.47%	0.62	0.45	0.19	0.71
CISDM Distressed Securities Index	8.70%	5.70%	1.53	–21.22%	0.83	0.60	0.01	0.70
CISDM Event Driven Multi-Strategy Index	8.83%	5.84%	1.51	–20.19%	0.87	0.71	–0.05	0.70
CISDM Merger Arbitrage Index	7.12%	3.26%	2.19	–5.71%	0.71	0.58	0.02	0.51
CISDM Equity Long/Short Index	8.88%	7.47%	1.19	–17.21%	0.95	0.75	–0.06	0.54
CISDM Global Macro Index	6.29%	3.93%	1.60	–3.87%	0.59	0.39	0.22	0.29
S&P 500 Total Return Index	8.51%	15.31%	0.56	–50.95%		1.00	–0.01	0.62
Bloomberg Barclays US Aggregate Bond Index	5.37%	3.47%	1.55	–3.83%			1.00	0.18
Bloomberg Barclays US Corp High Yield Bond Index	6.75%	9.09%	0.74	–33.31%				1.00

Source: Schneeweis, Kazemi, and Bird (2016).

Research has shown that the actual performance of hedge fund strategies depends on the market conditions affecting that strategy. As shown in Exhibit 23, equity-based hedge fund strategies are correlated with several equity and bond market factors. Credit-sensitive hedge fund strategies (e.g., distressed securities) and credit-sensitive bond instruments are correlated with similar factors (e.g., high-yield debt returns). Because relative value strategies (e.g., equity market neutral) are sensitive to different return factors from those to which hedged equity strategies and the S&P 500 are sensitive, they are expected to have low correlations with the S&P 500 and may be considered as more effective risk diversifiers. Because equity hedge funds load on similar return factors as the S&P 500, they offer less diversification than many relative value strategies and can be more rightly considered return enhancers to a long-only program.

Exhibit 23 Correlations, 1996–2015

Hedge Fund	S&P 500	Bloomberg Barclays US Aggregate Bond	Bloomberg Barclays US Corporate High Yield	S&P 500 Volatility	Bloomberg Barclays US Aggregate Volatility
CISDM Equal Weight Hedge Fund Index	0.74	0.00	0.64	–0.42	–0.12
CISDM Equity Market Neutral Index	0.40	0.08	0.34	–0.28	–0.10
CISDM Convertible Arbitrage Index	0.45	0.19	0.71	–0.34	–0.21
CISDM Distressed Securities Index	0.60	0.01	0.70	–0.55	–0.19
CISDM Event Driven Multi-Strategy Index	0.71	–0.05	0.70	–0.51	–0.22
CISDM Merger Arbitrage Index	0.58	0.02	0.51	–0.31	–0.11
CISDM Equity Long/Short Index	0.75	–0.06	0.54	–0.39	–0.10
CISDM Global Macro Index	0.39	0.22	0.29	–0.13	–0.09

Notes: Stock and bond volatility was measured as monthly volatility of daily returns of the S&P 500 and the Bloomberg Barclays US Aggregate Bond index, respectively.
Source: Schneeweis, Kazemi, and Bird (2016).

The different sensitivities of various hedge fund strategies to various market factors result in different correlations among hedge fund strategies themselves. The correlations between various hedge fund strategies are given in Exhibit 24. Diversification among hedge fund strategies should therefore also reduce the volatility of hedge fund–based investment portfolios.

EXAMPLE 10

Liquid Alternatives

The term "liquid alternatives" (or liquid alts) refers to a variety of hedge fund–like investment strategies such as those offered in the United States through the Investment Company Act of 1940 fund structures (mutual funds, closed-end funds, and ETFs). Unlike hedge funds, liquid alternatives provide the daily liquidity and transparency characteristic of "40 Act funds." Liquid alts also typically have more attractive fee structures and are available to a wider range of investors than corresponding hedge funds. It is estimated that the liquid alt market consisted of 53 funds with $240 billion in assets under management at the end of 2014.[84] Some of the strategies followed by liquid alts are outlined below:

84 See Preqin, "Liquid Alternatives: Investor and Fund Manager Outlook" (April 2015): https://www.preqin.com/docs/reports/Preqin-Special-Report-Liquid-Alternatives-April-2015.pdf.

Exhibit 24 Correlations between Hedge Fund Strategies, 1996–2015

	CISDM EW Hedge Funds	CISDM Equity Market Neutral	CISDM Convertible Arbitrage	CISDM Event Driven	CISDM Merger Arbitrage	CISDM Distressed Securities	CISDM Equity Long/ Short	CISDM Global Macro	S&P 500	Bloomberg Barclays US Aggregate	Bloomberg Barclays US Corporate High Yield
CISDM Hedge Funds	1.00	0.62	0.62	0.87	0.71	0.83	0.95	0.59	0.74	0.00	0.64
CISDM Equity Market Neutral		1.00	0.39	0.57	0.52	0.45	0.63	0.54	0.40	0.08	0.34
CISDM Convertible Arbitrage			1.00	0.67	0.51	0.72	0.50	0.27	0.45	0.19	0.71
CISDM Event Driven				1.00	0.80	0.87	0.85	0.48	0.71	–0.05	0.70
CISDM Merger Arbitrage					1.00	0.68	0.73	0.47	0.58	0.02	0.51
CISDM Distressed Securities						1.00	0.77	0.43	0.60	0.01	0.70
CISDM Equity Long/ Short							1.00	0.60	0.75	–0.06	0.54
CISDM Global Macro								1.00	0.39	0.22	0.29
S&P 500									1.00	–0.01	0.62
Bloomberg Barclays US Aggregate Bond										1.00	0.18
Bloomberg Barclays US Corporate High Yield											1.00

Source: Schneeweis, Kazemi, and Bird (2016).

Equity Long–Short. This strategy typically selects stocks based on top-down or bottom-up fundamental analysis and hedges market exposure with short equity or long put exposure. Liquid alts equity long–short strategies correspond to hedge fund equity long–short strategies.

Event Driven. This strategy takes equity or debt positions in firms involved in a corporate event such as a merger or restructuring. Corresponding hedge fund strategies include merger arbitrage, distressed, and credit long–short.

Relative Value. This strategy takes both long and short positions to benefit from relative mispricing between similar or related securities. Corresponding hedge fund strategies include convertible arbitrage and equity market neutral.

Macro. Macro strategies are systematic or discretionary strategies that take long or short positions in a variety of asset classes (equities, bonds, currencies, commodities) based on macroeconomic conditions. They often utilize trend-following or mean-reverting signals and correspond to global macro hedge fund strategies or managed futures strategies.

6.2.3 *Interpretation Issues*

Hedge fund indexes often have meaningfully different performance within a given time period, raising the challenging question of which index is most appropriate for the investor's purposes.

Despite the differences in returns, comparable hedge fund indexes appear to be sensitive to the same set of risk factors. The return differences among indexes often reflect differences in the weights of different strategy groups.

The hedge fund investor should be aware of the following issues in selecting and using hedge fund indexes.

Biases in Index Creation The use of manager-based hedge fund indexes in performance appraisal and asset allocation is based on the premise that the indexes neutrally reflect the underlying performance of the strategy. A primary concern is that most databases are self-reported; that is, the hedge fund manager chooses which databases to report to and provides the return data. Although the correlations among hedge fund indexes based on similar strategies are generally moderately high (i.e., above 0.80) in the period covered by Exhibit 24, in certain cases, the correlations fall below 0.30. There are several possible explanations for low correlations between "similar strategy" indexes. One is the restrictions on size and years of performance that some indexes impose. Another may be the weighting schemes.

Value weighting may cause a particular index to take on the return characteristics of the best-performing hedge funds in a particular time period: As top-performing funds grow through new inflows and high returns and poorly performing funds are closed, the top-performing funds represent an increasing share of the index. Fung and Hsieh (2001) pointed out that the indexes that are value weighted may reflect a given style's popularity with investors because the asset values of the various funds change as a result of asset purchases and price changes. Popularity may reflect the most recent results, creating a momentum effect in returns. Correctly interpreting an index subject to such momentum is problematic for investors.

Equal-weighted indexes may reflect potential diversification of hedge funds better than value-weighted indexes. For funds designed to track equal-weighted indexes, however, the costs of rebalancing to index weights make it difficult to create an investable form.[85]

A number of hedge fund indexes have been created that are investable. Some such indexes have the express goal of tracking a comparable but non-investable index. Exhibit 25 provides a comparison of return and risk characteristics of investable (HFRX) and non-investable (CISDM) indexes. As the exhibit shows, investable indexes tend to provide lower returns and often higher risk than the corresponding non-investable indexes. The creation of a single, all-encompassing hedge fund index that reflects some natural, market-based equilibrium assumption as to the proper holdings of hedge funds and that is appropriate for all purposes does not appear to be feasible. Therefore, many hedge fund investors use custom or negotiated benchmarks.

Exhibit 25 Comparison between Investable and Non-Investable Hedge Fund Indexes, 1996–2015

Performance and Correlations (1996–2015)	Annualized Return	Standard Deviation	Mean Return-to-Volatility Ratio	Maximum Drawdown
CISDM Equal Weight Hedge Fund Index	9.15%	7.36%	1.24	–21.71%
HFRX Equal Weighted Strategies Index	3.80%	4.81%	0.79	–23.55%
CISDM Equity Market Neutral Index	7.38%	2.21%	3.35	–2.79%
HFRX Equity Market Neutral Index	1.34%	3.83%	0.35	–14.93%
CISDM Convertible Arbitrage Index	8.03%	5.00%	1.61	–22.47%
HFRX Convertible Arbitrage Index	1.02%	10.88%	0.09	–60.39%
CISDM Distressed Securities Index	8.70%	5.70%	1.53	–21.22%
HFRX Distressed Securities Index	2.30%	7.08%	0.33	–39.10%
CISDM Event Driven Multi-Strategy Index	8.83%	5.84%	1.51	–20.19%
HFRX Event Driven Index	4.21%	6.71%	0.63	–25.80%
CISDM Merger Arbitrage Index	7.12%	3.26%	2.19	–5.71%
HFRX Merger Arbitrage Index	5.46%	3.42%	1.60	–5.46%
CISDM Equity Long/Short Index	8.88%	7.47%	1.19	–17.21%
HFRX Equity Hedge Index	5.30%	8.09%	0.66	–29.52%

An appropriate benchmark reflects the particular style of an investment manager and can serve as a surrogate for the manager in studies of risk and return performance and asset allocation. Of great concern for investors is whether an index reflects the actual relative sensitivity of hedge funds to various market conditions, so that the index provides information on the true diversification benefits of the underlying hedge fund strategies. Many studies have used both single-factor and multifactor models in identifying market factors and option-like payoffs that describe the sources of hedge fund returns.[86] However, the sensitivity of various hedge fund indexes to these economic factors may change over time, so an index's changing styles and changing assets under management (if the index is asset weighted) may make historical results relative to that index conditional at best.

85 See the HFRX strategy benchmarks at https://www.hedgefundresearch.com.
86 See Fung and Hsieh (1997a); Schneeweis and Pescatore (1999).

Relevance of Past Data on Performance The usefulness of historical hedge fund data is a topic of controversy. Research has shown that the volatility of returns is more persistent through time than the level of returns.[87] This evidence indicates that the best forecast of future returns is one that is consistent with prior volatility, not one that is consistent with prior returns.[88] Interpreting the results of such studies, however, involves a host of methodological concerns.

The composition of hedge fund indexes also changes greatly over time, so the past returns of an index reflect the performance of a different set of managers from today's or tomorrow's set. This issue may be a more severe problem for value-weighted indexes than for equal-weighted indexes because value-weighted indexes are more heavily weighted in the recent best-performing fund(s).

Survivorship Bias Survivorship bias is often raised as a major concern for investors in hedge funds. **Survivorship bias** results when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain. If survivorship bias is large, then the historical return record of the average surviving manager is higher than the average return of all managers over the test period. Because a diversified portfolio would have likely consisted of funds that were destined to fail as well as funds destined to succeed, studying only survivors results in overestimation of historical returns. It is estimated that this bias is in the range of at least 1.5%–3% per year.[89]

Survivorship bias varies among hedge fund strategies. For instance, survivorship bias is minor for event-driven strategies, is higher for hedged equity, and is considerable for currency funds. More importantly, for the largest hedge fund group, equity hedge funds, overestimation of historical performance because of survivorship bias has been previously reported to range from 1.5% to 2%. However, the bias may be concentrated in certain periods (e.g., the period following the August 1998 Long-Term Capital Management crisis). Thus, the levels of survivorship bias exhibited in past data may, depending on economic conditions and strategy, over- or underestimate future bias. Finally, data for US equity hedge funds indicate that for particular hedge fund strategies, although the relative return performance of the "dead" funds was lower than that of the "alive" funds, the survivorship bias may vary greatly among funds, with some non-survivor funds showing no return bias.

Moreover, the problem of survivorship bias may be reduced by conducting superior due diligence. For instance, one explanation for the proliferation of FOFs is that managers of these funds may be able to avoid managers destined to fail, thereby mitigating the survivorship bias problem. Investors may be willing to bear an additional layer of management fees to reduce exposure to the ill-fated managers. As a result, once the FOFs have screened funds, survivorship bias may be reduced significantly.

Stale Price Bias In some asset markets, lack of security trading may lead to what is called **stale price bias**. For securities with stale prices, measured correlations may be lower than expected and, depending on the time period chosen, measured standard deviation may be higher or lower than it would be if actual prices existed.

---

87 See Schneeweis (1998); Park and Staum (1998).

88 The ability of historical data to classify managers into similar trading strategies is still an open question. Fung and Hsieh (1997a) and others have used various factor analytic programs to group managers. In contrast, many fund management companies place managers into relevant groups on the basis of direct evaluation. Future research is required to see which of the relevant methods provides the least bias.

89 See Brown, Goetzmann, and Ibbotson (1999); Fung and Hsieh (2000).

Even in traditional asset markets, prices are often computed from factor models, appraisal values, and so on, so that reported prices do not reflect current market prices. In fact, for some CTAs and hedge fund strategies, reported prices reflect market-traded prices to a greater extent than in many traditional asset portfolios. There is little evidence that stale prices cause a significant bias in hedge fund returns.

Backfill Bias (Inclusion Bias) Backfill bias can result when missing past return data for a component of an index are filled in at the discretion of the component (e.g., a hedge fund, in the case of a hedge fund index) when it joins the index. As with survivorship bias, backfill bias can make results look too good because only components with good past results will be motivated to supply them.[90] The issue of this bias has been raised particularly with respect to certain hedge fund indexes.[91]

EXAMPLE 11

Hedge Fund Benchmarks

CBA, a large charitable organization, is planning to make an investment in one or more hedge funds. Alex Carr, CIO of CBA, is evaluating information prepared by the organization's senior analyst, Kim Park, CFA.

Carr asks Park why a particular US-focused market-neutral long–short hedge fund CBA is considering has resisted accepting a US equity index as a benchmark.

1. Prepare a response to Carr's question to Park.
2. Recommend an alternative to using a stock index benchmark for a market-neutral long–short hedge fund.
3. Discuss the impact the following factors have on index creation with respect to hedge funds:
   - A survivorship bias
   - B value-weighted indexes
   - C stale price bias

Solution to 1:

Market-neutral long–short hedge funds consider themselves to be absolute return vehicles, in that their performance should not be linked to that of the stock market. Such a fund is often presumed to have effectively zero systematic risk.

Solution to 2:

For those hedge funds using absolute return strategies that are indifferent to the direction of the market, a minimum return hurdle rate may be used as a standard for performance.

Solution to 3:

A Survivorship bias occurs when returns of managers who have failed or exited the market are not included in the data analyzed over a specific time frame. This situation results in overestimation of historical returns in the range of 1.5%–3.0% per year. Survivorship bias may be concentrated in certain economic periods, which further complicates analysis of the

90 See Malkiel and Saha (2005) and references therein. Another bias the authors identified is end-of-life bias, which arises from the option a hedge fund has to stop reporting results. One might expect that predominantly poorly performing hedge funds would choose to do that.

91 See Malkiel and Saha (2005).

persistence of returns over shorter time frames. A manager's investment performance reflects not only skill but also the starting point of market opportunities and valuation levels: Such factors constitute age (or vintage) effects in hedge fund performance. Over a long horizon, the starting point should generally decrease in importance. However, many hedge funds have average track records of only two to five years. Age effects make it difficult to compare the performance of hedge funds that have track records of different lengths.

B Indexes that are value weighted, as opposed to equally weighted, may take on the return characteristics of the best-performing hedge funds over a given period. These indexes thus reflect the weights of popular bets by hedge fund managers and popular styles among investors, because the asset values of the various funds change as a result of asset purchases as well as price appreciation.

C Lack of security trading leads to stale prices for those securities and can cause measured standard deviation to be over- or understated, depending on the time period being studied. As a result, measured correlations may be lower than expected. This issue is not a significant concern in the creation of hedge fund indexes because monthly data are used, and for many hedge fund strategies, the underlying holdings are relatively liquid, so positions reflect market-traded prices.

6.3 Hedge Funds: Investment Characteristics and Roles

Hedge funds have been described as skill-based investment strategies. Skill-based investment strategies obtain returns primarily from the firm's competitive advantages in information or its interpretation. To the extent that a hedge fund's returns derive primarily from an individual manager's skill or superior depth of information, those returns may be uncorrelated or weakly correlated with the long-term returns of the traditional stock and bond markets.

The investor needs to keep in mind, however, that the flip side of skill in producing investment success is market opportunity. The supply of market opportunities can and does vary for particular investment strategies as conditions in the investment industry, the economy, and the financial market evolve. To take an obvious example, the opportunities for merger arbitrage hedge funds are heavily influenced by the size, frequency, and regulatory conditions of corporate merger activities.

6.3.1 *Investment Characteristics*

A number of empirical studies have directly assessed the return drivers of traditional and alternative investments. For instance, a common set of factors has been used to explain traditional stock and bond returns.[92] Similarly, academic research indicates that for hedge funds, a common set of return drivers based on trading strategy factors (e.g., option-like payoffs) and location factors (e.g., payoffs from a buy-and-hold policy) help to explain the returns of each strategy.[93]

Results show that, as for traditional "long-bias" stock and bond investments, the returns of some long-bias equity-based and fixed income–based hedge fund strategies are affected primarily by changes in the risk and return of the underlying stock and bond markets. These strategies should therefore be regarded less as portfolio risk diversifiers than as portfolio return enhancers. Hedge fund strategies that attempt

92 See Fama and French (1996).
93 See Fung and Hsieh (1997a); Getmansky, Lee, and Lo (2015).

to be less affected by the direction of the underlying stock and bond markets (e.g., equity market neutral and bond arbitrage) may be regarded more as risk diversifiers for traditional stock and bond portfolios.

Studies that used direct replication of underlying strategies also support the role of market factors and option-like payoff variables (e.g., put options) in describing certain hedge fund strategies.[94] The bottom line is that analysis of the underlying factors used in trading strategies is important, given the investor's economic forecast and market expectations, when deciding which hedge funds to include in a portfolio. Investors may consider allocation to various strategies warranted by economic factors directly driving hedge fund returns and may even consider allocations to new strategies based on new economic conditions that are expected to benefit these new strategies.

6.3.2 *Roles in the Portfolio*

Hedge funds constitute a diverse set of strategies. Because the strategies are skill based, most investors will accord great importance to manager selection. Investors put varying emphasis on style selection. For a given portfolio, the diversification benefits of adding hedge funds in different style groups can be variable.

FOFs have been popular as entry-level investments because they essentially delegate individual manager selection to the FOF manager and provide professional management. They also reduce the due diligence process to a single manager. FOFs may be diversified funds composed of various hedge fund strategies, or they may be "style pure." A significant consideration is that FOF investing involves two layers of management and incentive fees.

Research indicates that an equally weighted diversified portfolio of five to seven randomly selected equity securities will result in a portfolio standard deviation similar to that of the investment population from which it is drawn. Similarly, for hedge funds, a randomly selected equal-weighted portfolio of five to seven hedge funds has a standard deviation similar to that of the population from which it is drawn.[95] Thus, as is true for equity portfolios, multi-manager hedge fund portfolios may have risk levels similar to those of a larger population of hedge funds. Also important is that a portfolio of randomly selected hedge funds has a correlation in excess of 0.90 with a typical hedge fund benchmark. Therefore, a smaller subset of hedge funds can represent the performance of a hedge fund composite index, just as a smaller portfolio of stocks or mutual funds can represent the performance of the S&P 500 or a mutual fund index, respectively.

The Role of Hedge Funds as Diversifiers A first caution is that, as discussed in detail in the reading on asset allocation, the allocations produced by mean–variance optimization (MVO) are sensitive to errors in return estimates. The fact that historical index returns vary among index providers suggests that basing allocations on historical hedge fund index returns in MVO may be unreliable.[96] Hedge fund strategies often have option characteristics that present a further challenge when relying on MVO.

The use of hedge fund indexes in overall asset allocation is based, in part, on the assumption that FOFs created to track certain hedge fund strategies perform similarly to the benchmarks used in asset allocation analysis. In short, there are a number of issues involved in portfolio creation both within and among strategies. These issues

94 See, for example, Hasanhodzic and Lo (2007); Bollen and Fisher (2013).

95 See Henker (1998).

96 It is important to note that the use of historical returns in optimization modeling may not reflect expected risk and return relationships. If factor-based regression models are used to forecast expected rates of return, then the consistency of the sensitivities of various index models to factors is an issue of concern.

include (1) persistence in historical performance, (2) portfolio rebalancing, and (3) the impact of return distribution features beyond mean and standard deviation—that is, "higher moments."

If one assumes that a portfolio tracks the performance of a particular index, then an investor may use hedge fund indexes together with traditional indexes to improve risk–return trade-offs.

Historical Performance The benefit of including hedge funds in diversified portfolios is illustrated in Exhibit 26. For the 2001–2015 period, when hedge funds are added to US stocks, bonds, or a portfolio of US stocks and bonds, the risk-adjusted return improves. For instance, the mean return-to-volatility ratio of a balanced portfolio of US stocks and bonds, 0.74 (Portfolio A), increases to 0.77 when hedge funds are added (Portfolio B). Similarly, when hedge funds are added to a diversified portfolio of equities, bonds, and alternative assets (Portfolio C), the mean return-to-volatility ratio increases from 0.65 to 0.69 (Portfolio D). The correlation between hedge funds and the US stock/bond portfolio (Portfolio A) is 0.78; the correlation between hedge funds and the stock/bond/alternatives portfolio (Portfolio C) is 0.84.

Exhibit 26 Hedge Fund Performance in Portfolios, 2001–2015

Portfolios	A	B	C	D
Annualized return	5.54%	5.63%	5.71%	5.77%
Standard deviation	7.54%	7.29%	8.72%	8.38%
Mean return-to-volatility ratio	0.74	0.77	0.65	0.69
Maximum drawdown	–27.11%	–26.55%	–33.96%	–32.79%
Correlation with hedge funds	0.78	0.82	0.84	0.86
Portfolio A	Equal weights S&P 500 and Bloomberg Barclays US Aggregate Bond Index			
Portfolio B	90% Portfolio A and 10% hedge funds			
Portfolio C	75% Portfolio A and 25% CTAs/commodities/private equity/real estate			
Portfolio D	90% Portfolio C and 10% hedge funds			

Source: Schneeweis, Kazemi, and Bird (2016).

The data in Exhibit 26 indicate that the inclusion of hedge funds can provide mean–variance improvements to portfolios. On the other hand, researchers such as Amin and Kat (2003) have shown that including hedge funds frequently leads to lower skewness and higher kurtosis, which are exactly opposite to the attributes (positive skewness and moderate kurtosis) that investors are presumed to want.[97]

97 See, for example, Dan diBartolomeo, "Understanding the Distribution of Hedge Fund Returns," Northfield Asia Seminars (October 2014): http://www.northinfo.com/documents/627.pdf.

EXAMPLE 12

Skewness and Hedge Funds

In 2002, the S&P 500 dropped by more than 20% and distressed debt hedge funds as a group achieved poor returns. Equity market–neutral funds also achieved poor returns, a result that was explained as relating to lower market liquidity. [98]

1. Explain why distressed debt hedge funds might have performed poorly in 2002.
2. Explain how lower market liquidity might have negatively affected long–short market-neutral hedge funds.

Solution to 1:

Major declines in equity markets lead to widening credit spreads and, all else being equal, to capital losses on high-yield bonds. Distressed debt hedge funds are exposed to the risk of increased credit spreads; these considerations could explain why such funds fared poorly in 2002.

Solution to 2:

Maintaining market neutrality requires dynamic portfolio adjustments. Declines in market liquidity increase the cost of shorting equity markets.

The following are techniques that a portfolio manager might consider for neutralizing negative skewness in a portfolio resulting from hedge fund positions:[99]

- Adopt a mean–variance, skewness- and kurtosis-aware approach to hedge fund selection. An example is given by Kat (2005), who discussed combining global macro and equity market–neutral hedge strategies with traditional assets. Global macro funds have tended to have positive skewness and only moderate correlation with equities but relatively high kurtosis and volatility; equity market–neutral strategies tend to act as volatility and kurtosis reducers in the portfolio. In other words, smart hedge fund selection may be able to reduce the problem of negative skewness.
- Invest in managed futures. Managed futures programs are generally trend following in nature, which tends to produce skewness characteristics that are opposite to those of many hedge funds.

6.3.3 *Other Issues*

In addition to market factors that affect a broad range of investment vehicles, individual fund factors may affect the expected performance of hedge funds. Academic and practitioner research has tested various fund-specific factors—such as onshore/offshore, age, and size—for their impact on manager performance. Results from this research support the following conclusions: (1) Young funds outperform old funds on a total-return basis, or at least old funds do not outperform young ones; and (2) on average, large funds underperform small funds; and (3) returns of FOFs may provide a closer approximation to the actual experience of hedge fund investors than do the returns of hedge fund indexes.[100]

98 This discussion draws on Kat (2005), who also discussed a program of buying and rolling over out-of-the-money stock index put options, which tend to deliver positively skewed returns.
99 This discussion is based on Kat (2005).
100 See Howell (2001); Liang (2000); Fung and Hsieh (2002).

Unfortunately, as in any test of fund effects, one has the problem of disaggregating effects for a large number of funds with different strategies, starting periods, and so on. In fact—although it is not the purpose of this reading to conduct a detailed analysis of each of these effects—the following discussion indicates that simple relationships between hedge fund returns and each of the aforementioned fund factors must be analyzed closely before final conclusions can be made.

- *Performance fees and lock-up impacts*. Periods of severe drawdown (e.g., 1998) may influence funds to dissolve rather than face the prospect of not earning the incentive fees because of HWM provisions. There is some evidence of an impact of lock-up periods on hedge fund performance. In the case of US hedge funds, funds with quarterly lock-ups have higher returns than similar-strategy funds with monthly lock-ups.
- *Funds of funds*. FOF performance may differ from overall hedge fund performance because of various issues, including a less direct impact of survivorship bias on FOFs because hedge funds that dissolve are included in the returns of the FOFs. (There still is some survivorship bias, in that FOFs may remove themselves from datasets because of poor performance, for example.) FOFs may thus offer a more accurate prediction of future fund returns than that provided by the more generic indexes.

  However, classification and style drift are issues with FOFs. A number of FOFs reported as diversified by category differ greatly not only in their correlation with standard indexes but also in their sensitivity to general economic factors. Investors must use factors to test for "style drift" in generic FOFs.

  FOFs that change over time in response to rebalancing may not fit well into strict asset allocation modeling. For instance, new FOFs (US diversified FOFs) starting in the years 1992 onward were found to have lower correlations with FOFs starting in 1991 or earlier, but as time progressed, the correlations increased. This finding indicates that new FOFs are constructed differently from old FOFs, as expected. New FOFs may be more flexible in fund or style selection. As time passes, however, older FOFs can redistribute cash or funds in such a way that they resemble the new FOFs. Thus, simple averaging across FOFs without taking the year of origination into account may not be appropriate.

  Over time, hedge fund correlations with hedged equity have risen and hedge fund correlations with global macro strategies have fallen, indicating a possible increase in FOFs' use of hedged equity and a decrease in the use of global macro. These results suggest that FOFs may be style timing and that FOFs have become less useful in asset allocation strategies because of changes in their factor sensitivity and composition—in contrast to more style-pure hedge fund indexes or strategies.
- *Effect of fund size*. On the one hand, there are potential advantages for a hedge fund to having a large asset base. A large fund may be able to attract and retain more talented people than a small fund and may receive more attention from, for example, its prime broker. On the other hand, a smaller fund may be more nimble. With smaller positions, the market impact cost of its trades may be lower. Depending on the particular strategies pursued, there may be an optimal size for the fund in relation to market opportunities available for its strategy at a given time. The investor should, following the paradigm for due diligence illustrated in Example 2, examine the current market opportunities in relation to the fund's size.

  Research has generally supported the conclusion that, overall, larger funds earn lower mean returns and lower risk-adjusted returns than small funds. However, this relationship of performance to fund size has been found to have exceptions

depending on hedge fund strategy. Because market opportunities and assets under management in a strategy change, the best advice may be to evaluate the effect of fund size on a case-by-case basis. The investor should also investigate differences in mortality rates among hedge funds by size within the strategy.

- *Age (vintage) effects*. The usual performance statistics hide the time dimension of hedge fund performance. Investors should be sensitive to the fact that because of vintage effects, it may be difficult to compare the performance of funds with track records of different lengths. Comparisons with the performance of the median manager of the same vintage in a hedge fund's style group can be revealing.

Hedge Fund Due Diligence Hedge funds have historically been loosely regulated entities without the mandated and often standardized disclosure requirements of other investment vehicles, such as unit trusts in the United Kingdom and mutual funds in the United States. Although hedge funds typically provide an annual audited financial statement and performance review, they rarely disclose their existing portfolio positions. Possible concerns that arise from this lack of disclosure (see Anson 2002a) include the following:

- The authenticity of the hedge fund manager's performance is uncertain if investors cannot independently verify the performance data because of the opacity of the fund's holdings and related pricing.
- Risk monitoring and management are difficult for investors without disclosure of trading and portfolio positions by the hedge fund manager. Without full disclosure of the fund's holdings, investors cannot aggregate risk across their entire investment program to understand the implications at the portfolio level.

Because hedge fund operations and/or strategies may also be somewhat opaque, reducing risk in hedge fund investing starts with due diligence.

Again, the framework for due diligence presented in Example 2—covering market opportunity, investment process, organization, people, terms and structure, service providers, documents, and write-ups—applies here. The investor may interview the hedge fund manager and/or submit a questionnaire. The Alternative Investments Management Association (AIMA) provides the following due diligence checklist as a guide for investors evaluating hedge fund managers.[101] Investors should try to learn the following information:

I. Structure of the hedge fund
  - **a** Legal entity: type and ownership structure
  - **b** Name and address of hedge fund manager
  - **c** Domicile: onshore or offshore
  - **d** Branch offices or other locations (and their functions)
  - **e** Regulatory registrations (e.g., investment adviser or commodity trading adviser)
  - **f** Personnel: responsible officers and employees (including their biographies)
  - **g** Auditors, legal counsel, and prime broker information

II. Strategy of the hedge fund
  - **a** Style (e.g., event driven, global macro)
  - **b** Instruments used under each strategy (e.g., which derivatives)

101 See www.aima.org.

- **c** Benchmark, hurdle rate, high-water mark, etc.
- **d** Competitive niche or any unique aspects of the fund
  - **i.** The source of investment ideas or strategy
  - **ii.** How the strategy works under different market conditions
  - **iii.** Market conditions under which the strategy works best
  - **iv.** Any capacity constraint for the strategy
- **e** Current investments: types and positions

III. Performance data
- **a** List of all funds and performance since inception
- **b** Information on the performance of the funds with explanations

IV. Risk
- **a** What are the risks and how are they measured and managed? Which personnel are involved in risk management?
- **b** Specific risk-control measures, if any (e.g., position limits, derivatives, counterparty credit limits)
- **c** Past, current, and future use of leverage

V. Research
- **a** Any change in strategy in the past resulting from research findings
- **b** Efforts put into research for investment/trading ideas
- **c** Budget and personnel (internal and external) for research

VI. Administration
- **a** Lawsuits, litigations, regulatory actions against the fund or its managers
- **b** Significant employees and employee turnover
- **c** Personnel arrangement for the account: responsible account executive
- **d** Disaster recovery plan

VII. Legal
- **a** Fee structure: management and incentive fees (Is a high-water mark applicable?)
- **b** Lock-up
- **c** Subscription amount: maximum and minimum
- **d** Drawback provision

VIII. References
- **a** Professional: auditor, prime broker, legal counsel
- **b** Existing investors

EXAMPLE 13

An Investor Does Due Diligence on a Hedge Fund

Alois Winkelmann is conducting due diligence on a US-based hedge fund, Tricontinent Investors, for the Malvey Charitable Trust (MCT). Among the facts Winkelmann gathers are the following:

Structure

The fund employs three people—the two principals, Bryce Smith and Henrietta Duff, and an administrative assistant. Smith's prior work experience includes 10 years as an equity analyst at North Country Trust Company and, prior to that, 3 years as an associate in a Syracuse, New York, law firm. He holds a BBA and an LLB. Duff worked for three years as an equity growth fund manager at a medium-size mutual fund complex. Prior to that, she was a corporate finance associate at a leading investment bank. Duff holds an AB in English and an MBA with a concentration in finance. The fund's relationship with its prime broker extends back two years. The fund has used only one prime broker since it was formed. The prime broker is a prestigious firm ranked number two among prime brokerage businesses.

Hedge Fund Strategy

- The fund invests in both fixed-income and equity markets.
- The fund buys US 10-year Treasury notes and borrows short term abroad in markets that have particularly low interest rates to earn, currently, a positive spread.
- The fund conducts merger arbitrage involving the securities of the target and the acquirer.

Legal

The fund has a 1 and 20 fee structure and a two-year lock-up period.

Using only the information supplied, identify and discuss the risk factors in this hedge fund investment.

Solution:

- The firm is a small shop with limited management and research resources.
- The hedge fund has only a two-year track record available for evaluation.
- Neither principal has prior experience in either fixed-income investing or merger arbitrage, although Duff's investment banking background and Smith's legal experience may be relevant.
- The fixed-income strategy could become unprofitable if the US dollar weakens against the currencies of the markets in which Tricontinent is borrowing short term.
- The fixed-income strategy could become less profitable or unprofitable if the spread between long-term and short-term interest rates decreases.
- Given the liquidity of the underlying assets, a two-year lock-up may be considered excessive.

6.4 Performance Evaluation Concerns

The reading on evaluating portfolio performance covers the basic concepts of performance evaluation, including the components of performance measurement, performance attribution, and performance appraisal. This section provides further comments and illustrations in the context of hedge funds. In reviewing the performance of a hedge fund, some factors an investor needs to consider are

- the returns achieved;
- volatility (not only standard deviation but also downside volatility);

- what performance appraisal measures to use;
- correlations (to gain information on diversification benefits in a portfolio context);
- skewness and kurtosis (because these affect risk and may qualify the conclusions drawn from a performance appraisal measure); and
- consistency (including the period specificity of performance).

Returns Hedge funds typically report data to hedge fund data providers monthly, and the default compounding frequency for hedge fund performance evaluation and reporting is monthly. The rate of return reported by hedge funds is the nominal monthly holding-period return, computed as follows:

Rate of return = [(Ending value of portfolio) – (Beginning value of portfolio)]/ (Beginning value of portfolio)

These returns are typically compounded over 12 monthly periods (or 4 periods if the data are reported quarterly) to obtain the annualized rate of return. The reporting and compounding frequency can materially affect hedge funds' apparent performance for a number of reasons, including the following:

- Many hedge funds allow entry into or exit out of their funds quarterly or even less frequently.
- In calculating drawdowns, no compounding is typically applied to the loss.

The issues of leverage and derivatives in return calculation also arise in hedge fund performance evaluation. The calculation convention followed in the hedge fund industry is to "look through" the leverage as if the asset were fully paid. Thus, as the beginning value in the above equation for rate of return, the return on a levered position is based on the amount actually paid plus any borrowing used to fund the purchase. The ending value is, of course, calculated on a consistent basis. Thus, leverage affects the weighting of an asset in the portfolio but not the return on the individual asset. The same principle of deleveraging applies to the computation of the rate of return when derivatives are included in the hedge fund portfolio.[102]

Investors sometimes examine the rolling returns to a hedge fund. The **rolling return**, *RR*, is simply the moving average of the holding-period returns for a specified period that matches the investor's time horizon (e.g., a calendar year). For example, if the investor's time horizon is 12 months, the rolling return would be calculated using

$$RR_{n,t} = (R_t + R_{t-1} + R_{t-2} + \ldots + R_{t-(n-1)})/n$$

so

$$RR_{12,t} = (R_t + R_{t-1} + R_{t-2} + \ldots + R_{t-11})/12$$

Rolling returns provide some insight into the characteristics of returns. In particular, they show how consistent the returns are over the investment period and identify any cyclicality in the returns.

Volatility and Downside Volatility As in traditional investments, the standard deviation of returns is a common measure of risk in hedge fund performance. The standard deviation of hedge fund returns is computed in the usual fashion and is typically

102 Because derivatives require only a good faith deposit, which is interest yielding, there is minimal real capital investment involved. The computed rate of return under the assumption that the full value of the derivatives constitutes the investment base is, at best, a pseudo rate of return. Yau, Savanayana, and Schneeweis (1990) examined the impact of different rates of return of derivative investments based on differing computations of the rates of return and found significantly different results in portfolio optimization and hedging programs.

based on monthly returns. The annualized standard deviation is usually computed as the standard deviation of the monthly return times the square root of 12, making the assumption of serially uncorrelated returns. The use of the standard deviation of monthly returns as a measure of risk also makes the implicit assumption that returns follow a normal distribution, at least to a close approximation. As already mentioned, however, hedge funds appear to have more instances of extremely high and extremely low returns than would be expected with a normal distribution (i.e., positive excess kurtosis), and some funds also display meaningful skewness. When those conditions hold, standard deviation incorrectly represents the actual risk of a hedge fund's strategy.

Downside deviation, or semideviation, is an alternative risk measure that mitigates one criticism of standard deviation, namely, that it penalizes high positive returns. Downside deviation computes deviation from a specified threshold (i.e., below a specified return, r^*); only the negative deviations are included in the calculation. The threshold can be zero (separating gains from losses) or the prevailing short-term rate or any rate chosen by the user. Semideviation uses the average monthly return as the threshold. Once the threshold is determined, the computation resembles that of the standard deviation. Using downside deviation instead of standard deviation recognizes a distinction between good and bad volatility:

$$\text{Downside deviation} = \sqrt{\frac{\sum_{t=1}^{n}\left[\min\left(r_t - r^*, 0\right)\right]^2}{n-1}}$$

where min(A,B) means "A or B, whichever is smaller."

Another popular risk measure relates to drawdowns. As discussed in the reading on risk management, a drawdown in the field of hedge fund management is the difference between a portfolio's point of maximum net asset value for the period (its high-water mark) and any subsequent low point (until new "high water mark" is reached). *Maximum* drawdown is the largest difference between a high-water point and a subsequent low.[103] A portfolio may also be said to be in a position of drawdown during the period between a decline from a high-water mark and the point at which a new high-water mark is reached. How long this period lasts is relevant to evaluating a hedge fund's performance—in particular, its record of recovering from losses.

Performance Appraisal Measures The most extensively used industry measure to date has been the Sharpe ratio, which measures the average amount of return in excess of the risk-free rate per unit of standard deviation of return. The reading on evaluating portfolio performance gives a definition and a discussion, but we may present the Sharpe ratio as follows, with reference to the *ex post* performance in a given year:

Sharpe ratio = (Annualized rate of return – Annualized risk-free rate)/
Annualized standard deviation

In this application, a one-year T-bill yield is usually used to represent the annualized risk-free rate.

The Sharpe ratio has a number of limitations that the hedge fund investor needs to understand:

- The Sharpe ratio is time dependent; that is, the overall Sharpe ratio increases proportionally with the square root of time. An annual Sharpe ratio will therefore be $\sqrt{12}$ bigger than a monthly Sharpe ratio if returns are serially uncorrelated.[104]

103 See Lhabitant (2002, p. 254).
104 See Lhabitant (2004).

- It is not an appropriate measure of risk-adjusted performance when the investment has an asymmetrical return distribution, with either negative or positive skewness.[105]
- Illiquid holdings bias the Sharpe ratio upward.
- Sharpe ratios are overestimated when investment returns are serially correlated (i.e., when returns trend), which causes a lower estimate of the standard deviation. This occurs with certain hedge fund strategies that may have a problem with stale pricing or illiquidity. Distressed and emerging market securities may be examples.
- The Sharpe ratio is primarily a risk-adjusted performance measure for standalone investments and does not take into consideration the correlations with other assets in a portfolio.
- The Sharpe ratio has not been found to have predictive ability for hedge funds in general. Being a "winner" according to the Sharpe ratio over a past period cannot be relied on to predict future success.
- The Sharpe ratio can be gamed; that is, the reported Sharpe ratio can be increased without the investment really delivering higher risk-adjusted returns. Specifically, Spurgin (2001) demonstrated the following means of gaming the Sharpe ratio:
  1. Lengthening the measurement interval. This will result in a lower estimate of volatility; for example, the annualized standard deviation of daily returns is generally higher than the weekly, which, in turn, is higher than the monthly.
  2. Compounding the monthly returns but calculating the standard deviation from the uncompounded monthly returns.
  3. Writing out-of-the-money puts and calls on a portfolio. This strategy can potentially increase the return by collecting the option premium without paying off for several years. Strategies that involve taking on default risk, liquidity risk, or other forms of catastrophe risk have the same ability to report an upwardly biased Sharpe ratio. (Examples are the Sharpe ratios of market-neutral hedge funds before and after the 1998 liquidity crisis.) This approach is similar to trading negative skewness for a greater Sharpe ratio by improving the mean or standard deviation of the investment.[106]
  4. Smoothing returns. Using certain derivative structures, infrequent marking to market of illiquid assets, and pricing models that understate monthly gains or losses can reduce reported volatility.
  5. Getting rid of extreme returns (best and worst monthly returns each year) that increase the standard deviation. Operationally, this strategy entails a total-return swap: One pays the best and worst returns for one's benchmark index each year, and the counterparty pays a fixed cash flow and hedges the risk in the open market. If swaps are not available, one can execute this strategy directly with options.

105 A number of researchers insist that the Sharpe ratio should be interpreted together with the higher moments of the return distribution. For example, Brooks and Kat (2002) found that high Sharpe ratios tend to go together with negative skewness and high kurtosis.

106 See Spurgin (2001) and Anson (2002a) for theoretical proofs and examples.

The **Sortino ratio** replaces standard deviation in the Sharpe ratio with downside deviation. Instead of using the mean rate of return to calculate the downside deviation, this approach typically uses the investor's minimum acceptable return (some practitioners use the risk-free rate instead). The reading on risk management has further comments on this measure. The Sortino ratio is calculated as follows:

Sortino ratio = (Annualized rate of return
– Annualized minimum acceptable return)/Downside deviation

The **gain-to-loss ratio** measures the ratio of positive returns to negative returns over a specified period of time. The higher the gain-to-loss ratio (in absolute value), the better:

Gain-to-loss ratio = (Number of months with positive returns/
Number of months with negative returns) ×
(Average up-month return/Average down-month return)

In addition, two major appraisal measures based on drawdowns as indicators of risk, the Calmar ratio and the Sterling ratio, have been applied to hedge fund analysis.[107]

Correlations Correlations provide information about portfolio diversification. However, correlations are most meaningful when assets' or strategies' returns are normally distributed. This fact is an additional reason to consider skewness and kurtosis.

Skewness and Kurtosis To review, skewness is a measure of asymmetry in the distribution of returns. A symmetrical distribution has a skewness of zero; all else being equal, a positive value of skewness is desirable. Kurtosis measures the relative incidence of returns clustered near the mean return versus returns extremely far away from the mean. If one investment has higher kurtosis than another, it tends to have more instances of extreme returns.

Consistency Another element in evaluating hedge funds is consistency of results. Consistency analysis is most relevant when comparing funds of the same style or strategy. It is important to look at the number of months that the strategy has had positive (or negative) returns, the number of months that the strategy has had positive (negative) returns when the market is up (down), and the average monthly returns in up and down markets. For consistency, a fund should have a greater percentage of positive returns and a lower percentage of negative returns than the benchmark in all market conditions. We will illustrate this concept with the data given in Exhibit 27. In computing the rolling returns, the relevant holding period for the investor is assumed to be six months. This assumption is simply for illustration purposes. In practice, the rolling returns should match the investor's investment horizon.

107 The **Calmar ratio** is the compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period. Frequently, the time horizon is set at three years (36 months), but if three years of data are not available, the available data are used. The **Sterling ratio** is the compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%. To calculate this average yearly drawdown, the data period is divided into 12-month periods, the maximum drawdown is calculated for each, and the results are averaged. The convention for the time horizon follows that of the Calmar ratio.

Exhibit 27 Hypothetical Hedge Fund Consistency Data

Month	Hedge Fund Return (%)	Index Return (%)	(HF Return – Hurdle Rate)^2	(Index Return – Hurdle Rate)^2	1+ HF Return	1+ Index Return	Rolling Six-Month Return of HF	Rolling Six-Month Return of Index
January	2.5	1.0	0.0000	0.0000	1.0250	1.0100		
February	1.5	1.3	0.0000	0.0000	1.0150	1.0130		
March	–1.0	–1.6	2.0070	4.0671	0.9900	0.9840		
April	–1.2	–2.4	2.6137	7.9338	0.9880	0.9760		
May	–1.0	–4.2	2.0070	21.3139	0.9900	0.9580		
June	0.9	2.0	0.0000	0.0000	1.0090	1.0200	0.0028	–0.0065
July	–1.0	2.5	2.0070	0.0000	0.9900	1.0250	–0.0030	–0.0040
August	0.7	–2.1	0.0000	6.3338	1.0070	0.9790	–0.0043	–0.0097
September	1.1	2.0	0.0000	0.0000	1.0110	1.0200	–0.0008	–0.0037
October	2.1	0.5	0.0000	0.0000	1.0210	1.0050	0.0047	0.0012
November	1.5	3.1	0.0000	0.0000	1.0150	1.0310	0.0088	0.0133
December	1.5	0.2	0.0000	0.0470	1.0150	1.0020	0.0098	0.0103
Sum	7.6	2.3	8.6347	39.6956				
Mean	0.63	0.19					0.0026	0.0001
Product					1.0777	1.0203		

Notes: The hurdle rate is 5% per year or 0.4167% per month. Deviation from the hurdle rate squared is computed if the fund/index return is less than the hurdle rate; otherwise, it will be equal to zero. The rolling six-month return is computed as $RR_t = (R_t + R_{t-1} + \ldots + R_{t-5})/6$.

Exhibit 28 shows the computation of the performance statistics of a hypothetical hedge fund for 12 months from the data given in Exhibit 27.

Exhibit 28 Return and Risk Calculations

	Hedge Fund	Index
1. Return		
Total fund return = $[(1 + r_1)(1 + r_2)\ldots(1 + r_{12})] - 1 = 1.0777 - 1 = 0.0777$		
Total index return = 1.0203 – 1 = 0.0203	7.77%	2.03%
Geometric mean per year:		
Fund = $(1.0777^{1/12} - 1) \times 12 = 7.51\%$		
Index = $(1.0203^{1/12} - 1) \times 12 = 2.01\%$	7.50%	2.02%
Rolling six-month returns mean = $(RR_{6,1} + RR_{6,2} + RR_{6,3} + RR_{6,4} + RR_{6,5} + RR_{6,6} + RR_{6,7})/7$		
where $RR_{6,t} = (R_t + R_{t-1} + R_{t-2} + R_{t-3} + R_{t-4} + R_{t-5})/6$		
Fund = (0.0028 – 0.0030 – 0.0043 – 0.0008 + 0.0047 + 0.0088 + 0.0098)/7 = 0.0026		
Index = (–0.0065 – 0.0040 – 0.0097 – 0.0037 + 0.0012 + 0.0133 + 0.0103)/7 = 0.0001	0.26%	0.01%
Rolling six-month returns (max)	0.98%	1.33%
Rolling six-month returns (min)	–0.43%	–0.97%
2. Risk		

(continued)

Exhibit 28 (Continued)

	Hedge Fund	Index
Annualized standard deviation	4.62%	7.87%
Annualized downside deviation:		
Hurdle rate = 5% per year		
$\text{Fund} = \sqrt{8.6348/(12-1)} \times \sqrt{12} = 3.07$		
$\text{Index} = \sqrt{39.6955/(12-1)} \times \sqrt{12} = 6.58$	3.07%	6.58%
3. Appraisal		
Sharpe ratio (per year) = (Return – 5%)/Standard deviation:		
Fund = (7.5 – 5)/4.62 = 0.54		
Index = (2.02 – 5)/7.87 = –0.38	0.54	–0.38
Sortino ratio (per year) = (Return – 5%)/Downside deviation:		
Fund = (7.5 – 5)/3.07 = 0.81		
Index = (2.02 – 5)/6.58 = –0.45	0.81	–0.45
Gain/Loss:		
Fund = (1.475/–1.05) × (8/4) = –2.81		
Index = (1.575/–2.575) × (8/4) = –1.22	–2.82	–1.22
4. Consistency		
Number of months	12	12
Number of positive months	8	8
Percentage of positive months	66.67%	66.67%
Average return in up-months	1.48%	1.58%
Number of negative months	4	4
Percentage of negative months	33.33%	33.33%
Average return in down-months	–1.05%	–2.58%
Average monthly return in index up-months:		
Fund = (2.5 + 1.5 + 0.9 – 1.0 + 1.1 + 2.1 + 1.5 + 1.5)/8 = 1.263.		
Index = (1.0 + 1.3 + 2.0 + 2.5 + 2.0 + 0.5 + 3.1 + 0.2)/8 = 1.575.	1.26%	1.58%
Average monthly return of hedge fund in index down-months = (–1.0 – 1.2 – 1.0 + 0.7)/4 = –0.625.	–0.63%	–2.58%
5. Correlation between Fund and Index Returns—12 Months		**0.53**

Note: The arithmetic means used in the computation of standard deviation were computed as 0.63% and 0.19% for, respectively, the fund and the index.

7 MANAGED FUTURES

Managed futures have been an investment alternative since the late 1960s. More recently, such institutional investors as corporate and public pension funds, endowments, trusts, and bank trust departments have been including managed futures as one segment of a well-diversified portfolio.

Managed futures are private pooled investment vehicles or separate accounts that can invest in the futures markets for the benefit of their investors and have the ability to use leverage in a wide variety of trading strategies. Like hedge funds, managed futures programs are actively managed. Similar to hedge funds, with which they are often grouped, managed futures programs are often structured as limited partnerships open only to accredited investors (institutions and high-net-worth individuals) but can be offered as separate accounts. Compensation arrangements for managed futures programs are also similar to those of hedge funds. The primary difference between hedge funds and managed futures is that, for the most part, managed futures trade exclusively in derivatives markets (futures or options on futures markets) whereas hedge funds tend to be more active in spot markets while using futures markets for hedging. Because hedge funds often trade in individual securities whereas managed futures programs trade market-based futures and options on futures contracts on broader or more generic baskets of assets, hedge funds can be viewed as concentrating on inefficiencies in micro (security) stock and bond markets whereas managed futures look for return opportunities in macro (index) stock and bond markets. In addition, in some jurisdictions, managed futures programs have been historically more highly regulated than hedge funds or have different legal and tax standards.

7.1 The Managed Futures Market

Managed futures programs are an industry comprising specialist professional money managers. In the United States, such programs are run by general partners known as commodity pool operators (CPOs), who either serve as or have hired professional commodity trading advisers to manage money in the pool. CTAs can also offer strategies via separate accounts. In the United States, both CPOs and CTAs are registered with the US Commodity Futures Trading Commission (CFTC) and the National Futures Association (NFA, a self-regulatory body).

7.1.1 *Types of Managed Futures Investments*

Managed futures have been described as skill-based investment strategies. Skill-based strategies obtain returns from the unique skill or insight of the trader. Like hedge funds, managed futures have also been described as absolute return strategies.

In addition to private commodity pools, managed futures programs are also available in separately managed accounts (sometimes known as "CTA managed accounts"). Publicly traded commodity funds open to smaller investors are also available. Managed futures programs may use a single manager or multiple managers.

Managed futures funds share the compensation structure of hedge funds, consisting of a management fee plus an incentive fee, with a 2 plus 20 arrangement the most common structure.

Managed futures are often classified into subgroups on the basis of investment style (e.g., systematic or discretionary), markets traded (e.g., currency or financial), or trading strategy (e.g., trend following or contrarian). Managed futures are at times viewed as a subset of global macro hedge funds, in that they also attempt to take advantage of systematic moves in major financial and non-financial markets, primarily through trading futures and related option contracts.

The trading strategies of managed futures include the following:

- *Systematic trading strategies* primarily follow a rule-based trading model, usually based on past prices. Most systematic CTAs invest by using a trend-following program, although some trade according to a contrarian, or counter-trend, program. In addition, trend-following CTAs may concentrate on short-term trends, medium-term trends, long-term trends, or a combination thereof.
- *Discretionary trading strategies* trade financial, currency, and commodity futures and related options. Unlike systematic strategies, they involve portfolio manager judgment. Discretionary trading models include those based on quantitative fundamental economic data and on trader beliefs. Traders often use multiple criteria in making trading decisions.

Managed futures programs may be classified according to the markets emphasized in trading:

- *Financial* (financial futures/options and currency futures/options)
- *Currency* (currency futures/options)
- *Diversified* (financial futures/options, currency futures/options, and physical commodity futures/options)

A market classification can also be used to distinguish subcategories of systematic and discretionary trading strategies.

7.1.2 *Size of the Managed Futures Market*

Worldwide, the managed futures industry has grown from less than US$1 billion under management in 1980 to approximately US$327 billion under management in 2015.[108] To put this last figure in perspective, consider that the managed futures industry is probably close to 10% the size of the hedge fund industry as judged by assets under management.

7.2 Benchmarks and Historical Performance

The benchmarks for managed futures are similar to those for hedge funds, in that indexes represent the performance of a group of managers with a similar trading strategy or style.

7.2.1 *Benchmarks*

Investable benchmarks for actively managed derivative strategies exist. Such indexes replicate the return to a mechanical, trend-following strategy in a number of financial and commodity futures markets. For example, the Mount Lucas Management Index takes both long and short positions in a number of futures markets based on a technical (moving-average) trading rule that is, in effect, an active momentum strategy.

The BarclayHedge and CISDM CTA trading strategy benchmarks are examples of benchmarks based on peer groups of CTAs. The equal-weighted CISDM CTA Equal Weighted Index reflects manager returns for all reporting managers in the CISDM CTA database. The Barclay Traders indexes include indexes for systematic and discretionary strategies and for groups based on market emphasis (financial/metals, currency, agricultural, diversified). For example, the Barclay Systematic Traders Index may include financial/metals, currency, agricultural, and diversified systematic CTAs.

108 These figures do not include the large number of funds traded through hedge funds (e.g., global asset allocators) or proprietary trading desks of large investment houses, insurance companies, and banks that use strategies similar to those of independent CTAs. The estimate is from Barclays Trading Group.

7.2.2 *Historical Performance*

The performance of managed futures on an individual basis and as a group is of interest. As Exhibit 29 shows, on a portfolio basis, for the 1996–2015 period, the volatility of the CISDM CTA index (8.5%) was less than that of the S&P 500 (15.3%) but greater than that of the Bloomberg Barclays US Aggregate Bond Index (3.5%). The mean return-to-volatility ratio for the CTA index was better than that of equities but not better than that of bonds. Exhibit 30 shows the performance of CTAs in 2008, during the global financial crisis. While the CTA index exhibited large positive returns in 2008 with a moderate standard deviation, the other indexes (with the exception of bonds) exhibited large negative returns and generally very high volatility. It is worth noting that the correlations of the CISDM CTA index with the equity, private equity, and real estate indexes were very negative in 2008.

Exhibit 29 CTA Performance, 1996–2015

Stock, Bond, and CTA Performance	S&P	Bloomberg Barclays US Aggregate	CISDM CTA EW
Annualized total return	8.2%	5.3%	7.2%
Annualized standard deviation	15.3%	3.5%	8.5%
Mean return-to-volatility ratio	0.53	1.54	0.85
Maximum drawdown	–50.9%	–3.8%	–11.9%
Correlation with CTA index	–0.06	0.27	1.00

Alternative Asset Performance	Commodities	Hedge Fund	Real Estate	Private Equity
Annualized total return	–1.0%	9.2%	10.3%	8.2%
Annualized standard deviation	22.8%	7.4%	19.5%	27.2%
Mean return-to-volatility ratio	–0.04	1.24	0.53	0.30
Maximum drawdown	–79.4%	–21.7%	–67.9%	–80.4%
Correlation with CTA index	0.14	0.74	0.02	–0.06

Source: Schneeweis, Kazemi, and Tolivaisa (2016).

Exhibit 30 CTA Performance in 2008

Stock, Bond, and CTA Performance	S&P 500	Bloomberg Barclays US Aggregate	CISDM CTA EW
Total return	–37.0%	5.2%	21.8%
Standard deviation	21.0%	6.1%	10.6%

(continued)

Exhibit 30 (Continued)

Stock, Bond, and CTA Performance	S&P 500	Bloomberg Barclays US Aggregate	CISDM CTA EW
Maximum drawdown	–37.7%	–3.8%	–4.4%
Correlation with CTA index	–0.50	–0.12	1.00

Alternative Asset Performance	Commodities	Hedge Fund	Real Estate	Private Equity
Total return	–46.5%	–19.2%	–37.3%	–64.1%
Standard deviation	42.9%	11.0%	43.4%	38.1%
Maximum drawdown	–62.2%	–19.9%	–49.2%	–64.1%
Correlation with CTA index	0.13	–0.02	–0.49	–0.40

Source: Schneeweis, Kazemi, and Tolivaisa (2016).

Exhibit 31 displays the correlations among CTA investment strategies, which range from moderate to highly positive. The correlation of systematic with discretionary is among the lowest at 0.48. In general, the correlations among CTA strategies appear to be influenced by the degree to which the strategies are systematic or discretionary. The overall CTA equal-weighted index is highly correlated with diversified, financial, and systematic strategies and distinctly less correlated with currency and discretionary strategies.

Exhibit 31 Correlations of CISDM CTA Universe Strategies, 1996–2015

Correlations	CTA Index (EW)	Currency	Diversified	Financials	Discretionary	Systematic	Average Correlations
CISDM CTA Equal Weighted Index	1.00	0.59	0.96	0.85	0.53	0.96	**0.78**
Barclay CTA Asset Weighted Currency Index	0.59	1.00	0.55	0.61	0.30	0.62	**0.53**
Barclay CTA Asset Weighted Diversified Index	0.96	0.55	1.00	0.83	0.55	0.98	**0.77**
Barclay CTA Asset Weighted Financials Index	0.85	0.61	0.83	1.00	0.43	0.88	**0.72**
Barclay CTA Asset Weighted Discretionary Index	0.53	0.30	0.55	0.43	1.00	0.48	**0.46**
Barclay CTA Asset Weighted Systematic Index	0.96	0.62	0.98	0.88	0.48	1.00	**0.78**
Average Correlations	**0.78**	**0.53**	**0.77**	**0.72**	**0.46**	**0.78**	
S&P 500 Total Return Index	–0.06	0.03	–0.12	–0.08	0.05	–0.10	**–0.05**
Bloomberg Barclays US Aggregate Bond	0.27	0.16	0.25	0.39	0.03	0.29	**0.23**
Bloomberg Barclays US Corporate High Yield	–0.09	–0.03	–0.14	–0.10	–0.04	–0.13	**–0.09**

Source: Schneeweis, Kazemi, and Tolivaisa (2016).

Exhibit 32 complements the information provided in Exhibits 29 and 30 by adding performance information on investable CTA indexes, including correlations with US equity and bond indexes. Across investable CTA indexes, correlations with US equities and US bonds are low and in some instances negative.

Exhibit 32 Performance of CISDM CTA Universe Strategies and Traditional Assets, 2004–2015

2004–2015		Mean Return to Volatility					Correlation with			
Performance and Correlations	Annualized Return	Deviation	Ratio	Maximum Drawdown	Skew	Kurtosis	CISDM CTA EW	S&P 500	Bloomberg Barclays US Aggregate	Bloomberg Barclays High Yield
CISDM CTA Equal Weighted Index	5.66%	8.03%	0.71	–0.12	0.49	–0.03	1.00	0.05	0.13	–0.06
Credit Suisse/ Tremont Investable Managed Futures Index	3.98%	11.11%	0.36	–0.17	0.00	–0.86	0.92	0.09	0.18	–0.04
MLM Index monthly total return	2.32%	5.68%	0.41	–0.09	0.70	4.76	0.58	–0.28	0.06	–0.36

Source: Schneeweis, Kazemi, and Tolivaisa (2016).

7.2.3 *Interpretation Issues*

In evaluating historical managed futures return data, the investor should be aware of the upward bias that survivorship can impart. Research has found return differences on the order of 3.5% between the surviving CTAs and the full sample that includes defunct CTAs.[109] The differential performance between survivor and non-survivor samples (on an absolute basis and on a risk-adjusted basis) comes chiefly from differences in return performance in the months just prior to CTA dissolution. The ability of investment professionals to forecast which managers may not survive could result in dramatic differences in investment results.[110]

7.3 Managed Futures: Investment Characteristics and Roles

Similar to hedge funds, managed futures are active skill-based strategies that investors can evaluate for the potential to improve a portfolio's risk and return characteristics. In the following sections, we present more details on these investments.

109 See Fung and Hsieh (1997b); McCarthy, Schneeweis, and Spurgin (1996).
110 For research in the area of manager default, see Diz (1999).

7.3.1 *Investment Characteristics*

This discussion of investment characteristics will focus on the market opportunities that may be exploited by CTAs. Derivatives markets are zero-sum games.[111] As a result, the long-term return to a passively managed, unlevered futures position should be the risk-free return on invested capital less management fees and transaction costs. For derivatives-based investment strategies like managed futures to produce excess returns, on average, there must be a sufficient number of hedgers or other users of the markets who systematically earn less than the risk-free rate. (Hedgers, for example, may pay a risk premium to liquidity providers for the insurance they obtain.) If that condition is met, managed futures as a whole may be able to earn positive excess returns (i.e., be the winning side in the zero-sum transactions).

The zero-sum nature of derivatives markets also does not restrict CTAs from attempting to conduct arbitrage when relationships are out of equilibrium. Institutional characteristics and differential carrying costs among investors may permit managed futures traders to take advantage of short-term pricing differences between theoretically identical stock, bond, futures, options, and cash market positions. CTAs may also attempt to take advantage of the opportunity to trade in trending markets.

Most actively managed futures traders follow momentum strategies. In equity markets, research has begun to support the notion that short-term momentum-based strategies may be able to produce excess returns; the evidence related to the opportunities in futures markets is less well developed.[112] Government policy intervention in interest rate and currency markets may cause trending in currency and fixed-income markets. Some corporate risk management approaches may result in trading that creates short-term trending. Trading techniques based on capturing these price trends, whatever the source, may be profitable. There is also evidence that momentum trading imparts the desirable characteristic of positive skewness to managed futures returns.

Because of the ease with which futures traders take short positions, these traders can attempt to earn positive excess returns in falling as well as rising markets. Some of the most impressive periods of CTA performance have been during periods of poor performance in the equity markets (e.g., October 1987). Access to options markets permits managed futures and hedge fund traders to create positions that attempt to exploit changes in the market volatility of the underlying asset (volatility being one of the determinants of option value). Such strategies are not available to investors who are restricted to using cash markets.

Because managed futures can replicate many strategies available to a cash market investor at a lower cost—and permit strategies that are unavailable to cash investors—factor models for this group must include the factors that may be unique to managed futures and hedge fund trading opportunities.[113] To the degree that managed futures returns and stock/bond returns are explained by different factors, managed futures may provide investors with exposure to unique sources of return. The presence of such risk factors also provides an economic rationale for managed futures' diversification capabilities when added to a portfolio of equities and bonds.

7.3.2 *Roles in the Portfolio*

As for the other alternative investments, we now offer historical evidence on the potential of managed futures as part of a portfolio. Managed futures appear to be useful in diversifying risk even in a diversified portfolio of stocks, bonds, and hedge funds.

---

111 The term "zero sum" refers to the fact that derivatives markets reallocate uncertain cash flows among market participants without enhancing aggregate cash flows in any way. See Gastineau and Kritzman (1999).

112 See Lee and Swaminathan (2000) and references therein for the evidence on momentum strategies in US equity markets.

113 For a discussion of whether managed futures returns are the natural result of market forces or are based primarily on trader skill, see Schneeweis and Spurgin (1996).

Exhibit 33 shows that, for the period 1996–2015, managed futures would have been a valuable addition to a stock/bond/hedge fund portfolio in relation to both US and global stocks and bonds. The mean return-to-volatility ratios of Portfolios B and D, which include a 10% investment in managed futures, dominate those of the portfolios invested only in stocks, bonds, and alternative investments.

Exhibit 33 Managed Futures Performance in Portfolios, 1996–2015

Portfolio	A	B	C	D
Annualized return	7.1%	7.2%	7.35%	7.41%
Standard deviation	7.8%	7.1%	8.9%	8.1%
Mean return-to-volatility ratio	0.91	1.01	0.83	0.92
Maximum drawdown	–27.1%	–22.9%	–36.0%	–31.3%
Correlation with CTA index	0.00	0.12	0.02	0.13
Portfolio A	Equal weights S&P 500 and Bloomberg Barclays US Aggregate Bond Index			
Portfolio B	90% Portfolio A and 10% CISDM CTA EW Index			
Portfolio C	75% Portfolio A and 25% hedge funds/commodities/private equity/real estate			
Portfolio D	90% Portfolio C and 10% CISDM CTA EW Index			

Source: Schneeweis, Kazemi, and Tolivaisa (2016).

The performance of managed futures has also been examined in the peer-reviewed literature. The conclusions appear to be investment vehicle dependent and, to some extent, time period and strategy dependent. On the one hand, a number of studies found that publicly traded commodity funds have been poor investments, whether on a stand-alone basis or as part of a diversified portfolio.[114] On the other hand, some research has concluded that private commodity pools and CTA-based managed accounts do have value as stand-alone investments, as part of a portfolio, or in both roles.[115] Note that many CTAs prefer not to offer their services through public or private pools, so distinctions as to investment vehicle matter in interpreting these results.[116]

It appears that an investor can fairly closely track the performance of a CTA-based managed futures index by using a small random selection of CTAs. Henker and Martin (1998) provided empirical evidence that a naively (e.g., randomly) chosen CTA portfolio replicates comparison CTA benchmark indexes. They showed that a portfolio of randomly selected CTAs has a correlation in excess of 0.90 with that of a commonly cited benchmark (the Managed Account Reports dollar-weighted CTA index). Henker and Martin also showed that, as for equity securities, a randomly selected equally weighted portfolio of 8–10 CTAs has a standard deviation similar to that of the population from which it is drawn.

These results, taken as a whole, suggest that the forecasted returns to a CTA-based managed futures index can be useful for determining the optimal asset allocation to managed futures when the investor will invest with a relatively limited number of

114 See, for example, Elton, Gruber, and Rentzler (1987, 1990); Edwards and Park (1996).
115 See Edwards and Park (1996); Edwards and Liew (1999); McCarthy, Schneeweis, and Spurgin (1996).
116 The value of commodity funds, in contrast to investing directly with CTAs, has been questioned by Schneeweis (1996). Schneeweis, however, also concludes that the results are strategy and time period dependent. Given that commodity funds are often multi-manager in form, the benefit of commodity fund investment relative to multiple CTA investment is primarily a function of the fee structure.

CTAs.[117] Henker and Martin also concluded, as did Billingsley and Chance (1996), that fewer than 10 CTAs are needed to achieve most of the benefits of including CTAs in an existing stock and bond portfolio.

7.3.3 *Other Issues*

Performance persistence in CTA managers has been actively debated in the academic community.[118] Although there is little evidence that a strategy of investing in winners and avoiding losers will be successful over time, there is some evidence of performance persistence. McCarthy et al. (1996) showed that the relative riskiness of a CTA—the CTA's beta with respect to an index of CTAs—is a good predictor of future relative returns.[119] Thus, past CTA performance may be valuable in forecasting CTAs' and multi-adviser CTA portfolios' return and risk parameters, especially at the portfolio level. In terms of public policy, public disclosure of individual CTAs as well as benchmark information may be of benefit to potential investors who want to forecast the expected risk-adjusted performance of public commodity funds.

Because managed futures frequently use derivatives and leverage in their strategies, investors should conduct the same due diligence as described in the hedge fund section. Particular attention should be paid to the risk management practices of the CTA.

EXAMPLE 14

Adding Managed Futures to the Strategic Asset Allocation

Andrew Cassano, CIO of a large charitable organization, is meeting with his senior analyst, Lori Wood, to discuss managed futures. Wood presents Cassano with information taken from Exhibit 33.

Excerpt of Exhibit 33 Managed Futures Performance in Portfolios, 1996–2015

Measure	Portfolio A	Portfolio C	Portfolio D
Annualized return	7.1%	7.35%	7.41%
Annualized standard deviation	7.8%	8.9%	8.1%
Mean return-to-volatility ratio	0.91	0.83	0.92
Maximum drawdown	–27.1%	–36.0%	–31.3%
Correlation with CTA index	0.00	0.02	0.13
Portfolio A	50% S&P 500, 50% Bloomberg Barclays US Aggregate Bond		

117 See also Park and Staum (1998).
118 See Brown and Goetzmann (1995).
119 Similar results were reported by Brorsen (1998).

(Continued)

Measure	Portfolio A	Portfolio C	Portfolio D
Portfolio C	75% Portfolio A, 25% hedge funds/commodities/private equity/real estate		
Portfolio D	90% Portfolio C, 10% CISDM CTA EW Index		

Source: Schneeweis, Kazemi, and Tolivaisa (2016).

1 Using data from this exhibit, determine whether the addition of managed futures to a portfolio comprising US equities, US bonds, and alternative investment strategies would improve the risk/return profile of that portfolio. Justify your response with reference to two statistics provided in the exhibit.

Cassano addresses Wood as follows: "Are there other statistics besides those given that could be potentially useful as predictors of the persistence of performance of CTA managers?"

2 With respect to Cassano's question, recommend another statistic that research has shown to be a useful predictor of persistence of performance among CTAs.

Cassano states: "If managed futures are a subset of hedge funds, including them in the portfolio may be redundant if we also invest in other hedge funds. We won't gain any diversification benefits."

3 Critique Cassano's statement and justify your response with reference to data in the exhibit.

Solution to 1:

The mean return-to-volatility ratio for Portfolio D, which incorporates an allocation of 10% to managed futures, improves on the mean return-to-volatility ratio of Portfolio C. Therefore, managed futures appear to be valuable when added to a portfolio of US equities, US bonds, and alternative investment strategies. Standard deviation and maximum drawdown are superior for Portfolio D as well.

Solution to 2:

Research has indicated that the relative riskiness of a CTA (i.e., the commodity trading adviser's beta with respect to an index of CTAs) is a good predictor of future relative returns. Thus, past CTA performance may be valuable in forecasting CTA and multi-adviser CTA portfolio return and risk parameters, especially at the portfolio level.

Solution to 3:

The correlation of the hedge fund composite with the CISDM CTA composite is demonstrated in the low correlations of Portfolios A and C with the CTA index (shown in Exhibit 33), which indicates that the trading strategies of managed futures may provide unique sources of return when compared with hedge fund strategies that have relatively high exposure to traditional equity and bond markets.

The next section discusses investment strategies based on the equity and debt of distressed companies.

8 DISTRESSED SECURITIES

Distressed securities are the securities of companies that are in financial distress or near bankruptcy. In the United States, investing in distressed securities involves purchasing the claims of companies that have already filed for Chapter 11 (protection for reorganization) or are in immediate danger of doing so.[120] Under Chapter 11 protection, companies try to avoid Chapter 7 (protection for liquidation) through an out-of-court debt restructuring with their creditors.

Debt and equity are traditional asset classes. Yet, because of the special characteristics and risks of the debt and equity of distressed companies and the strategies that use them, distressed securities are widely viewed as an alternative investment. Contributing to this perspective is the fact that among the most active investors in the field are hedge funds and private equity funds.

8.1 The Distressed Securities Market

Distressed securities investing has a long history—in the United States, dating back at least to the 1930s, when Max L. Heine formed an investment firm specializing in selectively acquiring the debt and real estate of bankrupt railroads. Through the 1980s and early 1990s, individual professional investors, private buyout funds, and others became increasingly active in the securities (and sometimes the real assets) of troubled and bankrupt companies in many industries. With the explosive growth in hedge funds, with their ability to take short and long positions across all markets, and an abundant supply of troubled companies, by the 2000s, distressed securities investing had become well established as a set of skill-based strategies. The market opportunities for such strategies increase with higher default rates on speculative-grade bonds (which have historically averaged about 5% per year in the United States) and decrease with increases in the number of distressed debt investors competing for mispriced securities.

8.1.1 *Types of Distressed Securities Investments*

Investors may access distressed securities chiefly through two structures:

- *Hedge fund structure.* This is the dominant type. For the hedge fund manager, this structure offers the advantage of being able to take in new capital on a continuing basis. The AUM fee and incentive fee arrangement, particularly when there is no hurdle rate associated with the incentive fee, may be more lucrative than with other structures. Investors generally enjoy more liquidity (that is, they can withdraw capital more easily) than with other structures.
- *Private equity fund structure.* Private equity funds have a fixed term (i.e., a mandated dissolution date) and are closed end (they close after the offering period has closed). This structure has advantages in cases where the assets are highly illiquid or difficult to value. An NAV fee structure may be problematic when it is difficult to value assets. When assets are illiquid, offering hedge fund–style redemption rights may be inappropriate.

There are also structures that are hybrids of the hedge fund and private equity fund structures. In addition, distressed securities investing may be conducted in traditional investment structures, such as separately managed accounts, and even in open-end

120 "Chapter" in this context refers to a section of the US Bankruptcy Code.

investment companies (mutual funds).[121] As a result of this variety, the investor can find information about distressed securities investing through hedge fund and private equity sources and elsewhere.

Distressed securities managers may themselves invest or trade in many types of assets, including the following:

- Publicly traded debt and equity securities of the distressed company
- Newly issued equity of a company emerging from reorganization that appears to be undervalued (**orphan equity**)
- Bank debt and trade claims—because banks and suppliers owed money by the distressed company may want to realize the cash value of their claims. When the company is in reorganization, these instruments are bankruptcy claims.
- "Lender of last resort" notes (debt factoring)
- Various derivative instruments for hedging purposes—in particular, for hedging the market risk of a position

8.1.2 *Size of the Distressed Securities Market*

The appropriate measure of the size of the distressed securities marketplace is elusive because the market value of these securities is often very different from the original issued value. One measure would aggregate all the assets under management related to distressed securities regardless of the investment structure in which such assets are managed. Nevertheless, the size of the high-yield bond market can give an indication of the potential supply of opportunities, because distressed debt is one part of that market—in particular, the highest-risk part. Based on a maximum quality rating of Ba1 (as determined by Moody's Investors Service), the size of the US high-yield market was US$1.3 trillion as of December 2015.[122] This figure can be compared with the market size of only US$69 billion at face value as of the end of 1991.

8.2 Benchmarks and Historical Performance

Hedge fund industry data are the chief source for evaluating modern distressed securities investing.

8.2.1 *Benchmarks*

In the context of hedge funds, distressed securities investing is often classed as a sub-style of event-driven strategies. All the major hedge fund indexes that we discussed in the hedge fund section have a sub-index for distressed securities; for example, the Credit Suisse, CISDM, and HFR indexes all have distressed securities sub-indexes. In the United States, returns to the Altman-Kuehne/NYU Salomon Center Defaulted Bond and Bank Loan databases provide information a comparison point for evaluating a long-only value strategy in distressed debt.

8.2.2 *Historical Performance*

The returns on distressed securities investing can be quite rewarding. Exhibit 34 presents historical performance data for distressed securities and high-yield fixed-income securities. Using the investable monthly HFRX Distressed/Restructuring Index for the period January 1998–December 2015, Exhibit 34 shows that the return distribution for

121 In such traditional structures as mutual funds, long-only investing would be expected.

122 See Heather Rupp, "The High Yield Market: Market Size, Ownership, Funds, and Opportunities," AdvisorShares (8 March 2016): http://alphabaskets.com/the-high-yield-market-market-size-ownership-funds-and-opportunities/.

distressed securities is non-normal. In particular, the distribution reflects significant downside risk, with a negative skewness of –0.30. The negative skewness indicates that for distressed securities, large negative returns are more likely than large positive returns. Hence, there is a bias to the downside. In addition, the monthly return distribution displays excess kurtosis (1.29). This finding indicates that these securities are exposed to large outlier events. The two statistics together indicate significant downside risk. Consequently, risk and risk-adjusted return measures that are based on a normal distribution assumption, such as the Sharpe ratio and mean return-to-volatility ratio, may not capture the complete risk–return trade-off of distressed securities investing.

Exhibit 34 Monthly Returns of High-Yield and Distressed Securities, 1998–2015

Statistic	HFRX Fixed Income-Credit Index	HFRX Distressed/ Restructuring Index
Mean monthly return	0.63%	0.43%
Monthly standard deviation	4.46%	0.99%
Skew	–0.64	–0.30
Kurtosis	1.09	1.29

Source: www.hedgefundresearch.com.

The monthly return distribution of the HFRX Fixed Income-Credit Index debt displays risk characteristics similar to those of the distressed securities index, with a negative skewness of –0.64 and an excess kurtosis of 1.09. Overall, high-yield debt investing, although producing favorable returns over the period, was subject to considerable credit risk and, probably, event risk. These risks were greater, however, than those observed for distressed securities investing.

Exhibit 35 shows that for the same period, distressed securities underperformed stock and bond investments, albeit with a lower standard deviation than the S&P 500 and high-yield bonds. The mean return-to-volatility ratio for the HRFX Distressed/Restructuring Index is 0.33, which is lower than the ratios for all the other assets. While the maximum drawdown of the distressed index is better than that of the S&P 500, it is worse than either of the bond indexes. Low correlation with stock and bond investments suggests that adding distressed securities to a portfolio of stocks and bonds might provide significant diversification benefits. Because returns of distressed securities display negative skewness and high kurtosis (see Exhibit 34), however, risk as represented by standard deviation is probably understated.

Exhibit 35 Distressed Securities Performance, 1998–2015

Measure	HFRX Distressed/ Restructuring Index	S&P 500	Bloomberg Barclays US Aggregate Bond	Bloomberg Barclays US Corp High Yield Bond
Annualized return	2.30%	6.54%	5.23%	6.18%
Annualized standard deviation	7.08%	15.44%	3.41%	9.51%
Mean return-to-volatility ratio	32.52%	55.61%	154.75%	74.25%
Maximum drawdown	–39.10%	–50.95%	–3.83%	–33.31%

Exhibit 35 (Continued)

Measure	HFRX Distressed/ Restructuring Index	S&P 500	Bloomberg Barclays US Aggregate Bond	Bloomberg Barclays US Corp High Yield Bond
Correlation with S&P 500	0.46	1.00	–0.08	0.62
Correlation with Bloomberg Barclays US Aggregate Bond	–0.09	–0.08	1.00	0.16

Sources: www.hedgefundresearch.com; CISDM.

In terms of performance, this strategy depends a great deal on the business cycle and how well the economy is doing. When the economy is not doing well, bankruptcies increase and this strategy has many investment opportunities. However, an important risk factor that may not be captured by the performance data is event risk. The ability to correctly predict whether an event will occur would ensure the success of the strategy.

8.2.3 *Interpretation Issues*

In estimating the size of the distressed securities market, we gave figures for the high-yield debt market. Non-investment-grade or high-yield bonds are not necessarily on the brink of default; thus, they should not be considered distressed. Distressed bonds constitute the highest-credit-risk segment of the high-yield bond market.[123] Furthermore, distressed securities include distressed equities and strategies based on these instruments.

8.3 Distressed Securities: Investment Characteristics and Roles

Although certain types of distressed securities investing may be considered for their risk diversification potential, some of the typical risks of distressed securities are not well captured by such measures as correlation and standard deviation, which are usually the guideposts in portfolio optimization. Investors look to distressed securities investing primarily for the possibility of high returns from security selection (exploiting mispricing), activism, and other factors.

8.3.1 *Investment Characteristics*

The market opportunity that distressed securities investing offers to some investors arises from the problems that corporate distress poses to other investors. Many investors are barred either by regulations or by their investment policy statements from any substantial holdings in below-investment-grade debt. These investors must sell any debt that has crossed the threshold from investment grade to high yield (so-called **fallen angels**). Banks and trade creditors may prefer to convert their claims to cash rather than participate as creditors in a possibly long reorganization process. Failed leveraged buyouts have also been a source of distressed securities opportunities.[124] Distressed securities investing opportunities require additional legal experience and resources that may be costly. The impulse of some investors to off-load distressed debt creates opportunities for bargain hunters.

123 Distressed debt has sometimes been defined arbitrarily as bonds trading at spreads of 1,000 bps or more above government bonds. See Yago and Trimbath (2003).

124 See Anson (2002b) for a detailed discussion of leveraged buyouts and this type of opportunity.

Old equity claims may be wiped out in a reorganization, replaced by new shares issued to creditors, and sold to the public as the company emerges from reorganization. These shares may be shunned by investors and analysts and thus may be mispriced. Distressed securities may offer a fertile ground for experts in credit analysis, turnarounds, business valuation, and bankruptcy proceedings to earn returns based on their skill and experience.

A common theme in distressed securities investing is that it often demands access to specialist skills and deep experience in credit analysis and business valuation. Distressed companies are potentially near the end of their life as going concerns. The investor needs to assess not only potential outcomes for the company as a going concern but also the bare-bones liquidation value of the company. The investor needs to understand the sources of the company's problems, its core business, and its financing structure. A distressed securities fund's abilities in this regard are one element of due diligence.

For a private or institutional investor investing indirectly via a hedge fund or other vehicle, this type of investment inherits the liquidity characteristics specified in the structure of the vehicle. A discussion of the types of risk involved in distressed securities investing follows an overview of strategies in the next section.

8.3.2 *Roles in the Portfolio*

According to the 2015 Commonfund Benchmarks Study of US educational endowments, overall allocation to distressed debt among the institutions surveyed was 2% for the 2015 fiscal year.[125]

From the perspective of the direct investor in distressed securities, there are a number of different strategies that may be adopted. As we discuss them, the reader should be aware that hedge fund and private equity businesses and benchmark vendors use a variety of classifications and that there are some differences in definitions. The aim here is to convey the gist of what the various approaches involve.

Long-Only Value Investing The simplest approach involves investing in perceived undervalued distressed securities in the expectation that they will rise in value as other investors see the distressed company's prospects improve. When the distressed securities are public debt, this approach is **high-yield investing**. When the securities are orphan equities, this approach is **orphan equities investing**.

Distressed Debt Arbitrage **Distressed debt arbitrage** (or distressed arbitrage) involves purchasing the traded bonds of bankrupt companies and selling the common equity short. The hedge fund manager attempts to buy the debt at steep discounts. If the company's prospects worsen, the value of the company's debt and equity should decline, but the hedge fund manager hopes that the equity, in which the fund has a short position, will decline to a greater degree. Indeed, as a residual claim, the value of equity may be wiped out. If the company's prospects improve, the portfolio manager hopes that the debt will appreciate at a higher rate than the equity because the initial benefits to a credit improvement accrue to bonds as the senior claim in the capital structure. Typically, the company will have already suspended any dividends, but debtholders will receive accrued interest. Distressed debt arbitrage has been popular with hedge funds.

Private Equity Private equity has also been called an "active" approach because it involves corporate activism. It has, in fact, a number of variations. The investor usually first becomes a major creditor of the target company to obtain influence on the board of directors or, if the company is already in reorganization or liquidation, on the creditor committee. The investor buys the debt at deep discounts, then influences and assists in

125 See Commonfund, "2015 NACUBO-Commonfund Study of Endowments Results Released," press release (27 January 2016): https://www.commonfund.org/2016/01/27/2015-nacubo-commonfund-study-of-endowments/.

the recovery or reorganization process. The objective of this focused active involvement is to increase the value of the troubled company by deploying the company's assets more efficiently than in the past or by helping to gain access to markets that may be hard to penetrate. If the investor obtains new shares in the company as part of the reorganization, the investor hopes to sell them subsequently at a profit.

A variation of the active approach is converting distressed debt to private equity in a **prepackaged bankruptcy**.[126] This type of operation is typically conducted by private equity firms. The firm (or team of firms, because the capital commitment may be major) takes a dominant position in the distressed debt of a public company. Working with the company and other creditors, the firm seeks to arrange a prepackaged bankruptcy in which the firm becomes the majority owner of a private company on favorable terms (the previous public equityholders losing their complete stake in the company).[127] After restoring the company to better health, the firm has a company that can be sold to private or public investors. An example discussed by Anson (2002b) is the conversion in 2001 of Loews Cineplex Entertainment Corporation from a public to a private company by two buyout firms. (The buyout firms sold their interest in 2004.) Loews subsequently merged with AMC Entertainment in 2005.

Distressed securities investors following an active approach will be proactive and aggressive in protecting and increasing the value of their claims.[128] Practitioners of the private equity approach are often referred to as "vulture" investors, and their funds, as "vulture funds" or "vulture capital." Nevertheless, if the company is turned around, other parties and society at large may ultimately benefit, and the vultures are bearing risk that other investors presumably wish to transfer to them.

EXAMPLE 15

Turnaround Partners

Often, distressed securities investors solicit the help of experienced executives to manage the troubled companies. In the case of the WorldCom/MCI bankruptcy, one such investor was quoted in the *Wall Street Journal*—when the investor urged Michael D. Capellas, the former chairman and CEO of Compaq Corporation, to join Worldcom Inc.—as saying, "You run the business and we'll run the bankruptcy process."[129]

Investors need to assess the risks that a particular distressed securities strategy may entail. Such strategies may be subject to one or more of the following risks:

- *Event risk*. Any number of unexpected company-specific or situation-specific risks may affect the prospects for a distressed securities investment. Because the event risk in this context is company or industry specific, it has a low correlation with the general stock market.

126 The term "prepackaged bankruptcy" refers to the case in which the debtor seeks agreement from creditors on the terms of a reorganization before filing formally for a Chapter 11 reorganization. More details are given later in this reading.
127 See Anson (2002b). Another operation Anson discusses is private equity firms making a cash bid for the assets of a company in reorganization at a discount to perceived value.
128 See Branch and Ray (2002).
129 *Wall Street Journal* (16 April 2004).

- *Market liquidity risk*. Market liquidity in distressed securities is significantly less than in other securities, although the liquidity has improved. Also, market liquidity, dictated by the supply and demand for such securities, can be highly cyclical in nature. The lack of a liquid market is a major risk in distressed securities investing.
- *Market risk*. The economy, interest rates, and the state of equity markets are not as important as the liquidity risks.
- *J factor risk*. Barnhill, Maxwell, and Shenkman (1999) referred to the judge's track record in adjudicating bankruptcies and restructurings as "**J factor risk**." The judge's involvement in the proceedings and the judgments will decide the outcome of investing in bankruptcy. Branch and Ray (2002) noted that the judge factor is also an important variable in determining which securities, debt or equity, of a Chapter 11–protected company to invest in.

Other risks may also be present. Some are associated with the legal proceedings of a reorganization: The actions of the trustees as well as the identity of creditors can affect the investment outcome. The distressed securities investor may lack information about the other investors and their motivations. Tax issues may arise in reorganizations.[130]

A normality assumption is not appropriate in evaluating this class of strategies. It has become quite well known that the returns from a distressed securities strategy are not normally distributed (they have negative skewness and positive excess kurtosis); if a normal distribution is assumed, risk measurement tends to underestimate the likelihood of downside returns.

Distressed securities are illiquid and almost non-marketable at the time of purchase. If the companies turn around, the values of the distressed securities may go up gradually and liquidity may improve. Typically, it takes a relatively long time for this strategy to play out; thus, valuing the holdings may be a challenge. It is difficult to estimate the true market values of distressed securities, and stale pricing is almost inevitable. Recall that stale valuations make distressed securities appear less risky. Therefore, the risk of this strategy is probably understated and its Sharpe ratio overstated.

Whether a distressed securities investment will be successful or not depends on many factors. The outcome depends heavily on the legal process, which may take years. However, the vulture investor's time frame is often months, not years. The role played by vulture investors has a significant bearing on the outcome. If vulture investors do not participate in the restructuring, or if they decide to sell prior to the final settlement, the flood of shares into the market will create further downward pressure on the stock price. Such outcomes may have a significant impact on the whole industry. Because any move by vulture investors may be heeded by other investors, they take great care not to divulge their intentions.

Thus, investing in distressed securities/bankruptcies requires legal, operational, and financial analysis. From an investment perspective, the relevant analysis involves an evaluation of the source of distress. The source could be the company's operations, finances, or both. This analysis is a complex task, and each distressed situation requires a unique approach and solution. As a result, distressed securities investing requires careful company selection. In this reading, we focus on the legal aspects.

8.3.3 *Other Issues*

In this section, we describe the bankruptcy process, primarily in the United States, in order to highlight how the process may affect the investment outcome and the issues that investors need to consider.

130 See Branch and Ray (2002) and Feder and Lagrange (2002) for more information.

Bankruptcy in the United States versus Other Countries[131] For all practical purposes, the relevant legislation for distressed securities investment in the United States is the Bankruptcy Reform Act of 1978, which applies to all bankruptcies filed since 1 October 1979. Of particular interest to distressed securities investors are Chapters 7 and 11, which provide specific treatments for, respectively, liquidations and reorganizations.

Branch and Ray (2002) pointed out that a US Chapter 7 bankruptcy is *conceptually* similar to the bankruptcy procedures followed in most other countries. That is, when a person seeks protection under Chapter 7, that person's assets are collected and liquidated and the proceeds are distributed to creditors by an appointed bankruptcy trustee. The debtor is normally discharged of the debts that were incurred prior to bankruptcy. As in most other countries, under Chapter 7, rehabilitation of the debtor is not especially important. It is in this sense that Chapter 7 in the United States is conceptually similar to the procedures in other countries.

In contrast, Chapter 11 emphasizes rehabilitation of the debtor and provides an opportunity for the reorganization (restructuring) of the debtor. This provision is the distinctive feature of US bankruptcy law that separates it from that of most of the rest of the world (although a similar code exists in Canada called the Companies' Creditors Arrangement Act, or CCAA). Chapter 11 is where opportunity arises for distressed debt investors. In Chapter 11, the debtor (a business seeking relief and protection) retains control of its assets (which will immediately pass into a bankruptcy estate under the supervision of the court) and continues its operations. While under this protection, the debtor, now known as a "debtor-in-possession," seeks to pay off creditors (often at a discount) over a period of time according to a plan approved by the bankruptcy court. Some of the liabilities may be discharged. By filing Chapter 11, a debtor can protect its productive assets from being seized by creditors and gain time to plan the turnaround of the business.

A plan of reorganization is submitted to the court for approval. The plan is typically proposed by the debtor with the agreement of its creditors, especially the senior creditors. This plan details how much and over what period of time the creditors will be paid. Prospective distressed securities investors should pay attention to the exclusivity period. During this time, only the debtor can file a plan of reorganization. After the exclusivity period expires, any party with an interest in the bankruptcy can file a plan proposing how the estate's creditors are to be paid under Chapter 11. Creditors and shareholders of the debtor eventually must approve the plan and have it confirmed by the bankruptcy judge. The judge can overrule some dissenting creditors, however, on economic grounds or for other considerations, such as social or legal reasons. Such an action of overruling is commonly referred to as the "cram-down." Thus, a cram-down is basically a court-ordered arrangement between the debtor and certain classes of creditors when those parties cannot come to an agreement on the reorganization plan; a cram-down may result in losses for certain creditors.

In this way, an approved reorganization plan created by the court of law may be costly to distressed securities investing. The uncertain nature of the outcome of legal proceedings makes analysis of such investment challenging, and the analysis must be accompanied by extensive due diligence.[132]

131 We do not intend to provide a complete treatment of the bankruptcy process; rather, we offer an overview of the process so that investors can recognize the complexities involved and make intelligent investment decisions without being confused by the legal technicalities. For a detailed treatment, see Branch and Ray (2002).

132 According to Branch and Ray (2002), only one out of eight companies that file for Chapter 11 is able to reorganize successfully in the United States.

Absolute Priority Rule In many jurisdictions, a reorganization or liquidation plan must follow the rule of priority with respect to the order of claims by the debtor's security holders. In general, claims from senior secured debtholders (typically, bank loans) will be satisfied first. The debtor's bondholders come next. The distribution may be split between senior and subordinated bondholders. Last on the list are the debtor's shareholders.

Relationship between Chapter 7 and Chapter 11 Why must distressed securities investors pay attention to Chapter 7 filings? Chapter 11 reorganization can start from a Chapter 7 filing, whether voluntarily or involuntarily. A debtor against whom an involuntary Chapter 7 is filed has a right to convert the case to a Chapter 11 proceeding. Similarly, a Chapter 7 debtor that filed a voluntary petition can convert the case to a Chapter 11, unless the case started as a Chapter 11. In addition, the court can convert a Chapter 11 case to Chapter 7 or dismiss the case for cause (e.g., the inability of the debtor to carry out a plan) at any point in the proceedings. The latter uncertainty adds much risk to bankruptcy investing.

Prepackaged Bankruptcy Filing In a prepackaged bankruptcy filing, the debtor agrees in advance with its creditors on a plan or reorganization before it formally files for protection under Chapter 11. Creditors usually agree to make concessions in return for equity in the reorganized company. This arrangement is tantamount to obtaining advance approval of an exchange offer of public debt with less stringent requirements than those found in the public indenture. In this way, a debtor expedites the bankruptcy process to emerge as a new organization.

EXAMPLE 16

Distressed Securities Investing

Gloria Richardson is CIO of a multi-billion-dollar home office for the Nelson family. She is discussing the revision of the governing investment policy statement to permit the investment in distressed securities. Susan Nelson represents the family in policy matters.

Nelson states: "Distressed securities sound like a very high-risk investment strategy because the strategy focuses on companies in bankruptcy. Is that why few investors choose to invest in distressed securities? What are the origins of distressed securities, and how are investors involved? Who researches these situations?"

1. Discuss the suitability of investing in distressed securities for buy-side (institutional) investors, and evaluate the participation of sell-side analysts in researching distressed securities.

Nelson is still concerned about the downside risk of investing in distressed securities. Nelson states: "I'm a patient investor, and I want our family's philanthropic contributions to extend into perpetuity, but it seems that the strategy of investing in distressed securities has higher risk in every aspect than investing in traditional equities and bonds."

2. Judge the suitability of investing in distressed securities for the home office. Justify your response with reference to time horizon and Nelson's statement regarding risk.

Solution to 1:

Some buy-side investors, such as pension plans, are unable or unwilling to hold below-investment-grade securities because of the securities' relatively high risk in comparison with other asset classes. However, results suggest that institutional investors with higher risk tolerances and long time horizons may receive stable returns from distressed securities with relatively low risk in the long run.

As a result of the inability of some institutional investors to allocate funds to distressed securities, few sell-side analysts cover this area of the market. Given this limited following of distressed securities, undercovered and undervalued market opportunities exist that knowledgeable investors can exploit to earn high returns.

Solution to 2:

Given Nelson's statement, investing in distressed securities could provide a potentially attractive strategy for the family's home office. Because the investment time horizon is long, there should be no inherent obstacle regarding the amount of time it may take for a distressed securities investment to pay off. Additionally, Nelson is incorrect in stating that distressed securities are riskier than traditional asset classes in all respects. Although long-term distressed securities investments show negative monthly returns for 20% of all months studied, the maximum 1-month and 12-month drawdowns are smaller for distressed securities than for US and world equities and bonds. If Nelson understands and accepts these risks, such investments may be appropriate.

SUMMARY

Alternative investments have become a significant portion of the portfolios of both individual and institutional investors. This reading presented six groups of alternative investments: real estate, private equity, commodities, hedge funds, managed futures, and distressed securities.

- Common features of alternative investments include relative illiquidity, which tends to be associated with a return premium as compensation; diversifying potential relative to a portfolio of stocks and bonds; high due diligence costs; and the difficulty of performance evaluation.
- Due diligence for alternative investment selection should cover market opportunity, investment process, organization, people, terms and structure, service providers, documents, and write-up.
- Special concerns for advisers to private wealth clients include tax issues, suitability, communication with the client, decision risk (the risk of changing strategies at the point of maximum loss), and potentially concentrated equity positions of the client in a closely held company.
- The physical real estate market is characterized by a relative lack of liquidity, large lot size, and high transaction costs.
- Real estate investments can be viewed in terms of direct ownership and indirect ownership. Direct ownership includes investment in residences, business real estate, and agricultural land. Indirect ownership includes investment in vehicles such as REITs.

- Advantages to real estate investment include tax benefits, the use of leverage, control over property, diversification, potential as an inflation hedge, and low volatility of returns.
- Disadvantages to real estate investment include the inability to subdivide real estate investments, high information costs, high commissions, maintenance and operating costs, location risk, and political risk related to tax deductions.
- Private equity investments are highly illiquid, and investors must be willing to hold these securities for long periods.
- Private equity investments include start-up companies, middle-market private companies, and private investment in public entities.
- Private equity investors include angel investors, venture capitalists, and larger companies in the same industry.
- There are two broad approaches to investing in commodities: direct and indirect. Direct commodity investment entails purchasing the physical commodities or using derivatives with direct exposure to changes in spot prices. In contrast, indirect investment in commodities involves the acquisition of indirect claims on commodities.
- The inflation-hedging ability of commodity investing appears to vary according to the commodity.
- Hedge funds are skill-based investment strategies in various forms, including limited partnerships. The funds use various investment strategies and thus are often classified according to investment style. Within each style category, hedge funds are classified according to the underlying markets traded or the unique trading style—for example, relative value, event driven, hedged equity, and global macro.
- Within each style classification, there are a number of subgroups. For instance, within the hedge fund relative value style classification, subgroups include market-neutral long–short equity, convertible hedging, and fixed-income arbitrage (or bond hedging).
- Hedge funds can provide both return and diversification benefits, but the risks are not usually well represented by standard deviation.
- Managed futures are actively managed investment vehicles that share many features of hedge funds (e.g., compensation arrangements). However, managed futures programs primarily trade futures and option contracts, whereas hedge funds typically are more active in cash markets.
- Managed futures programs include systematic trading strategies (based on trading rules applied to price data and often managed and traded by computers) and discretionary trading strategies (which incorporate manager judgment and fundamental data considerations).
- Distressed securities are securities of companies that are in financial distress or near bankruptcy. The securities could be equity, debt, trade claims, or other claims.
- Distressed securities investment exploits the fact that many investors are unable to hold below-investment-grade securities. Furthermore, few analysts cover the distressed securities market.
- Risks of distressed securities investing include event risk, J (for "judge") factor risk, liquidity risk, market risk, and other risks.

REFERENCES

Amin, Gaurav, and Harry Kat. 2003. "Stocks, Bonds, and Hedge Funds." *Journal of Portfolio Management*, vol. 29, no. 4: 113–120.

Ankrim, Ernest, and Chris Hensel. 1993. "Commodities in Asset Allocation: A Real Asset Alternative to Real Estate?" *Financial Analysts Journal*, vol. 49, no. 3: 20–29.

Anson, Mark. 2002a. *Handbook of Alternative Assets*. New York: John Wiley & Sons.

Anson, Mark. 2002b. "A Primer on Distressed Debt Investing." *Journal of Private Equity*, vol. 5, no. 3: 6–17.

Barnhill, Theodore, William Maxwell, and Mark Shenkman. 1999. *High Yield Bonds*. New York: McGraw-Hill.

Becker, Kent, and Joseph E. Finnerty. 2000. "Indexed Commodity Futures and the Risk and Return of Institutional Portfolios." OFOR Working Paper.

Billingsley, Randall, and Don Chance. 1996. "Benefits and Limitations of Diversification Among Commodity Trading Advisors." *Journal of Portfolio Management*, vol. 23, no. 1: 65–80.

Black, Keith, and Edward Szado. 2016. "Performance Analysis of Options-Based Equity Mutual Funds, Closed-End Funds, and Exchange-Traded Funds." *Journal of Wealth Management*, vol. 19, no. 1: 51–69.

Bodie, Zvi. 1983. "Commodity Futures as a Hedge Against Inflation." *Journal of Portfolio Management*, vol. 9, no. 3: 12–17.

Bollen, Nicolas P.B., and Gregg S. Fisher. 2013. "Send in the Clones? Hedge Fund Replication Using Futures Contracts." *Journal of Alternative Investments*, vol. 16, no. 2 (Fall): 80–95.

Bond, Michael, and Michael Seiler. 1998. "Real Estate Returns and Inflation: An Added Variable Approach." *Journal of Real Estate Research*, vol. 15, no. 3: 327–338.

Boyer, Brian. 2005. "Private Equity: A Plan Sponsor's Perspective." Presentation to CFA Society of Chicago, 17 November 2005.

Branch, Ben, and Hugh Ray. 2002. *Bankruptcy Investing: How to profit from distressed companies*, Revised edition. Washington, D.C.: Beard Books.

Brooks, Chris, and Harry Kat. 2002. "The Statistical Properties of Hedge Fund Index Returns and Their Implications for Investors." *Journal of Alternative Investments*, vol. 5, no. 2: 26–44.

Brorsen, B. Wade. 1998. "Performance Persistence for Managed Futures." Foundation of Managed Futures Research.

Brown, Stephen, and William Goetzmann. 1995. "Performance Persistence." *Journal of Finance*, vol. 50, no. 2: 679–698.

Brown, Stephen, William Goetzmann, and Roger Ibbotson. 1999. "Offshore Hedge Funds: Survival and Performance 1989–1995." *Journal of Business*, vol. 72, no. 1: 91–117.

Brunel, Jean. 2003. "Revisiting the Asset Allocation Challenge Through a Behavioral Finance Lens." *Journal of Wealth Management*, vol. 6, no. 2: 10–20.

Brunel, Jean. 2004. "Revisiting the Role of Hedge Funds in Diversified Portfolios." *Journal of Wealth Management*, vol. 7, no. 3: 35–48.

Büyükşahin, B., M.S. Haigh, and M.A. Robe. 2010. "Commodities and Equities: Ever a 'Market of One'?" *Journal of Alternative Investments*, vol. 12, no. 3 (Winter): 76–95.

Case, Bradford, William Goetzmann, and K. Geert Rouwenhorst. 2000. "Global Real Estate Markets: Cycles and Fundamentals." Working Paper, National Bureau of Economic Research.

Chatrath, Arjun, and Youguo Liang. 1998. "REITs and Inflation: A Long-Run Perspective." *Journal of Real Estate Research*, vol. 16, no. 3: 311–326.

Chung, S. 2000. "Effects of Derivative Usage on Commodity-Based Corporations." Ph.D. dissertation, University of Massachusetts.

CISDM. 2005a. "The Benefits of Commodity Investment: 2005 Update." June, CISDM, University of Massachusetts.

CISDM. 2005b. "The Benefits of Real Estate Investment: 2005 Update." June, CISDM, University of Massachusetts.

Cochrane, John. 2004. "The Risk of Venture Capital." University of Chicago Working Paper.

Corriero, Timothy, Tom Healy, and Scott Bond. 2013. "Timberland Investing in the U.S.: What You Need to Know Now." *Alternative Investment Analyst Review*, vol. 2, no. 1 (Second Quarter): 6–19.

DeFusco, Richard, Dennis McLeavey, Jerald Pinto, and David Runkle. 2015. *Quantitative Investment Analysis*, 3rd edition. Charlottesville, VA: CFA Institute.

Diz, Fernando. 1999. "How do CTA's Return Distribution Characteristics Affect their Likelihood of Survival?" *Journal of Alternative Investments*, vol. 2, no. 2: 37–41.

Downs, David, Hung-Gay Fung, Gary Patterson, and Jot Yau. 2003. "The Linkage of REIT Income- and Price-Returns with Fundamental Economic Variables." *Journal of Alternative Investments*, vol. 6, no. 1: 39–50.

Edwards, Franklin, and Jimmy Liew. 1999. "Hedge Funds Versus Managed Futures As Asset Classes." *Journal of Derivatives*, vol. 6, no. 4: 45–64.

Edwards, Franklin, and James Park. 1996. "Do Managed Futures Make Good Investments?" *Journal of Futures Markets*, vol. 16, no. 5: 475–517.

Eichholtz, Piet, Ronald Huisman, Kees Koedijk, and Lisa Schuin. 1998. "Continental Factors in International Real Estate Returns." *Real Estate Economics*, vol. 26, no. 3: 493–509.

Eichholtz, Piet, Ronald Mahieu, and Peter Schotman. 1999. "Real Estate Diversification: By Country or by Continent?" Working paper, University of Maastricht and Erasmus University-Rotterdam.

Elton, Edwin, Martin Gruber, and Joel Rentzler. 1987. "Professionally Managed, Publicly Traded Commodity Funds." *Journal of Business*, vol. 60, no. 2: 175–199.

Elton, Edwin, Martin Gruber, and Joel Rentzler. 1990. "The Performance of Publicly Offered Commodity Funds." *Financial Analysts Journal*, vol. 46, no. 4: 23–30.

Emery, Kenneth. 2003. "Private Equity Risk and Reward: Assessing the Stale Pricing Problem." *Journal of Private Equity*, vol. 6, no. 2: 43–50.

Erb, Claude, and Campbell Harvey. 2006. "The Strategic and Tactical Value of Commodity Futures." *Financial Analysts Journal*, vol. 62, no. 2: 69–97.

Fama, E., and K. French. 1988. "Business Cycles and the Behavior of Metals Prices." *Journal of Finance*, vol. 43, no. 5: 1075–1093.

Fama, Eugene, and Kenneth French. 1996. "Multifactor Explanations of Asset Pricing Anomalies." *Journal of Finance*, vol. 51, no. 1: 55–84.

Feder, Warren, and Patrick Lagrange. 2002. "Considerations for Investors before Investing in Bankrupt Companies." *Journal of Private Equity*, vol. 5, no. 4: 38–41.

Francis, Jack, and Roger Ibbotson. 2001. "Empirical Risk-Return Analysis of Real Estate Investments in the U.S., 1972–1999." *Journal of Alternative Investments*, vol. 4, no. 1: 33–39.

Froot, K. 1995. "Hedging Portfolios with Real Assets." *Journal of Portfolio Management*, vol. 21, no. 4: 60–77.

Fung, William, and David Hsieh. 1997a. "Empirical Characteristics of Dynamic Trading Strategies: The Case of Hedge Funds." *Review of Financial Studies*, vol. 10: 275–302.

Fung, William, and David Hsieh. 1997b. "Survivor Bias and Investment Style in the Returns of CTAs." *Journal of Portfolio Management*, vol. 24, no. 1: 30–41.

Fung, William, and David Hsieh. 2000. "Performance Characteristics of Hedge Funds and Commodity Funds: Natural vs. Spurious Biases." *Journal of Financial and Quantitative Analysis*, vol. 35: 291–307.

Fung, William, and David Hsieh. 2001. "The Risk in Hedge Fund Strategies: Theory and Evidence from Trend Followers." *Review of Financial Studies*, vol. 14: 313–341.

Fung, William, and David Hsieh. 2002. "Hedge-Fund Benchmarks: Information Content and Biases." *Financial Analysts Journal*, vol. 58, no. 1: 22–34.

Gastineau, Gary, and Mark Kritzman. 1999. *Dictionary of Financial Risk Management*, 3rd edition. New York: John Wiley & Sons.

Geltner, David. 2000. "Benchmarking Manager Performance Within the Private Real Estate Investment Industry." *Real Estate Finance*, vol. 17, no. 1: 23–34.

Geltner, David, and David Ling. 2001. "Ideal Research and Benchmark Indexes in Private Real Estate: Some Conclusions from the REPI/PREA Technical Report." *Real Estate Finance*, vol. 17, no. 4: 17–28.

Geman, Helyette. 2005. *Commodities and Commodity Derivatives: Modeling and Pricing for Agriculturals, Metals and Energy*. John Wiley & Sons.

Getmansky, Mila, Peter Lee, and Andrew Lo. 2015. "Hedge Funds: A Dynamic Industry in Transition." Working paper.

Greer, Robert. 1978. "Conservative Commodities: A Key Inflation Hedge." *Journal of Portfolio Management*, vol. 4, no. 4: 26–29.

Greer, Robert. 1994. "Methods for Institutional Investment in Commodity Futures." *Journal of Derivatives*, vol. 2, no. 2: 28–36.

Halpern, Philip, and Randy Warsager. 1998. "The Performance of Energy and Non-Energy Based Commodity Investment Vehicles in Period of Inflation." *Journal of Alternative Investments*, vol. 1, no. 1: 75–81.

Hartzell, David, John Hekman, and Mike Miles. 1986. "Diversification Categories in Investment Real Estate." *AREUEA Journal*, vol. 14: 230–254.

Hasanhodzic, Jasmina, and Andrew W. Lo. 2007. "Can Hedge-Fund Returns Be Replicated? The Linear Case." *Journal of Investment Management*, vol. 5, no. 2: 5–45.

Henker, Thomas. 1998. "Naïve Diversification for Hedge Funds." *Journal of Alternative Investments*, vol. 1, no. 3 (Winter): 33–38.

Henker, Thomas, and George Martin. 1998. "Naïve and Optimal Diversification for Managed Futures." *Journal of Alternative Investments*, vol. 1, no. 2: 25–39.

Hoesli, Martin, Bryan MacGregor, George Matysiak, and Nanda Nanthakumaran. 1997. "The Short Term Inflation Hedging Characteristics of U. K. Real Estate." *Journal of Real Estate Finance and Economics*, vol. 15, no. 1: 27–57.

Hoesli, Martin, Jon Lekander, and Witold Witkiewicz. 2004. "International Evidence on Real Estate as a Portfolio Diversifier." Research Paper No. 70, FAME.

Howell, Michel. 2001. "Fund Age and Performance." *Journal of Alternative Investments*, vol. 4, no. 2: 57–60.

Huberman, Gur. 1995. "The Desirability of Investment in Commodities via Commodity Futures." *Derivatives Quarterly*, Fall: 65–67.

Jensen, Gerald, Jeffrey Mercer, and Robert Johnson. 2002. "Tactical Asset Allocation and Commodity Futures." *Journal of Portfolio Management*, vol. 28, no. 4: 100–111.

Kaldor, Nicholas. 1939. "Speculation and Economic Stability." *Review of Economic Studies*, vol. 7: 1–27.

Kallberg, Jarl, Crocker Liu, and D. Wylie Greig. 1996. "The Role of Real Estate in the Portfolio Allocation Process." *Real Estate Economics*, vol. 24, no. 3: 359–377.

Kat, Harry. 2005. "Integrating Hedge Funds into the Traditional Portfolio." *Journal of Wealth Management*, vol. 7, no. 4: 51–57.

Laise, Eleanor. 2006. "Mutual Funds Adopt Hedge-Fund Strategies." *Wall Street Journal*. 21 February 2006: D1, D2.

Lee, Chyi Lin, and Ming-Long Lee. 2014. "Do European Real Estate Stocks Hedge Inflation? Evidence from Developed and Emerging Markets." *International Journal of Strategic Property Management*, vol. 18, no. 2: 178–197.

Lee, Charles, and Bhaskaran Swaminathan. 2000. "Price Momentum and Trading Volume." *Journal of Finance*, vol. 55, no. 5: 2017–2069.

Leibowitz, Martin L., and Anthony Bova. 2005. "Allocation Betas." *Financial Analysts Journal*, vol. 61, no. 4 (July/August): 70–82.

Lerner, Josh. 2000. *Venture Capital and Private Equity: A Casebook*. New York: John Wiley & Sons, Inc.

Lhabitant, François-Serge. 2002. *Hedge Funds: Myths and Limits*. New York: John Wiley & Sons.

Lhabitant, François-Serge. 2004. *Hedge Funds: Quantitative Insights*. New York: John Wiley & Sons.

Liang, Bing. 2000. "Hedge Funds: The Living and the Dead." *Journal of Financial and Quantitative Analysis*, vol. 35, no. 3: 309–326.

Litzenberger, Robert, and Nir Rabinowitz. 1995. "Backwardation in Oil Futures Markets: Theory and Empirical Evidence." *Journal of Finance*, vol. 50: 1517–1545.

Liu, Crocker, David Hartzell, and Martin Hoesli. 1997. "International Evidence on Real Estate Securities as an Inflation Hedge." *Real Estate Economics*, vol. 25, no. 2: 193–221.

Lizieri, Colin, and Stephen Satchell. 1997. "Property Company Performance and Real Interest Rates: A Regime Switching Approach." *Journal of Property Research*, vol. 14, no. 2: 85–97.

Lizieri, Colin, and Charles Ward. 2000. "Commercial Real Estate Return Distributions: A Review of Literature and Empirical Evidence." Working Paper, University of Reading.

Malkiel, Burton, and Atanu Saha. 2005. "Hedge Funds: Risk and Return." *Financial Analysts Journal*, vol. 61, no. 6: 80–88.

McCarthy, David, Thomas Schneeweis, and Richard Spurgin. 1996. "Investment in CTAs: An Alternative Managed Futures Investment." *Journal of Derivatives*, vol. 3, no. 4: 36–47.

Mei, Jianping, and Jiawei Hu. 2000. "Conditional Risk Premiums on Asian Real Estate Stocks." *Journal of Real Estate Finance and Economics*, vol. 21, no. 3: 297–313.

Miles, Mike, and Tom McCue. 1984. "Diversification in the Real Estate Portfolio." *Journal of Financial Research*, vol. 7, no. 1: 57–68.

Mull, Stephen, and Luc Soenen. 1997. "U.S. REITs as an Asset Class in International Investment Portfolios." *Financial Analysts Journal*, vol. 53, no. 2: 55–61.

Naranjo, Andy, and David Ling. 1997. "Economic Risk Factors and Commercial Real Estate Returns." *Journal of Real Estate Finance and Economics*, vol. 14, no. 3: 283–307.

Nijman, Theo, and Lauren Swinkels. 2003. "Strategic and Tactical Allocation to Commodities for Retirement Savings Schemes." Tilburg University.

Park, James, and Jeremy Staum. 1998. "Performance Persistence in Alternative Investment Industry." Working Paper, Paradigm Capital Management Inc., New York.

Peyton, Martha S. 2011. "Is Commercial Real Estate an Inflation Hedge?" *Real Estate Issues*, vol. 36, no. 3 (Fall): 37–44.

Schneeweis, Thomas. 1996. *The Benefits of Managed Futures*. AIMA.

Schneeweis, Thomas. 1998. "Evidence of Superior Performance Persistence in Hedge Funds: An Empirical Comment." *Journal of Alternative Investments*, vol. 1, no. 2: 76–79.

Schneeweis, Thomas, and Hossein Kazemi. 2001. "Alternative Means of Replicating Hedge Fund Manager Performance." CISDM/SOM Working Paper, University Massachusetts.

Schneeweis, Thomas, and Joseph Pescatore.eds. 1999. *The Handbook of Alternative Investment Strategies: An Investor's Guide*. New York: Institutional Investor.

Schneeweis, Thomas, and Richard Spurgin. 1996. "Managed Futures: Nature vs. Nurture." *Barclays Newsletter*. Fall.

Schneeweis, Thomas, and Richard Spurgin. 1997a. "Comparisons of Commodity and Managed Futures Benchmark Indexes." *Journal of Derivatives*, vol. 4, no. 4: 33–50.

Schneeweis, Thomas, and Richard Spurgin. 1997b. "Energy-Based Investment Products and Investor Asset Allocation." CISDM Working Paper, University of Massachusetts.

Schneeweis, Thomas, Hossein Kazemi, and Alex Tolivaisa. 2016. "The Benefits of Commodity Trading Advisors." CISDM White Paper.

Schneeweis, Thomas, Hossein Kazemi, and Alexander Bird. 2016. "The Benefits of Hedge Funds." CISDM White Paper.

Schneeweis, Thomas, Hossein Kazemi, and Edward Szado. 2016a. "The Benefits of Real Estate Investing." CISDM White Paper.

Schneeweis, Thomas, Hossein Kazemi, and Edward Szado. 2016b. "The Benefits of Commodity Investing." CISDM White Paper.

Seiler, Michael, James Webb, and Neil Myer. 1999. "Diversification Issues in Real Estate Investment." *Journal of Real Estate Literature*, vol. 7, no. 2: 163–179.

Siegel, Laurence. 2003. *Benchmarks and Investment Management*. Charlotteville, VA: AIMR.

Singleton, J. Clay. 2005. *Core-Satellite Portfolio Management*. New-York: McGraw-Hill.

Spurgin, Richard. 2001. "How to Game Your Sharpe Ratio." *Journal of Alternative Investments*, vol. 4, no. 3: 38–46.

Stevenson, Simon, and Louis Murray. 1999. "An Examination of the Inflation Hedging Ability of Irish Real Estate." *Journal of Real Estate Portfolio Management*, vol. 5, no. 1: 59–69.

Strongin, Steve, and Melanie Petsch. 1995. "Commodity Investing: Long-Run Returns and the Function of Passive Capital." *Derivatives Quarterly*, Fall: 56–64.

Telser, Lester G. 1958. "Futures Trading and the Storage of Cotton and Wheat." *Journal of Political Economy*, vol. 66, no. 3: 233–255.

Wan, Yang, Bin Mei, Michael L. Clutter, and Jacek P. Siry. 2013. "Assessing the Inflation Hedging Ability of Timberland Assets in the United States." *Forest Science*, vol. 59, no. 1: 93–104.

Waring, Barton, and Laurence Siegel. 2005. "Debunking Some Myths of Active Management." *Journal of Investing*, vol. 14, no. 2: 20–28.

Working, H. 1948. "Theory of the Inverse Carrying Charge in Futures Markets." *Journal of Farm Economics*, vol. 30: 1–28.

Working, H. 1949. "The Theory of the Price of Storage." *American Economic Review*, vol. 39: 1254–1262.

Yago, Glenn, and Susanne Trimbath. 2003. *Beyond Junk Bonds: Expanding High Yield Markets*. New York: Oxford University Press.

Yau, Jot, Uttama Savanayana, and Thomas Schneeweis. 1990. "The Effect of Alternative Return Measures in Financial Futures Research." *Advances in Futures and Options Research, Volume 4*. Frank Fabozzi, ed. Greenwich, CT: JAI Press.

Young, Michael, and Richard Graff. 1995. "Real Estate is Not Normal: A Fresh Look at Real Estate Return Distributions." *Journal of Real Estate Finance and Economics*, vol. 10, no. 3: 225–259.

Zaremba, Adam. 2015. "Is Financialization Killing Commodity Investments?" *Journal of Alternative Investments*, vol. 18, no. 1 (Summer): 66–91.

PRACTICE PROBLEMS

1 Compare the relative liquidity characteristics of direct versus indirect investment in real estate. Discuss three factors that affect the liquidity of both forms of investment.

The following information relates to Questions 2–3

Real Estate Performance 1990–2004[1]

Measure	NAREIT Index	NAREIT Index Hedged	NCREIF Index	NCREIF Index Unsmoothed	S&P 500	Bloomberg Barclays Aggregate Bond Index
Annualized return	12.71%	8.96%	6.14%	7.27%	10.94%	7.70%
Annualized std. dev.	12.74%	11.93%	3.37%	8.95%	14.65%	3.91%
Sharpe ratio	0.66	0.39	0.55	0.33	0.45	0.87
Minimum quarterly return	–14.19%	–10.16%	–5.33%	–18.55%	–17.28%	–2.87%
Correlation w/NAREIT	1.00	0.94	–0.001	0.21	0.35	0.18
Correlation w/NAREIT hedged	0.94	1.00	0.00	0.24	0.00	0.14
Correlation w/NCREIF	0.00	0.00	1.00	0.71	0.01	–0.18
Correlation w/NCREIF unsmoothed	0.21	0.24	0.71	1.00	–0.01	–0.27

Source: CISDM (2005a).

2 **A** Summarize the major categories of direct and indirect investment in real estate.

B Using the data in the table, evaluate the historical relative diversification benefits of both forms of investment when added to a 50 percent stock/50 percent bond portfolio. Use the NCREIF Index unsmoothed to represent direct investment and the NAREIT Index to represent indirect investment.

3 The board trustees of Elite Corporation's US$50 million pension fund are meeting to discuss a presentation they recently received from their pension consultant, who is recommending that they diversify their current 50/50 stock/bond asset allocation to include a 10 percent allocation to real estate. Although the trustees would like to reduce portfolio risk without sacrificing a significant amount of return, the trustees have previously been reluctant to change the asset allocation because they are concerned about "making a mistake we can't easily fix" if the economic environment changes.

1 As of the implied date of the question, what are now known as the Bloomberg Barclays bond series in this and other questions were known under the name of Lehman.

© 2017 CFA Institute. All rights reserved.

One trustee, Maya Semyonova, makes reference to the table above and some notes that provide an overview of how the various indexes are constructed. Semyonova states: "To address our stated risk and return objectives and given the superior historical benefits of direct investing in real estate, represented by the unsmoothed NCREIF Index, I recommend that we reallocate 10 percent from our bond investments indexed to the Bloomberg Barclays Aggregate to a direct real estate asset."

A second trustee, John Pearson, responds with a different recommendation: "I believe we should reallocate 10 percent from the 50 percent S&P 500 allocation to REITs to achieve our goals."

A Critique Semyonova's recommendation with reference to the return, risk, diversification, and liquidity characteristics of the two asset classes that Semyonova is referring to.

B Critique Pearson's recommendation with reference to the return, risk, diversification, and liquidity characteristics of the two asset classes that Pearson is referring to.

C Of the reallocation scenarios suggested by Semyonova and Pearson, choose the one most appropriate for Elite Corporation's pension fund based on the trustees' objectives. Justify your choice with reference to returns, risks, and issues concerning construction of real estate and REIT indexes.

---

4 Capital market analysts John Lake and Julie McCoy are reviewing the information in the following table.

Commodity Index Performance 1990–2004

Measure	GSCI	S&P 500	Bloomberg Barclays Gov./ Credit Bond	MSCI World Equity	Bloomberg Barclays Global Bond
Annualized return	7.08%	10.94%	7.77%	7.08%	8.08%
Annualized std. dev.	19.26%	14.65%	4.46%	14.62%	5.23%
Sharpe ratio	0.15	0.45	0.78	0.19	0.72
Minimum monthly return	–14.41%	–14.46%	–4.19%	–13.32%	–3.66%
Correlation with GSCI	1.00	–0.08	0.03	–0.06	0.06

Source: CISDM (2005b).

Lake and McCoy note that the Sharpe ratio for the GSCI is significantly lower than that of the S&P 500 and the Bloomberg Barclays Government/Corporate Bond indexes. They also note that the minimum monthly returns for the GSCI and S&P 500 are similar.

Lake states to McCoy: "Based on the historical record, I don't understand why we would invest in the GSCI when the annualized return for the GSCI is lower than that of the S&P 500 and Bloomberg Barclays Government/Corporate indexes, the minimum monthly return is similar to that of the S&P 500, and the Sharpe ratio is significantly lower than either of the domestic equity or bond asset classes. The risk measure in the Sharpe ratio should completely capture a commodity index's risk."

A Critique Lake's statement.

McCoy shows Lake the table below and suggests that these more recent data, which show a significant outperformance of commodity returns versus domestic and international equities and bonds, make a much stronger case for investing in commodities. McCoy also states that the low correlations of commodities with the other asset classes indicate that inclusion of commodities will provide significant diversification benefits to the portfolio.

Recent Commodity Index Performance 2000–2004

Measure	GSCI	S&P 500	Bloomberg Barclays Gov./ Credit Bond	MSCI World Equity	Bloomberg Barclays Global Bond
Annualized return	13.77%	–2.30%	8.00%	–2.05%	8.47%
Annualized std. dev.	22.10%	16.35%	4.76%	15.62%	6.02%
Sharpe ratio	0.50	–0.31	1.11	–0.30	0.96
Minimum monthly return	–14.41%	–10.87%	–4.19%	–10.98%	–3.66%
Correlation with GSCI	1.00	–0.05	0.05	0.00	0.10

Source: CISDM (2005b).

B Judge the validity of McCoy's conclusions regarding returns and correlations of the various asset classes.

5 Explain the practical effects of the following possible characteristics of a hedge fund index:

A survivorship bias.

B value weighting.

C stale price bias.

6 Ian Parkinson, as chief pension officer of a large defined-benefit plan, is considering presenting a recommendation that the pension plan make its first investments in three different types of hedge funds: 1) market neutral, 2) convertible arbitrage, and 3) global macro.

An analyst who works for Parkinson comes by with the table given below and makes the following comment: "The returns for global macro are very impressive. In fact, there are other strategies that have significantly outperformed the S&P 500, equity market-neutral, and convertible arbitrage over the past 15 years. I think that, based on their returns, we should focus specifically on the other strategies."

Performance of Hedge Fund Strategies and Traditional Assets 1990–2004

Fund or Asset	Annual Return (%)	Annual Standard Deviation (%)	Sharpe Ratio	Minimum Monthly Return (%)	Correlation with S&P 500	Correlation with Bloomberg Barclays Gov./ Credit Bond
HFCI	13.46	5.71	1.61	6.92	0.59	0.17
Event driven	13.46	5.59	1.64	–9.37	0.59	0.07
Equity hedge	15.90	9.34	1.24	–9.70	0.64	0.10
Equity market neutral	9.24	2.50	1.98	–1.07	0.09	0.24

(Continued)

Fund or Asset	Annual Return (%)	Annual Standard Deviation (%)	Sharpe Ratio	Minimum Monthly Return (%)	Correlation with S&P 500	Correlation with Bloomberg Barclays Gov./ Credit Bond
Merger/risk arbitrage	9.07	4.86	0.99	–8.78	0.48	0.10
Distressed	15.28	6.07	1.81	–9.71	0.42	0.04
Fixed-income arbitrage	7.62	3.61	0.92	–6.61	0.06	–0.06
Convertible arbitrage	10.23	3.96	1.50	–3.42	0.19	0.13
Global macro	16.98	8.38	1.51	–5.41	0.26	0.34
Short selling	–0.61	19.39	–0.25	–14.62	–0.76	–0.01
S&P 500	10.94	14.65	0.45	–14.46	1.00	0.13
Bloomberg Barclays Gov./ Credit Bond	7.77	4.46	0.78	–4.19	0.13	1.00
MSCI World	7.08	14.62	0.19	–13.32	0.86	0.09
Bloomberg Barclays Global Bond	8.09	5.23	0.73	–3.66	0.11	0.74

Note: HFCI is the Hedge Fund Composite Index and was constructed by equally weighting the EACM 100, the HFR Fund Weighted Composite Index, and Credit Suisse/Tremont Hedge Fund Index.
Source: CISDM (2005c).

A Describe the three alternative strategies that Parkinson is considering, and evaluate each with respect to their level of market risk and credit risk. Interpret their correlations with the S&P 500 and the Bloomberg Barclays Government/Corporate Bond indexes as presented in the table above.

B Critique the analyst's statement.

7 Interpret a "1 and 20" fee structure with reference to high-water marks and drawdowns.

8 Susan DiMarco is evaluating a hedge fund that has a high level of portfolio turnover and a short investment record. The hedge fund makes a contractual stipulation with limited partners regarding a lock-up period that is quite common in the hedge fund industry. A colleague, Jane Farkas, who has reviewed the fund, makes the following statement to DiMarco: "Well, if we're unhappy with performance, we can always fire the hedge fund manager. If they trade frequently, as indicated by their high portfolio turnover, our investment must have high liquidity." Judge the validity of Farkas's statement.

9 Jane Farkas tells Susan DiMarco that she has seen exciting data on the performance of market-neutral, convertible arbitrage, and global macro hedge funds. Farkas states: "The Sharpe ratios of all of these hedge fund strategies are much higher than for traditional equities or bonds, which means they have a great risk/return profile. We should definitely plan a major investment in hedge funds."

DiMarco responds: "There are several reasons that the Sharpe ratio may be misleading."

A Discuss the situations that could cause an upward bias in the calculation of the Sharpe ratio.

B Evaluate the reasons that statistically indicate that the Sharpe ratio is not the most appropriate measure of risk for hedge funds.

The following information relates to Questions 10–11

Monthly Returns of a Hedge Fund and an Index

Month	Hedge Fund Returns (%)	Index Returns (%)
January	3.50	–2.40
February	4.00	–4.00
March	–2.00	–1.60
April	–2.00	3.00
May	–1.00	–4.20
June	0.90	2.00
July	–1.00	2.50
August	1.70	–2.10
September	2.70	–2.00
October	3.70	0.50
November	0.40	3.10
December	–3.20	0.20

10 A Calculate the average rolling returns for the hedge fund if the investor's investment horizon is nine months.

B Explain how rolling returns can provide additional information about the hedge fund's performance.

11 A Compute the annualized downside deviations for the hedge fund and the index, and contrast them to the standard deviation. The annualized standard deviations for the hedge fund and the index are, respectively, 8.64 percent and 9.19 percent. Assume a hurdle rate of 5% per year.

B Compute the Sortino ratio and, based on this statistic, evaluate the performance of the hedge fund against the performance of the index portfolio.

12 Andrew Cassano, CIO of a large charitable organization, is meeting with his senior analyst, Lori Wood, to discuss managed futures. Cassano believes that it would be beneficial to evaluate this alternative investment category before making a final decision with respect to hedge fund investment.

Wood states: "Although managed futures are sometimes considered a subset of hedge funds, there are some differences that make them worthy of consideration."

A Determine which absolute-return hedge fund strategy to which managed futures are mostly closely related (i.e., managed futures are often considered a subgroup of this hedge fund strategy).

B Briefly discuss a primary similarity and a primary difference between managed futures and many other hedge fund strategies.

C Contrast the characteristics of two managed futures styles: systematic and discretionary.

13 Cassano asks: "If managed futures strategies are often momentum based, how do they achieve excess returns differently from traditional stock or bond investment vehicles?" Formulate an answer to Cassano's question.

14 List and discuss the sources of return available to managed futures programs through the use of derivative trading strategies.

15 Contrast "fallen angels" to high-yield debt.

16 Evaluate the role of investors in both the private equity and relative-value strategies—specifically, with respect to investing in distressed securities.

17 Formulate a description of the results of a prepackaged bankruptcy with reference to a) "prebankruptcy" creditors of the company, b) "prebankruptcy" shareholders, and c) vulture investors.

18 Critique the following statement: "When the economy has been faltering and may be going into recession, it is typically a good time to invest in distressed securities."

The following information relates to Questions 19–24

Franciszek Magerski is a portfolio manager who specializes in alternative investments. He recently joined Harman, Klyde, and Palson (HKP), private wealth managers. Although he has managed institutional portfolios, Magerski has no experience with private wealth clients. A partner at HKP tells Magerski: "Alternative investing and due diligence for private wealth clients is similar to that for institutional clients. Private clients have the same issues of time horizon, but different liquidity needs."

Magerski is assigned to modify a portfolio having a current allocation of 50 percent equity and 50 percent fixed income. The equity portion consists of common stocks from the S&P 500 and is benchmarked to that index. The fixed-income portion consists of high-grade US corporate bonds and US Treasury securities and closely tracks the Bloomberg Barclays Aggregate Bond Index.

Magerski intends to improve the risk-return profile of the portfolio by including alternative investments. Some recent characteristics of equities, fixed-income securities, US treasury bills, and four potential alternative asset classes are shown in Exhibit 1. Magerski will use the Sharpe ratio to initially select three alternative investments for the portfolio.

Exhibit 1 Characteristics of Asset Classes

Asset Class	Annual Return (%)	Standard Deviation of Returns (%)	Correlation with US Stocks	Correlation with US Bonds
US Common Stocks	11.0	15.0	1.00	0.12
US Bonds	7.5	4.0	0.12	1.00

(continued)

Exhibit 1 (Continued)

Asset Class	Annual Return (%)	Standard Deviation of Returns (%)	Correlation with US Stocks	Correlation with US Bonds
Real Estate–NCREIF–unsmoothed	8.0	9.0	–0.01	–0.27
Hedge Funds–market neutral	6.0	2.5	0.09	0.21
Commodities–GSCI	7.0	19.0	–0.06	0.04
Private Equity	20.0	22.0	0.50	0.30
US Treasury Bills	3.5	—	—	—

Although the new equity and fixed-income allocation will form the passive core of the portfolio, the alternative segment allows for active management, alpha generation, and additional diversification benefits. Magerski's associate, Julio Chavez, states that diversification is improved by adding real estate to an equity/fixed-income portfolio and points to the correlations between real estate and bonds and stocks as shown in Exhibit 1. Magerski expresses some concern with the real estate data because it refers to the NCREIF–unsmoothed index. Chavez states that the unsmoothed index provides a better indication of the benefits of real estate investment than the NCREIF (smoothed) Index.

Chavez also mentions that because the Sharpe ratios for hedge funds are generally higher than for traditional equities or bonds, a substantial allocation should be made to hedge funds. Magerski disagrees with Chavez and responds that the Sharpe ratio for a hedge fund may be biased and not always an appropriate performance measure for risk-adjusted return.

Magerski also tells Chavez there are several issues to consider when selecting hedge fund investments, including fee structure and liquidity. The hedge fund under consideration is an equity market-neutral fund with a fee structure consisting of a 2 percent management fee and a 15 percent incentive fee. The fund's initial amount of assets under management and the initial high-water mark are $100 million. When performance fees are paid, the incentive fee will, as is the standard industry practice, apply to the entire amount under management. Also, the lock-up period is five years and the long period is very beneficial to private wealth investors in the fund.

Magerski has received a research report recommending a large commodity allocation to manage portfolio risk and serve as an inflation hedge. The report notes, however, that some commodities are not effective as inflation hedges. Magerski is considering following this recommendation and continues reading the report so as to better understand which specific commodities would serve as the best inflation hedge.

19 Is the HKP partner's statement regarding differences between private clients and institutional clients correct?

A Yes.

B No, because their time horizon issues are different.

C No, because their liquidity needs are not different.

20 Using the Sharpe ratio, which of the following alternative investments has the *most* beneficial risk profile?

A Real Estate.

B Hedge Funds.

C Private Equity.

21 Chavez's preference for the unsmoothed version of the NCREIF Index instead of the smoothed version is most likely because the:

A smoothed version includes the effect of leverage on returns.

B smoothed version is based on actual unreliable market values.

C bias arising from infrequent appraisals is corrected in the unsmoothed version.

22 Magerski's concern about a biased Sharpe ratio for hedge funds is most likely because:

A eliminating extreme returns reduces the standard deviation of returns.

B smoothing returns can overstate true gains and losses and calculated volatility.

C lengthening the measurement interval from weekly data to monthly data increases the estimate of annualized standard deviation of returns.

23 Is Magerski's statement regarding the hedge fund incentive fee and the benefit of the lock-up period correct?

A No regarding both the incentive fee and the lock-up period.

B No regarding the incentive fee, and yes regarding the lock-up period.

C Yes regarding the incentive fee, and no regarding the lock-up period.

24 The report's comment about some commodities being ineffective as inflation hedges most likely relates to:

A livestock.

B changes, rather than levels, of inflation.

C storable commodities directly related to the level of economic activity.

The following information relates to Questions 25–29

The board of trustees of Cochran Corporation's US$150 million pension fund is meeting with a consultant, Ferdinand Clyburn. They plan to discuss altering the fund's current asset allocation of 50 percent equity and 50 percent bonds to include investments such as real estate, private equity, and commodities. The portfolio is currently invested in funds indexed to the S&P 500 Index and the Bloomberg Barclays US Aggregate Index. The board gives Clyburn the following investment policy mandate:

> Select an asset allocation that will increase the expected return on the portfolio without reducing liquidity.

Before Clyburn's presentation begins, Esme Howard, a trustee, asks the following question:

> "What are the return-distribution characteristics associated with alternative investment strategies that reduce downside risk?"

Clyburn begins his presentation with a discussion of real estate investing. He states that if the board decides to invest *directly* in real estate, then the optimal asset allocation should be based on either the National Council of Real Estate Investment Fiduciaries (NCREIF) Index (without correction) or the NCREIF Index (unsmoothed). He recommends the NCREIF (unsmoothed) because the NCREIF (without correction) historically suffers from a bias.

He further states that if the board decides to invest *indirectly* in real estate, the optimal asset allocation should be based on the National Association of Real Estate Investment Trusts (NAREIT) Index.

Based on the expected return data in Exhibit 1, Clyburn provides the board with alternative asset allocation strategies that include real estate. The potential asset allocations under consideration are displayed in Exhibit 2.

Exhibit 1 Expected Returns for Selected Indexes

Asset Class	Expected Annualized Return (%)
NAREIT Index	9.87
NCREIF Index (unsmoothed)	9.90
S&P 500 Index	11.16
Bloomberg Barclays US Aggregate Index	7.70

Exhibit 2 Asset Allocation Strategies That Include Real Estate

Allocation Strategy	Stock Allocation (%)	Bond Allocation (%)	Real Estate Allocation
Strategy 1	40	50	10% invested in the NAREIT Index
Strategy 2	40	40	20% invested in the NAREIT Index
Strategy 3	40	40	20% invested directly based on the NCREIF Index (unsmoothed)

Clyburn then provides an overview of private equity investing, with a primary focus on venture capital and buyout funds. In response to the presentation, trustee Rex Bolger asks the following question for clarification:

Bolger question #1 "What are the common features of private equity investing?"

Finally, Clyburn reviews the implications of investing in commodities on the risk-return profile of the pension fund's portfolio. He states that a major reason for including commodities in a portfolio is to provide protection against unexpected inflation. Bolger then asks another question:

Bolger question #2 "Historically, have all types of commodity investments been equally effective in protecting a portfolio against inflation?"

25 Which of the following is the *most* appropriate response to Howard's question?

A Positive skewness and low kurtosis.

B Positive skewness and high kurtosis.

C Negative skewness and high kurtosis.

26 The real estate index bias indicated by Clyburn is *most likely* an:

A overestimation of the return volatility.

B underestimation of the return volatility.

C overweighting of residential real estate.

27 Given the board's investment policy mandate and Exhibits 1 and 2, the *most* appropriate asset allocation is:

A Strategy 1.

B Strategy 2.

C Strategy 3.

28 Which of the following is the *least* appropriate response to Bolger's first question?

A High due diligence costs.

B Limited diversification potential.

C Complexity of valuation and assessment.

29 Which of the following is the *most* appropriate response to Bolger's second question?

A Yes.

B No, indirect commodity investments have been the most effective.

C No, direct commodity investments that are related to the intensity of economic activity have been the most effective.

The following information relates to Questions 30–35

Guy Northrup is an investment advisor with Stoneford Partners, a private wealth management firm. The advisors at Stoneford Partners are considering adding several hedge funds to their investment list. Northrup and his colleague, Sasha Slate, meet with their supervisor to discuss hedge fund investing.

Hedge Fund Characteristics

During the meeting Northrup comments: "Although fund of funds have lock-up periods similar to other hedge funds, investors in fund of funds typically pay lower fees overall."

Northrup reviews information about a hedge fund, Peeble Creek. Northrup notes they have $400 million under management and a 1.5 plus 20 fee structure without a high-water mark provision. Slate explains that a high-water mark caps the annual fee to the fund manager.

Performance Evaluation

The group's discussion changes to focus on evaluating the performance of hedge funds. During the discussion Northrup makes two observations:

Observation 1	As top-performing funds grow from new inflows and poorly performing funds close, value weighting the components of a hedge fund index will cause an index to have return characteristics similar to those of its best-performing funds over a given time period.
Observation 2	Transaction costs do not affect the ability to rebalance an investable, equally weighted hedge fund index.

The supervisor comments that the presence of some attributes may indicate the manager is trying to "game" the hedge fund's Sharpe ratio. Northrup notes the following changes in investment and reporting attributes for three hedge funds shown in Exhibit 1.

Exhibit 1 Three Hedge Funds and Attributes That May Affect Sharpe Ratio

Attributes	Fund A	Fund B	Fund C
Change in the length of measurement interval	From monthly to quarterly	From monthly to quarterly	From quarterly to monthly
Percent of assets subject to stale pricing	Increase from 5% to 10%	Decrease from 10% to 5%	Increase from 5% to 10%
Option trading	Write out-of-money calls	Buy out-of-money calls	Write in-the-money calls

Managed Futures

After the meeting, Northrup tells his supervisor that the firm should consider managed futures as a diversification tool for client portfolios. His supervisor replies: "That may be a good idea because there are possibilities to earn positive excess returns using managed futures:

- First, hedgers may pay a risk premium to liquidity providers, such as Commodity Trading Advisors (CTA), for the insurance that the hedgers obtain.
- Second, CTAs are more likely to be able to conduct profitable arbitrage trades between stock, bond, futures, options, and cash markets because of differential carrying costs between investors."

30 Are Northrup's comments about fund of funds' lock-up periods and lower fees *most likely* correct?

A No.

B Yes, for lower fees only.

C Yes, for lock-up periods only.

31 Which of the following *best* describes Peeble Creek's fee structure? Peeble Creek receives:

A a one-time fee of 1.5 percent of the investor's commitment and receives 20 percent of annual profits.

B an annual compensation of 1.5 percent of the fund's assets and an additional 20 percent of the fund's annual profits.

C an annual compensation of 1.5 percent of the investor's commitment and an additional 20 percent of the fund's cumulative returns at portfolio liquidation.

32 Is Slate's explanation about high-water marks correct?

A Yes.

B No, because the high-water mark provides a minimum fee to the manager.

C No, because the high-water mark determines if this period's incentive fee is paid.

33 Are Northrup's observations about value weighting and transaction costs for hedge funds indexes correct?

A No.

B Yes, for value weighting only.

C Yes, for transaction costs only.

34 Which of the hedge funds in Exhibit 1 has attributes that provide the greatest opportunity to game its Sharpe ratio?

A Fund A.

B Fund B.

C Fund C.

35 Are both of the supervisors' explanations of excess returns in managed futures investing correct?

A Yes.

B No, only the first statement is correct because differential carrying costs do not exist between CTAs and other investors.

C No, only the second statement is correct because CTAs, seeking liquidity, pay a premium to hedgers.

The following information relates to Questions 36–41

The University Endowment Fund is considering making an investment in hedge funds. Its investment committee is meeting to decide which of the following four hedge funds should be selected:

- COE Fund, a "fund of funds;"
- Savior Capital, an "equity market neutral" fund;
- Alphameric Advisors, a "distressed debt arbitrage" fund;
- MarketView LLC, a "long-only value investing in distressed securities" fund.

During the meeting, committee members made the following statements:

Statement 1	"The Sharpe ratio is not the best performance measure for hedge funds because it is based on the assumption of normality of returns."
Statement 2	"Alphameric Advisors' investment style involves selling the traded debt of the distressed company under consideration, and buying the debt of non-distressed companies."
Statement 3	"It is better to use an equally weighted hedge fund index to reflect the potential diversification of hedge funds rather than a value-weighted index. This is because value weighting may result in the index taking on the return characteristics of the best-performing hedge funds, creating a momentum effect in returns."
Statement 4	"The Sortino ratio is the best means to examine the consistency of hedge fund returns."

One of the investment committee members noted that MarketView LLC has a "2 and 20 fee structure with a high-water mark provision," and wondered what that meant.

36 Given the hedge funds' investment styles, which of the following is *most likely* to display negative skewness and high kurtosis in its investment returns?

A Savior Capital.

B MarketView LLC.

C Alphameric Advisors.

37 Given the hedge funds' investment styles, which of the following would be *most likely* to reduce the beta of the endowment fund's equity portfolio if the hedge fund investment replaces average-beta equity assets?

A COE Fund.

B Savior Capital.

C MarketView LLC.

38 Statement 1 is:

A correct.

B incorrect, because the Sharpe ratio accommodates a skewed distribution.

C incorrect, because the Sharpe ratio takes into account distributions with high kurtosis.

39 Statement 2 is:

A correct.

B incorrect, because this investment style involves a long position in the distressed company's traded debt and a short position in its equity.

C incorrect, because this investment style involves a long position in the distressed company's traded debt and a short position in non-distressed companies' debt.

40 Statement 3 is:

A correct.

B incorrect, because the higher survivorship bias of an equally weighted index will lead it to understate historical returns.

C incorrect, because changes in the index's composition tend to affect an equally weighted index less than a value-weighted index.

41 Statement 4 is:

A correct.

B incorrect, because it would be better to use rolling returns.

C incorrect, because it would be better to use the downside deviation.

SOLUTIONS

1 Direct (physical) investments in real estate tend to be much less liquid than investments in REITs (which are indirect investments). Reasons for the illiquidity of direct investments include the following:

- The large transaction sizes when buying/selling commercial/industrial buildings and land or residential apartment buildings is in contrast to the flexibility of trading small amounts in REITs on public exchanges.
- The lack of availability and timeliness of information with respect to direct real estate investment results in extensive valuation and due diligence issues, whereas REITs are exchange traded in real time on a daily basis, and information about them is readily available and accessible.
- The high transaction costs of direct investments in terms of broker commissions and the financing costs of buying physical assets require long-term investment horizons. Exchange-traded REITs have low transaction costs, and reallocation of funds is easy.

2 **A** Direct investment in real estate includes individual residences, agricultural land, and commercial real estate. The category of commercial real estate can be subdivided into industrial, office, retail, and apartment complexes. Indirect investment is achieved via REITs, which can be subdivided into equity, mortgage, and hybrid (a combination of first two) investment trusts.

B Using the unsmoothed NCREIF Index as a benchmark for direct investment in commercial real estate indicates that the long-term (1990–2004) correlation of direct real estate investment with the S&P 500 is slightly negative; the correlation of direct real estate investment with bonds (the Bloomberg Barclays Aggregate Bond Index) is significantly negative, indicating that adding physical real estate to a 50 percent stock/50 percent bond portfolio would have provided very substantial diversification benefits.

The correlations of the NAREIT Index with both the S&P 500 and bonds were both moderately positive for the period examined. This fact indicates that indirect investment in real estate had diversification benefits relative to a 50/50 stock bond portfolio, but that the diversification benefits were not as large as those resulting from direct real estate investment.

3 **A** Semyonova's recommendation can be critiqued along the following dimensions:

- *Return*: The long-term returns for bonds and direct investment in real estate (unsmoothed NCREIF) are similar (7.70 percent and 7.27 percent); therefore, reallocating 10 percent of bond investments to direct real estate investment would not sacrifice much return.
- *Risk*: a) The standard deviation for the unsmoothed NCREIF Index is more than twice that for the Bloomberg Barclays Aggregate; therefore, this reallocation does not reduce risk as measured by standard deviation. b) Downside volatility, as represented in this table by the minimum quarterly return, is much greater for real estate than for bonds. c) The NCREIF Index is a compilation of many types of real estate, whereas the trustees would have to choose a specific asset, possibly incurring higher risk than indicated by the NCREIF data.
- *Diversification*: The correlation between the Bloomberg Barclays Aggregate and the unsmoothed NCREIF Index is significantly negative, which would indicate good potential for diversification.

- *Liquidity*: Investment in physical real estate is the least liquid of the asset classes shown in the table. A transaction could probably not be reversed quickly or easily.

B Pearson's recommendations can be criticized along the following dimensions:

- *Return*: The unhedged return of REITs is almost 2 percentage points greater than the return of the S&P 500, whereas the hedged return is about 2 percentage points less than the S&P. Therefore, taking into account the equity return component of the NAREIT Index, this reallocation could represent a slight sacrifice in return.
- *Risk*: The standard deviation of the NAREIT Index and the hedged NAREIT Index was approximately 2 and 3 percentage points below that of the S&P 500, respectively. Thus no matter which index we use to represent indirect real estate investment, the reallocation would satisfy the objective of risk reduction, based on historical experience. Additionally, downside risk (as measured by the minimum quarterly return) was much less for REITs than for the S&P 500, so the reallocation could reduce downside risk as well.
- *Diversification*: The correlation between the S&P 500 and the hedged NAREIT Index is zero, indicating that REITs have sources of return that are different from those for large-cap equities, which would enhance diversification.
- *Liquidity*: REITs and S&P 500 equities are exchange traded and, therefore, are both liquid.

C The second scenario—that is, reallocation of 10 percent of large-cap equities to REITs—is the best choice to fulfill the trustees' stated goals for the following reasons:

- *Return*: Using the long-term data provided in the table, the first scenario (based on unsmoothed NCREIF data) would have a mean return of $10.94\% \times 0.5 + 7.70\% \times 0.4 + 7.27\% \times 0.1 = 9.28\%$, whereas the second scenario (using hedged NAREIT) would yield 9.12 percent. If the unhedged NAREIT returns are used in the calculation, the expected return rises to 9.5 percent. Therefore, a 10 percent investment in REITs (even those least correlated with equities—e.g., mortgage REITs) and corresponding 10 percent reduction in S&P 500 stocks would represent a return similar to that of the first scenario.
- *Risk*: The second scenario is superior in terms of risk reduction because it maintains a higher allocation to bonds, which show a much lower correlation with unhedged REITs than does the S&P 500. Additionally, the minimum quarterly return is worst (most negative) for the unsmoothed NCREIF Index and the S&P 500. Therefore, the second scenario would reduce allocation to an asset class with high downside risk and reallocate money to REITs, which have a lower downside risk. Finally, REITs are highly liquid and can be easily divested, whereas physical real estate necessitates a long-term commitment and entails high transaction costs. *Note*: Although bonds have a negative correlation with the NCREIF Index (the first scenario), which suggests a superior reduction in risk through diversification, the three points provided here indicate that the reallocation from equities to REITS more closely fulfills the stated objectives of the trustees.

- *Index construction*: The choice of real estate index is pertinent to the assumptions used in calculating expected results for asset allocation decisions. The use of the unsmoothed NCREIF Index can be substantiated because more frequent, market-based (transaction) data are more timely and accurate than the smoothed, annually calculated, appraisal-based data. This method suggests higher expected returns—and significantly greater risk.

  The use of the hedged NAREIT Index could be justified by the concept of eliminating double counting (the equity return component in equity REITs). Additionally, the use of mortgage and hybrid REITs would reduce the redundancy of the more highly correlated equity REITs. Nevertheless, equity REITs compose about 95 percent of the NAREIT Index, so the unhedged data show a significant increase in return with less risk, as demonstrated by the high Sharpe ratio of the NAREIT Index relative to most other asset classes.

4 A Two points can be made that relate to the value of the GSCI as a risk diversifier and the interpretation of the Sharpe ratio. First, the negative correlation of the GSCI with the S&P 500 and the low positive correlation of the GSCI with the Bloomberg Barclays Government/Corporate Bond Index suggest good risk reduction benefits when the GSCI is added to a portfolio of US stocks and bonds. Second, in interpreting the low Sharpe ratio for the GSCI, account must be taken of the appropriateness of the Sharpe ratio for measuring commodity returns. The validity of standard deviation as a measure of risk in the denominator of the Sharpe ratio is compromised when returns are skewed and/or have high kurtosis. Because the data presented does not address skewness or kurtosis, Lake's statement on standard deviation is speculative.

B McCoy is evaluating a short time series. Because investment performance depends on the time period studied, the high returns generated by commodities in 2000–2004 may not be representative of long-term performance. In fact, we know this is the case when the data are compared with data for the longer period documented in Problem 4. This does not necessarily suggest that investment in commodities is not appropriate. However, it raises a caveat about comparing expectations of future returns for a period when the economic environment may be different from that of the short-term period that generated the results in the table given. This information also suggests that commodities may provide benefits as a tactical asset class.

The same concerns with respect to the short timeframe covered by the table can be expressed for the correlation data. However, the values are virtually the same for the longer-term data, which suggests that commodity returns are not correlated with the other asset classes; as a result, inclusion of commodities in the portfolio could provide both long-and short-term diversification benefits.

5 A Survivorship bias occurs when returns of managers who have failed or exited the market are not included in the data analyzed over a specific timeframe. This results in overestimation of historical returns in the range of 1.5–3.0 percent per year. The timing of survivorship bias may be concentrated during certain economic periods, further complicating analysis of persistence of returns over short timeframes. Additionally, age (vintage) effects make it difficult to compare performance of hedge funds that have track records of different lengths. This is especially important when researching hedge funds, which have average track records of two to five years.

B Indexes that are value weighted as opposed to equally weighted may take on the return characteristics of the best-performing hedge fund in them over a given period. These indexes thus reflect the weights of popular bets by hedge fund managers, because the asset values of the various funds change as a result of asset purchases as well as price appreciation.

C Lack of security trading leads to stale price bias and can cause measured standard deviation to be over-or understated, depending on the time period being studied. This could result in measured correlations being lower than expected. This issue is not a significant concern in the creation of hedge fund indexes because monthly data are used. Furthermore, the underlying holdings in many hedge fund strategies are relatively liquid; therefore, positions reflect market prices.

6 **A** Equity market-neutral strategies identify over-and undervalued stocks while neutralizing the fund's exposure to market risk by combining long and short positions with similar exposure to related market or sector factors. Therefore, as their name suggests, they have little or no market risk. They also have low credit risk because their long–short positions result in net low leverage. As expected, there is virtually no correlation between funds using this strategy and the S&P 500.

Convertible arbitrage strategies exploit anomalies in the prices of corporate convertible bonds, warrants, and preferred stock. The convertible arbitrage funds buy or sell these securities and then hedge the risk of changes in price and volatility of the underlying securities, changes in interest rates, and changes in the issuers' credit ratings. The many small, individual positions taken, and hedging of these risks, result in low market exposure. However, this strategy also increases credit risk considerably because hedging via derivative instruments creates high leverage exposure. Convertible arbitrage strategies have a relatively low correlation with the S&P 500 or the Bloomberg Barclays Government/Corporate Bond Index because hedging the risks mitigates underlying market exposure.

Global macro strategies trade on systematic moves in major financial and nonfinancial markets by using futures and options contracts. They may also take positions in traditional equity and fixed-income markets. Because they tend to make large bets on the direction of currencies, commodities, or stock and bond markets globally, they have high market exposure. Given their extensive use of leverage via futures and options, they are also exposed to significant credit (leverage) risk. Because of their large positions with regard to anticipated changes in market levels, the correlation of global macro with the S&P 500 and Bloomberg Barclays Government/Corporate Bond Index tends to be greater than those of the first two strategies discussed here.

B The usefulness of historical hedge fund data continues to be controversial. Research has shown that the volatility of returns is more persistent through time than the level of returns. Issues such as survivorship and backfill bias have a significant impact on historical tests of performance persistence. Additionally, lock-up periods, restrictions on redemptions/withdrawals, and the relatively short track record of many hedge funds complicate the extrapolation of past performance to expected (future) performance of hedge funds.

7 The fee structures charged by hedge fund managers often have two components: management fees and incentive fees. The "1 and 20" refers to a 1 percent per year management fee based on net asset value plus a 20 percent incentive,

or profit-sharing, fee that is earned only if assets exceed a specified value. This value may be the high-water mark of the fund—that is, the highest previous NAV. Typically, drawdowns (declines/losses in net asset value) must be recouped before any incentive fees are charged.

8 Farkas's statement is not valid because the hedge fund has a lock-up period. During this time, the investor cannot redeem any part of the investment. Additionally, once the lock-up period has expired, redemption rights may be limited to a quarterly or semiannual schedule and the investor generally must give advance notice, ranging from 30 to 90 days, of an intention to redeem.

9 A Any of the following reasons could cause an upward bias in the Sharpe ratio:

- Lengthening the measurement interval: This will result in a lower estimate of volatility. For example, the annualized standard deviation of daily returns is generally higher than of weekly returns, which is, in turn, higher than of monthly returns.
- Compounding the monthly returns but calculating the standard deviation from the (not compounded) monthly returns.
- Writing out-of-the-money puts and calls on a portfolio: This strategy can potentially increase the return by collecting the option premium without paying off for several years. Strategies that involve taking on default risk, liquidity risk, or other forms of catastrophe risk have the same ability to report an upwardly biased Sharpe ratio. (An example is the Sharpe ratios of market-neutral hedge funds before and after the 1998 liquidity crisis.) This is akin to trading negative skewness for a greater Sharpe ratio by improving the mean or standard deviation of the investment.
- Smoothing of returns: Using certain derivative structures, infrequent marking to market of illiquid assets, or using pricing models that understate monthly gains or losses can reduce reported volatility.
- Eliminating extreme returns: Because such returns increase the reported standard deviation of a hedge fund, a manager may choose to attempt to eliminate the best and the worst monthly returns each year to reduce the standard deviation. Operationally, this entails a total-return swap, in which one pays the best and worst returns for one's benchmark index each year and the counterparty pays a fixed cash flow and hedges the risk in the open market. If swaps are not available, one can do it directly with options.

B Because of the option-like payoff characteristics of many hedge fund strategies, their returns are not normally distributed, but normality is an assumption inherent in the computation of standard deviation in the denominator of the Sharpe ratio. Hedge fund returns, on average, display some skewness (asymmetry of the return distribution), as well as high kurtosis (relatively frequent extreme returns). These effects are not captured by standard deviation, the risk measure used in the Sharpe ratio. Also, Sharpe ratios are overestimated when investment returns are serially correlated (i.e., returns trend), which causes a lower estimate of the standard deviation. This occurs with certain momentum (trend-following) hedge fund strategies and those that may have a problem with stale pricing or illiquidity (e.g., distressed securities).

10 A The hedge fund's average nine-month rolling return:

$$RR_{9,1} = (2.7 + 1.7 - 1 + 0.9 - 1 - 2 - 2 + 4 + 3.5)/9 = 0.7556\%$$
$$RR_{9,2} = 0.7778\%$$
$$RR_{9,3} = 0.3778\%$$

$RR_{9,4}$ = 0.2444%
Average = (0.7556 + 0.7778 + 0.3778 + 0.2444)/4 = 0.54%

B Rolling returns can show how consistent the returns are over the investment period and whether there is any cyclicality in the returns.

11 A A hurdle rate of 5% per year equates to a monthly hurdle rate of 5%/12 = 0.4167%.

The downside deviation for the hedge fund
$= \sqrt{28.78/(12-1)} \times \sqrt{12} = 5.60\%$.

The downside deviation for the index = $\sqrt{65.04/(12-1)} \times \sqrt{12} = 8.42\%$.

The downside deviation is lower than the standard deviation because downside deviation takes into account only the deviations on the downside. The downside deviation of the hedge fund is lower than that of the index in this case.

B Annualized return for the hedge fund = 0.6133% × 12 = 7.360%.

Annualized return for the index = –0.449% × 12 = –5.388%.

The Sortino ratio for the hedge fund = (7.36 – 5)/5.6 = 0.42.

The Sortino ratio for the index = (–5.39 – 5)/8.42 = –1.23.

The Sortino ratio of the hedge fund is much higher than that of the index, indicating that it provides greater return per unit of downside risk.

12 A Managed futures are often considered a subgroup of global macro hedge funds because both strategies attempt to take advantage of systematic moves in major financial and nonfinancial markets.

B The primary similarity between managed futures and absolute-return hedge fund strategies is that they seek positive returns regardless of market direction. Managed futures strategies invest exclusively in the forward and derivatives markets on a leveraged basis by trading futures and options contracts in the financial, commodity, and currency markets. In contrast, other hedge fund strategies invest in underlying markets; some, depending on their strategies, also use derivatives.

C Systematic trading strategies are rule based and frequently trend following. Discretionary trading strategies rely on portfolio manager judgment rather than rules and include strategies based on fundamental economic data and trader beliefs.

13 The theory of market efficiency suggests that news is simultaneously available to all market participants and is quickly incorporated into market prices. However, research in behavioral finance indicates that investors may systematically underreact to information; consequently, security prices may trend, particularly in traditional investment vehicles (stocks and bonds). Actively managed derivative strategies that follow momentum, or trend-based, models have been shown to be profitable by capturing these trends.

14 Similarly to market-neutral funds, managed futures programs can replicate many strategies available to cash market investors at lower transaction costs and can also trade on strategies by using derivatives that are unavailable to cash market investors. Research has shown that when returns are segmented according to whether the stock/bond markets rose or fell, managed futures have a negative correlation with cash market portfolios when cash market portfolios

post significant negative returns and are positively correlated when cash portfolios reported significant positive returns. Therefore, managed futures may offer unique asset allocation characteristics in different market environments.

Also, hedging demands of cash market participants may create investment situations where hedgers are required to offer derivative investors a risk premium, or positive return, for holding open long or short offsetting positions. Option traders may be able to create positions that offer this "risk premium" for holding various option contracts when cash market participants increase purchases of options to protect themselves in markets with trending prices or volatility. This return (i.e., the convenience yield) can be earned simply by buying and holding a derivatives portfolio.

15 The term "fallen angels" refers to debt securities that were originally deemed investment grade when issued by financially healthy companies but have subsequently been downgraded to below investment grade. In contrast, companies with high risk profiles and existing senior debt issues can seek additional (subordinated) financing via originally issued high-yield securities.

16 The private equity approach of investing is considered an active approach. New investors in the debt and/or equity of a troubled company (distressed securities) participate on creditor committees and assist in the recovery or reorganization process to maximize their return on investment. Under the relative-value approach, passive investors buy the distressed securities and either hold them until they appreciate to the desired level or trade them within a relatively short period of time.

17 The results of a prepackaged bankruptcy have different effects on the various parties involved:

A In a prepackaged bankruptcy, the prebankruptcy creditors of the company have already agreed in advance with the debtor company on a plan or reorganization before the debtor company actually files for bankruptcy. This may involve the creditors making concessions in return for equity of the reorganized company.

B Prebankruptcy shareholders do not have nearly as much leverage as the creditors. The prebankruptcy shareholders typically lose their entire stake in the company because in a prepackaged bankruptcy, a private equity firm (the vulture investor) seeks to become a majority owner of a new private company.

C The vulture investor is bearing a lot of risk in a transaction like this but may come out with a substantial profit if things work out well. The vulture investor hopes to end up with a healthy company that can be sold to private or public investors.

18 The statement is correct. When the economy is in a downturn, there are more bankruptcies, thereby increasing the supply of distressed securities at relatively low (or falling) prices.

19 B is correct. Private clients have different time horizon issues compared to institutional investors such as pension funds. The partner is correct in stating that private clients have different liquidity needs than institutional investors.

20 B is correct. Using the data in Exhibit 1, the Sharpe ratio for hedge funds = $(6 - 3.5)/2.5 = 1.0$. For real estate the ratio is $(8 - 3.5)/9 = 0.50$, and for private equity it is $(20 - 3.5)/22 = 0.75$.

21 C is correct. Unsmoothing the data corrects bias in returns calculated from infrequent appraisals and property transactions.

22 A is correct. Magerski's concern relates to the potential for the Sharpe ratio to be gamed. Standard deviation of returns is reduced when extreme returns are eliminated. Smoothing returns understates gains and losses and reduces volatility. Lengthening the measurement interval generally decreases the estimate of annualized standard deviation of returns.

23 A is correct. The incentive fee applies to the difference between the ending period net asset value and the net assets at the high water mark, not to the entire amount under management. Five years is an exceedingly long lock-up period during which investors will not be able to withdraw any funds.

24 A is correct. Commodity classes such as livestock and agriculture exhibit negative correlation with unexpected inflation as measured by monthly changes in the inflation rate. Thus they are poor inflation hedges. Storable commodities directly linked to economic activity exhibit positive correlation with changes in inflation and have superior inflation-hedging properties.

25 A is correct. The two characteristics of the returns distribution associated with alternative investment strategies that reduce downside risk are positive skewness and low kurtosis.

26 B is correct. The returns on the NCREIF Index are based on appraisals that underestimate the volatility in underlying values.

27 B is correct. Strategy 2 (40% stock/40% bonds/20% NAREIT Index) satisfies the board's mandate because:

- the expected portfolio return of 9.52% (0.4 × 11.16% + 0.4 × 7.70% + 0.2 × 9.87%) is greater than the current allocation's expected return of 9.43% (0.5 × 11.16% + 0.5 × 7.70%), and
- indirect investments in real estate via REITs would not result in reduced liquidity because REITs are very liquid.

28 B is correct. One of the common features of private equity investing is the high level of diversification potential due to low correlations with traditional investment classes.

29 C is correct. Historically, direct commodity investments that are (directly) related to the intensity of economic activity have had significant, positive return correlations with inflation.

30 A is correct. Contrary to Northrup's comment, fund of funds usually do not impose lock-up periods (or minimum initial holding period) and their fees are higher as investors pay two layers of fees: one to the FOF and the other to the underlying hedge fund managers.

31 B is correct. 1.5 plus 20 refers to a 1.5 percent management fee for assets under management (AUM) plus a 20% incentive fee for the managers; without a high-water mark provision, managers receive 20% of annual profits.

32 C is correct. The high-water mark is a specified net asset value level that a fund must exceed before performance/incentive fees are paid to the hedge fund manager. Once the first incentive fee has been paid, the highest month-end NAV establishes a high-water mark.

33 B is correct. Value weighting may result in a particular index taking on the return characteristics of the best-performing hedge funds in a particular time period. The second observation is incorrect as the transaction costs make it difficult to rebalance an equally weighted index.

34 A is correct. Use of a longer measurement interval will help to lower annualized volatility estimates; illiquid assets or stale prices bias the Sharpe ratio upward; use of out-of-the-money options can potentially increase returns by collecting premiums now while paying off at a later time.

35 A is correct. Both statements are correct. Hedgers may pay a risk premium to liquidity providers for the insurance they obtain so managed futures may be able to earn positive excess returns. Differential carrying costs among investors may permit managed fund traders to take advantage of short-term pricing differences between theoretically identical stock, bond, futures, options, and cash market positions.

36 B is correct. The historical returns of (a long-only position in) distressed securities have been shown to have negative skewness and high kurtosis.

37 B is correct. Equity market-neutral portfolios are supposed to have no systematic risk as a result of holding both long and short positions in stocks.

38 A is correct. The Sharpe ratio is based on a normality assumption, and hedge fund returns typically have negative skewness and high kurtosis.

39 B is correct. In distressed debt arbitrage the investor buys the distressed company's debt at steep discount and shorts its equity. Therefore, if the situation worsens and the debt is discounted further, the short position in equity will fall relatively more than the debt.

40 A is correct. As strategies become popular, more money flows into them causing those to become overweighted in a value-weighted index. On the other hand, in an equally weighted index, as a result of rebalancing, the overweighting is not a major issue.

41 B is correct. Rolling returns can provide an understanding into the consistency and cyclicality of hedge fund returns.

CUSTOMER SERVICE

68

PORTFOLIO MANAGEMENT
STUDY SESSION

14

Risk Management

Effective risk management identifies, assesses, and controls numerous sources of risk in an effort to maintain an appropriate balance between the expected rewards and potentially negative outcomes associated with risks incurred. With the increasingly complex nature of investment management firms and investment portfolios, sophisticated risk management techniques have been developed to provide analysts with the necessary tools to properly measure and manage various risks.

This study session presents a framework for risk management, focusing on the concepts and tools for measuring and managing market risk and credit risk.

READING ASSIGNMENTS

Reading 27 Risk Management
by Don M. Chance, PhD, CFA, Kenneth Grant, and John R. Marsland, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

27

Risk Management

by Don M. Chance, PhD, CFA, Kenneth Grant, and John R. Marsland, CFA

Don M. Chance, PhD, CFA, is at Louisiana State University (USA). Kenneth Grant is at Risk Resources USA and the School of Professional Studies at Columbia University (USA). John R. Marsland, CFA, is at Schroders Investment Management (United Kingdom).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss features of the risk management process, risk governance, risk reduction, and an enterprise risk management system;
☐	**b.** evaluate strengths and weaknesses of a company's risk management process;
☐	**c.** describe steps in an effective enterprise risk management system;
☐	**d.** evaluate a company's or a portfolio's exposures to financial and nonfinancial risk factors;
☐	**e.** calculate and interpret value at risk (VaR) and explain its role in measuring overall and individual position market risk;
☐	**f.** compare the analytical (variance–covariance), historical, and Monte Carlo methods for estimating VaR and discuss the advantages and disadvantages of each;
☐	**g.** discuss advantages and limitations of VaR and its extensions, including cash flow at risk, earnings at risk, and tail value at risk;
☐	**h.** compare alternative types of stress testing and discuss advantages and disadvantages of each;
☐	**i.** evaluate the credit risk of an investment position, including forward contract, swap, and option positions;
☐	**j.** demonstrate the use of risk budgeting, position limits, and other methods for managing market risk;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**k.** demonstrate the use of exposure limits, marking to market, collateral, netting arrangements, credit standards, and credit derivatives to manage credit risk;
☐	**l.** discuss the Sharpe ratio, risk-adjusted return on capital, return over maximum drawdown, and the Sortino ratio as measures of risk-adjusted performance;
☐	**m.** demonstrate the use of VaR and stress testing in setting capital requirements.

1 INTRODUCTION

Investment is an intrinsically risky activity. Indeed, risk taking is an innate characteristic of human activity and as old as humankind itself. Without risk, we have little possibility of reward. We thus need to treat risk management as a critical component of the investment process. Specifically, with regard to both individual investments and entire portfolios, we should examine and compare the full spectrum of risks and expected returns to ensure that to the greatest extent possible the exposures we assume are at all times justified by the rewards we can reasonably expect to reap. Proper identification, measurement, and control of risk are key to the process of investing, and we put our investment objectives at risk unless we commit appropriate resources to these tasks.

A portfolio manager must be familiar with risk management not only as it relates to portfolio management but also as it relates to managing an enterprise, because a portfolio manager is a responsible executive in an enterprise (his investment firm). He must also understand the risks and risk management processes of companies in which he invests. The risk management framework presented in this reading is an inclusive one, applicable to the management of both enterprise and portfolio risk.

Although portfolio managers and enterprises may occasionally hedge their risks or engage in other risk-reducing transactions, they should not, and indeed cannot, restrict their activities to those that are risk free, as discussed in more detail later. The fact that these entities engage in risky activities raises a number of important questions:

- What is an effective process for identifying, measuring, and managing risk?
- Which risks are worth taking on a regular basis, which are worth taking on occasion, and which should be avoided altogether?
- How can our success or lack of success in risk taking be evaluated?
- What information should be reported to investors and other stakeholders concerning the risk of an enterprise or a portfolio?

The answers to these questions and many others collectively define the process of *risk management.* Over the course of this reading, we endeavor to explain this process and some of its most important concepts. Consistent with the book's focus on portfolio management, this reading concentrates on managing risks arising from transactions that are affected by interest rates, stock prices, commodity prices, and exchange rates. We also survey the other risks that most enterprises face and illustrate the discussion from a variety of perspectives. The reading is organized as follows. Section 2 defines

and explains a risk management framework. Section 3 discusses what constitutes good risk management. Sections 4, 5, and 6 discuss the individual steps in the risk management process, and we conclude with a summary.

RISK MANAGEMENT AS A PROCESS

2

We can formally define risk management as follows:

> Risk management is a process involving the identification of exposures to risk, the establishment of appropriate ranges for exposures (given a clear understanding of an entity's objectives and constraints), the continuous measurement of these exposures (either present or contemplated), and the execution of appropriate adjustments whenever exposure levels fall outside of target ranges. The process is continuous and may require alterations in any of these activities to reflect new policies, preferences, and information.

This definition highlights that risk management should be a *process*, not just an activity. A process is continuous and subject to evaluation and revision. Effective risk management requires the constant and consistent monitoring of exposures, with an eye toward making adjustments, whenever and wherever the situation calls for them.[1] Risk management in its totality is all at once a proactive, anticipative, and reactive process that continuously monitors and controls risk.

Exhibit 1 illustrates the *practical application of the process* of risk management as it applies to a hypothetical business enterprise. We see at the top that the company faces a range of financial and nonfinancial risks; moving down the exhibit, we find that the company has responded to this challenge by establishing a series of risk management policies and procedures. First, it defines its risk tolerance, which is the level of risk it is willing and able to bear.[2] It then identifies the risks, drawing on all sources of information, and attempts to measure these risks using information or data related to all of its identified exposures. The process of risk measurement can be as simple as Exhibit 1 illustrates, but more often than not it involves expertise in the practice of modeling and sometimes requires complex analysis. Once the enterprise has built effective risk identification and measurement mechanisms, it is in a position to adjust its risk exposures, wherever and whenever exposures diverge from previously identified target ranges. These adjustments take the form of risk-modifying transactions (broadly understood to include the possible complete transfer of risk). The execution of risk management transactions is itself a distinct process; for portfolios, this step consists of trade identification, pricing, and execution. The process then loops around to the measurement of risk and continues in that manner, and to the constant monitoring and adjustment of the risk, to bring it into or maintain it within the desired range.

1 For brevity, we often refer to an exposure to risk or **risk exposure** (the state of being exposed to or vulnerable to a risk) as simply an *exposure*.

2 An enterprise may have different risk tolerances for different types of risk in a manner that does not readily permit averaging, so we should view risk tolerance in this context as potentially multidimensional.

Exhibit 1 Risk Management Process: The Practice of Risk Management

In applying the risk management process to portfolio management, managers must devote a considerable amount of attention to measuring and pricing the risks of financial transactions or positions, particularly those involving derivatives. Exhibit 2 illustrates this process of pricing and measuring risk, expanding on the detail given in Exhibit 1. In Exhibit 2, we see at the top that in pricing the transaction, we first identify the source(s) of uncertainty. Then we select the appropriate pricing model and enter our desired inputs to derive our most accurate estimate of the instrument's model value (which we hope reflects its true economic value). Next, we look to the marketplace for an indication of where we can actually execute the transaction. If the execution price is "attractive" (i.e., the market will buy the instrument from us at a price at or above, or sell it to us at a price at or below, the value indicated by our model), it fits our criteria for acceptance; if not, we should seek an alternative transaction. After executing the transaction, we would then return to the process of measuring risk.

Exhibit 2 Risk Management Process: Pricing and Measuring Risk

Our discussion of Exhibit 1 highlighted that risk management involves adjusting levels of risk to appropriate levels, not necessarily eliminating risk altogether. It is nearly impossible to operate a successful business or investment program without taking risks. Indeed, a company that accepted no risk would not be an operating business. Corporations take risks for the purpose of generating returns that increase their owners' wealth. Corporation owners, the shareholders, risk their capital with the same objective in mind. *Companies that succeed in doing the activities they should be able to do well, however, cannot afford to fail overall because of activities in which they have no expertise.* Accordingly, many companies hedge risks that arise from areas in which they have no expertise or comparative advantage. In areas in which they do have an edge (i.e., their primary line of business), they tend to hedge only tactically. They hedge when they think they have sufficient information to suggest that a lower risk position is appropriate. They manage risk, increasing it when they perceive a

competitive advantage and decreasing it when they perceive a competitive disadvantage. In essence, they attempt to efficiently allocate risk. Similarly, portfolio managers attempt to efficiently use risk to achieve their return objectives.

We have illustrated that risk management involves far more than risk reduction or hedging (one particular risk-reduction method). Risk management is a general practice that involves risk modification (e.g., risk reduction or risk expansion) as deemed necessary and appropriate by the custodians of capital and its beneficial owners.

For the risk management process to work, managers need to specify thoughtfully the business processes they use to put risk management into practice. We refer to these processes collectively as risk governance, the subject of the next section.

3 RISK GOVERNANCE

Senior management is ultimately responsible for *every* activity within an organization. Their involvement is thus essential for risk management to succeed. The process of setting overall policies and standards in risk management is called risk governance. Risk governance involves choices of governance structure, infrastructure, reporting, and methodology. The quality of risk governance can be judged by its transparency, accountability, effectiveness (achieving objectives), and efficiency (economy in the use of resources to achieve objectives).

Risk governance begins with choices concerning governance structure. Organizations must determine whether they wish their risk management efforts to be centralized or decentralized. Under a centralized risk management system, a company has a single risk management group that monitors and ultimately controls all of the organization's risk-taking activities. By contrast, a decentralized system places risk management responsibility on individual business unit managers. In a decentralized approach, each unit calculates and reports its exposures independently. Decentralization has the advantage of allowing the people closer to the actual risk taking to more directly manage it. Centralization permits economies of scale and allows a company to recognize the offsetting nature of distinct exposures that an enterprise might assume in its day-to-day operations. For example, suppose one subsidiary of a company buys from Japan and another subsidiary sells to Japan, with both engaged in yen-denominated transactions. Each subsidiary would perceive some foreign exchange exposure. From a centralized viewpoint, however, these risks have offsetting effects, thereby reducing the overall need to hedge.

Moreover, even when exposures to a single risk factor do not directly offset one another, enterprise-level risk estimates may be lower than those derived from individual units because of the risk-mitigating benefits of diversification. For example, one corporate division may borrow US dollars at five-year maturities, and another division may fund its operation by issuing 90-day commercial paper. In theory, the corporation's overall sensitivity to rising interest rates may be less than the sum of that reported by each division, because the five-year and 90-day rate patterns are less than perfectly correlated.

In addition, centralized risk management puts the responsibility on a level closer to senior management, where we have argued it belongs. It gives an overall picture of the company's risk position, and ultimately, the overall picture is what counts. This centralized type of risk management is now called **enterprise risk management** (ERM) or sometimes firmwide risk management because its distinguishing feature is

a firmwide or across-enterprise perspective.[3] In ERM, an organization must consider each risk factor to which it is exposed—both in isolation and in terms of any interplay among them.

Risk governance is an element of **corporate governance** (the system of internal controls and procedures used to manage individual companies). As risk management's role in corporate governance has become better appreciated, the importance of ERM has risen proportionately. Indeed, for risk-taking entities (this means nearly the entire economic universe), it is contradictory to suggest that an organization has sound corporate governance without maintaining a clear and continuously updated understanding of its exposures at the enterprise level. Senior managers who have an adequate understanding of these factors are in a superior governance position to those who do not, and over time this advantage is almost certain to accrue to the bottom line. Therefore, the risk management system of a company that chooses a decentralized risk management approach requires a mechanism by which senior managers can inform themselves about the enterprise's overall risk exposures.

At the enterprise level, companies should control not only the sensitivity of their earnings to fluctuations in the stock market, interest rates, foreign exchange rates, and commodity prices, but also their exposures to credit spreads and default risk, to gaps in the timing match of their assets and liabilities, and to operational/systems failures, financial fraud, and other factors that can affect corporate profitability and even survival.

EXAMPLE 1

Some Risk Governance Concerns of Investment Firms

Regardless of the risk governance approach chosen, effective risk governance for investment firms demands that the trading function be separated from the risk management function. An individual or group that is independent of the trading function must monitor the positions taken by the traders or risk takers and price them independently. The risk manager has the responsibility for monitoring risk levels for all portfolio positions (as well as for portfolios as a whole) and executing any strategies necessary to control the level of risk. To do this, the risk manager must have timely and accurate information, authority, and independence from the trading function. That is not to say that the trading function will not need its own risk management expertise in order to allocate capital in an optimal fashion and maximize risk-adjusted profit. Ideally, the risk manager will work with the trading desks in the development of risk management specifications, such that everyone in the organization is working from a common point of reference in terms of measuring and controlling exposures.

Effective risk governance for an investment firm also requires that the back office be fully independent from the front office, so as to provide a check on the accuracy of information and to forestall collusion. (The **back office** is concerned with transaction processing, record keeping, regulatory compliance, and other administrative functions; the **front office** is concerned with trading and sales.) Besides being independent, the back office of an investment firm must have a high level of competence, training, and knowledge because failed trades, errors, and over-sights can lead to significant losses that may be amplified by leverage.

3 The Committee of Sponsoring Organizations of the Treadway Commission defines ERM as follows: "Enterprise risk management is a process, effected by an entity's board of directors, management, and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives" (2004, p. 2).

The back office must effectively coordinate with external service suppliers, such as the firm's **global custodian**. The global custodian effects **trade settlement** (completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller), safekeeping of assets, and the allocation of trades to individual custody accounts. Increasingly, financial institutions are seeking risk reduction with cost efficiencies through **straight-through processing** (STP) systems that obviate manual and/or duplicative intervention in the process from trade placement to settlement.

An effective ERM system typically incorporates the following steps:

1. Identify each *risk factor* to which the company is exposed.
2. Quantify each exposure's size in money terms.
3. Map these inputs into a risk estimation calculation.[4]
4. Identify overall risk exposures as well as the contribution to overall risk deriving from each risk factor.
5. Set up a process to report on these risks periodically to senior management, who will set up a committee of division heads and executives to determine capital allocations, risk limits, and risk management policies.
6. Monitor compliance with policies and risk limits.

Steps 5 and 6 help enormously in allowing an organization to quantify the magnitude and distribution of its exposures and in enabling it to use the ERM system's output to more actively align its risk profile with its opportunities and constraints on a routine, periodic basis.

As a final note, effective ERM systems always feature centralized data warehouses, where a company stores all pertinent risk information, including position and market data, in a technologically efficient manner. Depending on the organization's size and complexity, developing and maintaining a high-quality data warehouse can require a significant and continuing investment. In particular, the process of identifying and correcting errors in a technologically efficient manner can be enormously resource intensive—especially when the effort requires storing historical information on complex financial instruments. It is equally clear, however, that the return on such an investment can be significant.

4 IDENTIFYING RISKS

As indicated above, economic agents of all types assume different types of exposures on a near-continuous basis. Moreover, these risk exposures take very different forms, each of which, to varying extents, may call for customized treatment. Effective risk management demands the separation of risk exposures into specific categories that reflect their distinguishing characteristics. Once a classification framework is in place, we can move on to the next steps in the risk management process: identification, classification, and measurement.

Although the list is far from exhaustive, many company (or portfolio) exposures fall into one of the following categories: market risk (including interest rate risk, exchange rate risk, equity price risk, commodity price risk); credit risk; liquidity risk; operational risk; model risk; settlement risk; regulatory risk; legal/contract risk; tax

4 For example, using Value at Risk or another of the concepts that we will discuss later.

risk; accounting risk; and sovereign/political risk. These risks may be grouped into financial risks and nonfinancial risks as shown in Exhibit 3.[5] **Financial risk** refers to all risks derived from events in the external financial markets; **nonfinancial risk** refers to all other forms of risk.

Exhibit 3 The Sources of Risk

Example 2 illustrates a simple analysis of risk exposures. In the example, we have detailed the subtypes of market risk; each one may pose unique issues of measurement and management.

EXAMPLE 2

An Analysis of Risk Exposures

Liam McNulty is the risk manager for a large multinational agricultural concern, Agripure. The company grows its own corn, wheat, and soybeans but pays large sums to third parties for pesticides, fertilizer, and other supplies. For this, it must borrow heavily to finance its purchases. Customers typically purchase Agripure's goods on credit. Moreover, Agripure buys and sells its products and raw materials worldwide, often transacting in the domestic currency of its customers and suppliers. Finally, to finance its own expansion, Agripure intends to issue stock.

Recommend and justify the risk exposures that McNulty should report as part of an enterprise risk management system for Agripure.

Solution:

McNulty should report on the following risk exposures:

- Market risk, including these subtypes:
  - Commodity price risk, because Agripure has exposures in raw materials and finished products.

5 A notable risk that could be included in a comprehensive listing (particularly as pertains to commercial enterprises) is **business risk**, defined by Ross, Westerfield, and Jordan (1993, p. 527) as "the equity risk that comes from the nature of the firm's operating activities." For example, the risk for a hotel business that arises from variability in room occupancy rates would be classified as business risk. In a later section on other risks, we also discuss two types of risks related to netting.

- Foreign exchange risk, because it buys and sells products world-wide, often transacting in the home currency of the entity on the other side of the transaction.
- Equity market risk, because Agripure's expansion financing is affected by the price it receives for its share issuance.
- Interest rate risk, because Agripure has exposures in financing its raw material purchases and because its customers typically purchase their goods on credit.

■ Credit risk, because Agripure's customers typically purchase their goods on credit.

■ Operational risk, because as an agricultural producer Agripure is subject to weather-related risk (an external event).

In the following sections, we discuss each of these risks in detail.

4.1 Market Risk

Market risk is the risk associated with interest rates, exchange rates, stock prices, and commodity prices. It is linked to supply and demand in various marketplaces. Although we may distinguish among interest rate risk, currency risk, equity market risk, and commodity risk when discussing measurement and management issues, for example, these subtypes all have exposure to supply and demand. Much of the evolution that has taken place in the field of risk management has emanated from a desire to understand and control market risks, and we will have a good deal to say about this topic throughout the balance of this reading.

One set of market risk takers with special requirements for market risk are defined-benefit (DB) pension funds, which manage retirement assets generally under strict regulatory regimes. Pension fund risk management necessarily concerns itself with funding the stream of promised payments to pension plan participants. Therefore, a DB plan must measure its market exposures not purely on the basis of its assets but also in terms of the risks of pension assets in relation to liabilities. Other investors as well can have strong asset/liability management concerns.[6] This has important implications for exposure measurement, risk control, capital allocation and risk budgeting, which we will address later.

4.2 Credit Risk

Apart from market risk, credit risk is the primary type of financial risk that economic agents face. **Credit risk** is the risk of loss caused by a counterparty or debtor's failure to make a promised payment. This definition reflects a traditional binary concept of credit risk, by and large embodied by default risk (i.e., the risk of loss associated with the nonperformance of a debtor or counterparty). For the last several years, however, credit markets have taken on more and more of the characteristics typically associated with full-scale trading markets. As this pattern has developed, the lines between credit risk and market risk have blurred as markets for credit derivatives have developed.[7] For example, the holder of a traded credit instrument could suffer a loss as a result of a short-term supply–demand imbalance without the underlying probability of default

6 See the readings on managing institutional investor portfolios and asset allocation in particular.
7 A **credit derivative** is a contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

changing. Some subset of market participants often suffers losses whether credit is improving or deteriorating because it is now quite easy to take long and short positions in credit markets. Finally, note that pricing conventions for credit typically take the form of spreads against market benchmarks, for example, government bond yields or swap rates.[8] Thus when a given credit instrument is said to be priced at 150 over, it typically means that the instrument can be purchased to yield 150 basis points over the rate on the market benchmark (e.g., the government bond with the same maturity).

Until the era of over-the-counter derivatives, credit risk was more or less exclusively a concern in the bond and loan markets. Exchange-traded derivatives are guaranteed against credit loss. OTC derivatives, however, contain no explicit credit guaranty and, therefore, subject participants to the threat of loss if their counterparty fails to pay.

Before OTC derivatives became widely used, bond portfolio managers and bank loan officers were the primary credit risk managers. They assessed credit risk in a number of ways,[9] including the qualitative evaluation of corporate fundamentals through the review of financial statements, the calculation of credit scores, and by relying on consensus information that was and still is widely available for virtually every borrower. The synthesis of this "credit consensus" resides with rating agencies and credit bureaus, which were historically, and to some extent still are, the primary sources of information on credit quality. The proliferation and complexity of financial instruments with credit elements in the OTC derivatives market, however, has placed new demands on the understanding of credit risk. Indeed, the need to better understand credit risk has led to significant progress in developing tools to measure and manage this risk.

4.3 Liquidity Risk

Liquidity risk is the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.[10] In some cases, the market for a financial instrument can dry up completely, resulting in a total inability to trade an asset. This risk is present in both initiating and liquidating transactions, for both long and short positions, but can be particularly acute for liquidating transactions—especially when such liquidation is motivated by the need to reduce exposures in the wake of large losses. Those wishing to sell securities under these circumstances can find the market bereft of buyers at prices acceptable to the seller, particularly in periods of unusually high market stress. Perhaps less frequently, short sellers in need of covering losing positions are at risk to short squeezes. This situation is often exacerbated by the fact that for most cash instruments, short sellers establish positions by borrowing the securities in question from brokerage firms and other entities that typically can require the securities to be returned with little or no advance warning. Although derivatives can be used to effectively sell an asset or liquidate a short position, they often will not help in managing liquidity risk. If the underlying is illiquid, there is a good possibility that the universe of associated derivative instruments may also be illiquid.

---

8 A **swap rate** is the interest rate applicable to the pay-fixed-rate side of an interest rate swap. See Chance (2003) to review the basics of swaps.

9 Credit risk in the more general context of fixed-income securities is discussed in more detail in Fabozzi (2004a), Chapter 15. Many of the principles of credit risk analysis for fixed-income securities also apply to derivatives.

10 Liquidity has been used in various senses. For example, **funding risk** (the risk that liabilities funding long asset positions cannot be rolled over at reasonable cost) has sometimes been referred to as a type of liquidity risk; liquidity in this sense relates to the availability of cash. One would still distinguish between market liquidity risk (discussed in the reading) and funding liquidity risk.

For traded securities, the size of the **bid–ask spread** (the spread between the bid and ask prices), stated as a proportion of security price, is frequently used as an indicator of liquidity.[11] When markets are illiquid, dealers expect to sell at relatively high prices and buy at relatively low prices to justify their assumption of exposure to liquidity risk. However, bid–ask quotations apply only to specified, usually small size, trades, and are thus an imprecise measure of liquidity risk. Other, more complex measures of liquidity have been developed to address the issue of trading volume. For example, Amihud's (2002) illiquidity ratio measures the price impact per $1 million traded in a day, expressed in percentage terms. Note, however, that no explicit transaction volume is available for many OTC instruments. Less formally, one of the best ways to measure liquidity is through the monitoring of transaction volumes, with the obvious rule of thumb being that the greater the average transaction volume, the more liquid the instrument in question is likely to be. Historical volume patterns, however, may not repeat themselves at times when the liquidity they imply is most needed.

Liquidity risk is a serious problem and often is difficult to observe and quantify. It is not always apparent that certain securities are illiquid: Some that are liquid when purchased (or sold short) can be illiquid by the time they are sold (or repurchased to cover short positions). Valuation models rarely encompass this liquidity risk in estimating fair value. Those models that do attempt to incorporate transaction costs do so in a nonformulaic manner. Of course, these problems typically reach their apex when the markets themselves are under stress and the need for liquidity is most acute. Liquidity assessments that fail to consider the problems that might arise during periods of market stress are incomplete from a risk management perspective. For all of these reasons, liquidity risk is one of the more complex aspects of risk management.

We now turn our attention to nonfinancial risks, starting with operational risk.

4.4 Operational Risk

Operational risk, sometimes called operations risk, is the risk of loss from failures in a company's systems and procedures or from external events. These risks can arise from computer breakdowns (including bugs, viruses, and hardware problems), human error, and events completely outside of companies' control, including "acts of God" and terrorist actions.

Computer failures are quite common, but the development of backup systems and recovery procedures has reduced their impact in recent years. Technology bugs and viruses are potentially quite risky but have become more manageable with the proper personnel, software, and systems. Even the smallest business has learned to back up files and take them off the premises. Larger businesses have much more extensive computer risk management practices.

Human failures include the typically manageable unintentional errors that occur in every business, along with more critical and potentially disastrous incidences of willful misconduct.

11 For example, see Amihud and Mendelson (1986). We must state the bid–ask spread as a proportion of stock price to control for differences in securities' prices.

EXAMPLE 3

An Operational Risk for Financial Services Companies: The Rogue Trader

Among the more prominent examples of operational risk for financial service companies is that of the so-called rogue trader: an individual who has either assumed an irresponsibly high level of risk, engaged in unauthorized transactions, or some combination of the two. The risks associated with this type of activity increase the longer it goes undetected, and often the very lack of controls that creates the opportunity for a rogue trader in the first place renders it difficult to quickly determine that a problem exists. In some extreme cases, such as an incident that occurred in the Singapore office of Barings Bank, a rogue trader can cause an entire organization to fold. The incidence of high-profile rogue trading episodes has multiplied since the early 1990s, but in nearly all of these episodes, the problem's major source was a lack of rudimentary corporate controls and oversight.[12]

Our definition of operational risk includes losses from external events. Insurance typically covers damage from fires, floods and other types of natural disasters, but insurance provides only cash compensation for losses. If a flood destroys the trading room of a bank, the monies recovered likely will not come close to paying for the loss of customers who may take their trading business elsewhere. Hence, most companies have backup facilities they can activate in such cases. The 1993 World Trade Center bombing in New York City led many companies to establish backup systems in the event of another terrorist attack, which sadly took place on a greater scale eight years later. The speed with which trading enterprises, including the New York Stock Exchange, domiciled inside or near the World Trade Center reestablished full-scale operations after such a devastating attack is but one indication of the increased importance placed on operational risk management by these enterprises.

In some cases, companies manage operational risk by using insurance contracts, which involves a transfer of risk. A few types of derivative contracts even pay off for operational losses, but the market for these has not fully developed. These instruments are essentially insurance contracts. Most companies manage operational risk, however, by monitoring their systems, taking preventive actions, and having a plan in place to respond if such events occur.

4.5 Model Risk

Model risk is the risk that a model is incorrect or misapplied; in investments, it often refers to valuation models. Model risk exists to some extent in any model that attempts to identify the fair value of financial instruments, but it is most prevalent in models used in derivatives markets.

Since the development of the seminal Black–Scholes–Merton option pricing model, both derivatives and derivative pricing models have proliferated.[13] The development of so many models has brought model risk to prominence. If an investor chooses an inappropriate model, misinterprets the results, or uses incorrect inputs, the chance of loss increases at the same time that control over risk is impaired. Therefore, investors must scrutinize and objectively validate all models they use.

12 For more on the subject of operational risk in financial services companies, see Marshall (2001).
13 See Chance (2003).

4.6 Settlement (Herstatt) Risk

The payments associated with the purchase and sale of cash securities such as equities and bonds, along with cash transfers executed for swaps, forwards, options, and other types of derivatives, are referred to collectively as settlements. The process of settling a contract involves one or both parties making payments and/or transferring assets to the other. We define **settlement risk** as the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.[14]

Most regulated futures and options exchanges are organized in such a way that they themselves (or a closely affiliated entity) act as the central counterparty to all transactions. This facility usually takes the form of a clearing house, which is backed by large and credible financial guarantees. All transactions on the exchange take place between an exchange member and the central counterparty, which removes settlement risk from the transaction. The possibility always exists, however, that the exchange member is acting in an agency capacity and/or that its end client fails to settle. Clearly in these circumstances, the responsibility falls to the exchange member to make good and bear any loss on the trade.

OTC markets, including those for bonds and derivatives, do not rely on a clearing house. Instead, they effect settlement through the execution of agreements between the actual counterparties to the transaction. With swaps and forward contracts, settlements take the form of two-way payments. Two-way payments create the problem that one party could be in the process of paying its counterparty while that counterparty is declaring bankruptcy and failing to make its payment. Netting arrangements, used in interest rate swaps and certain other derivatives, can reduce settlement risk. In such arrangements, the financial instrument is periodically marked to market (under an agreed-upon methodology) and the "loser" pays the "winner" the difference for the period. This mechanism reduces the magnitude of any settlement failures to the net payment owed plus the cost of replacing the defaulted contract. Transactions with a foreign exchange component, however (e.g., currency forwards and currency swaps, but also spot trades), do not lend themselves to netting. Furthermore, such contracts often involve two parties in different countries, increasing the risk that one party will be unaware that the other party is declaring bankruptcy. The risk has been called Herstatt risk because of a famous incident in 1974 when Bank Herstatt failed at a time when counterparties were sending money to it.

Fortunately, bankruptcy does not occur often. Furthermore, through continuously linked settlement (CLS) in which payments on foreign exchange contracts are executed simultaneously, this risk has been even further mitigated.[15]

4.7 Regulatory Risk

Regulatory risk is the risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change. Equities (common and preferred stock), bonds, futures, and exchange-traded derivatives markets usually are regulated at the federal level, whereas OTC derivative markets and transactions in alternative investments (e.g., hedge funds and private equity partnerships) are much more loosely regulated. Federal authorities in most countries take the position that these latter transactions are private agreements between sophisticated parties, and as

14 Note that settlement can also fail because of operational problems even when the counterparty is credit-worthy; the risk in that case would be an operational risk.

15 The execution takes place in a five-hour window (three hours in Asia Pacific), representing the overlapping business hours of different settlement systems. For more information, see www.cls-group.com.

such should not be regulated in the same manner as publicly traded markets. Indeed, in some circumstances, unsophisticated investors are excluded altogether from participating in such investments.

With regard to derivatives, companies that are regulated in other ways may have their derivatives business indirectly regulated. For example, in the United States, banks are heavily regulated by federal and state banking authorities, which results in indirect regulation of their derivatives business. Beyond these de facto restrictions, however, in most countries, the government does not regulate the OTC derivatives business.[16]

Regulation is a source of uncertainty. Regulated markets are always subject to the risk that the existing regulatory regime will become more onerous, more restrictive, or more costly. Unregulated markets face the risk of becoming regulated, thereby imposing costs and restrictions where none existed previously. Regulatory risk is difficult to estimate because laws are written by politicians and regulations are written by civil servants; laws, regulations, and enforcement activities may change with changes in political parties and regulatory personnel. Both the regulations and their enforcement often reflect attitudes and philosophies that may change over time. Regulatory risk and the degree of regulation also vary widely from country to country.

Regulatory risk often arises from the arbitrage nature of derivatives and structured transactions. For example, a long position in stock accompanied by borrowing can replicate a forward contract or a futures contract. Stocks are regulated by securities regulators, and loans are typically regulated by banking oversight entities. Forward contracts are essentially unregulated. Futures contracts are regulated at the federal level in most countries, but not always by the same agency that regulates the stock market. Equivalent combinations of cash securities and derivatives thus are not always regulated in the same way or by the same regulator. Another example of inconsistent or ambiguous regulatory treatment might arise from a position spanning different geographic regions, such as the ownership of a NASDAQ-listed European-domiciled technology company in a European stock portfolio.

4.8 Legal/Contract Risk

Nearly every financial transaction is subject to some form of contract law. Any contract has two parties, each obligated to do something for the other. If one party fails to perform or believes that the other has engaged in a fraudulent practice, the contract can be abrogated. A dispute would then likely arise, which could involve litigation, especially if large losses occur. In some cases, the losing party will claim that the counterparty acted fraudulently or that the contract was illegal in the first place and, therefore, should be declared null and void. The possibility of such a claim being upheld in court creates a form of **legal/contract risk**: the possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake.

Derivative transactions often are arranged by a dealer acting as a principal. The legal system has upheld many claims against dealers, which is not to say that the dealer has always been in the wrong but simply that dealers have sometimes put themselves into precarious situations. Dealers are indeed often advisors to their counterparties, giving the impression that if the dealer and counterparty enter into a contract, the counterparty expects the contract to result in a positive outcome. To avoid that misunderstanding, dealers may go to great lengths to make clear that they are the opposite party, not an advisor. Dealers also write contracts more carefully to cover the various contingencies that have been used against them in litigation. But a government or regulator might still take the legal view that a dealer has a higher duty of care for a

16 Of course, contract law always applies to any such transaction.

less experienced counterparty. Contract law is in most circumstances federally or nationally governed. As such, the added possibility exists in arbitrage transactions that different laws might apply to each side of the transaction, thus adding more risk.

4.9 Tax Risk

Tax risk arises because of the uncertainty associated with tax laws. Tax law covering the ownership and transaction of financial instruments can be extremely complex, and the taxation of derivatives transactions is an area of even more confusion and uncertainty. Tax rulings clarify these matters on occasion, but on other occasions, they confuse them further. In addition, tax policy often fails to keep pace with innovations in financial instruments. When this happens, investors are left to guess what type and level of taxation will ultimately apply, creating the risk that they have guessed wrongly and could later be subject to back taxes. In some cases, transactions that appear upfront to be exempt from taxation could later be found to be taxable, thereby creating a future expense that was unanticipated (and perhaps impossible to anticipate) at the time that the transaction was executed. We noted, in discussing regulatory risk, that equivalent combinations of financial instruments are not always regulated the same way. Likewise, equivalent combinations of financial instruments are not always subject to identical tax treatment. This fact creates a tremendous burden of inconsistency and confusion, but on occasion the opportunity arises for arbitrage gains, although the tax authorities often quickly close such opportunities.

Like regulatory risk, tax risk is affected by the priorities of politicians and regulators. Many companies invest considerable resources in lobbying as well as hiring tax experts and consultants to control tax risk.

4.10 Accounting Risk

Accounting risk arises from uncertainty about how a transaction should be recorded and the potential for accounting rules and regulations to change. Accounting statements are a key, if not primary, source of information on publicly traded companies. In the United States, accounting standards are established primarily by the Financial Accounting Standards Board (FASB). Legal requirements in the area of accounting are enforced for publicly traded companies by federal securities regulators and by the primary stock exchange associated with the security. Non-US domiciled companies that raise capital in the United States are also subject to these standards and laws. The law demands accurate accounting statements, and inaccurate financial reporting can subject corporations and their principals to civil and criminal litigation for fraud. In addition, the market punishes companies that do not provide accurate accounting statements, as happened for Enron and its auditor Arthur Andersen.

The International Accounting Standards Board (IASB) sets global standards for accounting. The FASB and the IASB have been working together toward convergence of accounting standards worldwide with 2005 targeted for harmonization. Historically, accounting standards have varied from country to country, with some countries requiring a higher level of disclosure than others.

EXAMPLE 4

Accounting Risk: The Case of Derivative Contracts

Accounting for derivative contracts has raised considerable confusion. When confusion occurs, companies run the risk that the accounting treatment for transactions could require adjustment, which could possibly lead to a need to

restate earnings. Earnings restatements are almost always embarrassing for a company, because they suggest either a desire to hide information, the company's failure to fully understand material elements of its business, or some combination of the two. Restatements are very detrimental to corporate valuations because they cause investors to lose confidence in the accuracy of corporate financial disclosures. Beyond that, if negligence or intent to mislead was involved, the company could face civil and criminal liabilities as well.

Confusion over the proper accounting for derivatives gives rise to accounting as a source of risk. As with regulatory and tax risk, sometimes equivalent combinations of derivatives are not accounted for uniformly. The accounting profession typically moves to close such loopholes, but it does not move quickly and certainly does not keep pace with the pace of innovation in financial engineering, so problems nearly always remain.

The IASB in IAS 39 (International Accounting Standard No. 39) requires the inclusion of derivatives and their associated gains and losses on financial statements, as does the FASB in SFAS 133 (Statement of Financial Accounting Standard No. 133). These rulings contain some areas of confusion and inconsistency, however, affording considerable room for interpretation.[17]

Most companies deal with accounting risk by hiring personnel with the latest accounting knowledge. In addition, companies lobby and communicate actively with accounting regulatory bodies and federal regulators in efforts to modify accounting rules in a desired direction and to make them clearer. Companies have tended to fight rules requiring more disclosure, arguing that disclosure per se is not always beneficial and can involve additional costs. A trade-off exists between the rights of corporations to protect proprietary information from competitors and the need to adequately inform investors and the public. This controversy is unlikely to go away, suggesting that accounting risk will always remain.

4.11 Sovereign and Political Risks

Although they are covered indirectly above in areas such as regulatory, accounting, and tax risk, we can also isolate, and to a certain extent evaluate, the risks associated with changing political conditions in countries where portfolio managers may choose to assume exposure. Although this topic merits more discussion than can reasonably be devoted in this space, we can broadly define two types of exposures.

Sovereign risk is a form of credit risk in which the borrower is the government of a sovereign nation. Like other forms of credit risk, it has a current and a potential component, and like other forms, its magnitude has two components: the likelihood of default and the estimated recovery rate. Of course, the task of evaluating sovereign risk is in some ways more complex than that of evaluating other types of credit exposure because of the additional political component involved. Like other types of borrowers, debtor nations have an asset/liability/cash flow profile that competent analysts can evaluate. In addition to this profile, however, lenders to sovereigns (including bondholders) must consider everything from the country's willingness to meet its credit obligations (particularly in unstable political environments) to its alternative means of financing (seeking help from outside entities such as the International Monetary Fund, imposing capital controls, etc.) and other measures it might take, such as currency devaluation, to stabilize its situation.

17 Gastineau, Smith, and Todd (2001) provides excellent information on accounting for derivatives in the United States.

The presence of sovereign risk is real and meaningful, and perhaps the most salient example of its deleterious effects can be found in Russia's 1998 default. This episode represented the first time in many decades that a nation of such size and stature failed to meet its obligations to its lenders. Moreover, although the country was experiencing considerable trauma at that time—in part as the result of a contagion in emerging markets—it is abundantly clear that Russia was *unwilling* rather than *unable* to meet these obligations. The end result was a global financial crisis, in which investors lost billions of dollars and the country's robust development arc was slowed down for the better part of a decade.

Political risk is associated with changes in the political environment. Political risk can take many forms, both overt (e.g., the replacement of a pro-capitalist regime with one less so) and subtle (e.g., the potential impact of a change in party control in a developed nation), and it exists in every jurisdiction where financial instruments trade.

4.12 Other Risks

Companies face nonfinancial and financial risks other than those already mentioned. **ESG risk** is the risk to a company's market valuation resulting from environmental, social, and governance factors. Environmental risk is created by the operational decisions made by the company managers, including decisions concerning the products and services to offer and the processes to use in producing those products and services. Environmental damage may lead to a variety of negative financial and other consequences. Social risk derives from the company's various policies and practices regarding human resources, contractual arrangements, and the workplace. Liability from discriminatory workplace policies and the disruption of business resulting from labor strikes are examples of this type of risk. Flaws in corporate governance policies and procedures increase governance risk, with direct and material effects on a company's value in the marketplace.

One little-discussed but very large type of risk that some investment companies face is that of performance netting risk, often referred to simply as netting risk. **Performance netting risk**, which applies to entities that fund more than one strategy, is the potential for loss resulting from the failure of fees based on net performance to fully cover contractual payout obligations to individual portfolio managers that have positive performance when other portfolio managers have losses and when there are asymmetric incentive fee arrangements with the portfolio managers. The problem is best explained through an example.

Consider a hedge fund that charges a 20 percent incentive fee of any positive returns and funds two strategies equally, each managed by independent portfolio managers (call them Portfolio Managers A and B). The hedge fund pays Portfolio Managers A and B 10 percent of any gains they achieve. Now assume that in a given year, Portfolio Manager A makes $10 million and Portfolio Manager B loses the same amount. The net incentive fee to the hedge fund is zero because it has generated zero returns. Unless otherwise negotiated, however (and such clauses are rare), the hedge fund remains obligated to pay Portfolio Manager A $1 million. As a result, the hedge fund company has incurred a loss, despite breaking even overall in terms of returns.[18] Note that the asymmetric nature of incentive fee contracts (i.e., losses are not penalized as gains are rewarded) plays a critical role in creating the problem the hedge fund faces. Because such arrangements are effectively a call option on a percentage of profits, in

18 The asymmetric nature of the incentive fee contract (currently typical for hedge funds) plays a critical role in this example; were the arrangement symmetric, with negative returns penalized as positive returns are rewarded, the issue discussed would disappear.

some circumstances they may provide an incentive to take excessive risk (the value of a call option is positively related to the underlying's volatility). Nevertheless, such arrangements are widespread.

Performance netting risk occurs only in multistrategy, multimanager environments and only manifests itself when individual portfolio managers within a jointly managed product generate actual losses over the course of a fee-generating cycle—typically one year. Moreover, an investment entity need not be flat or down on the year to experience netting-associated losses. For any given level of net returns, its portion of fees will by definition be higher if all portfolio managers generate no worse than zero performance over the period than they would if some portfolio managers generate losses. As mentioned earlier, an asymmetric incentive fee contract must exist for this problem to arise.

Performance netting risk applies not just to hedge funds but also to banks' and broker/dealers' trading desks, commodity trading advisors, and indeed, to any environment in which individuals have asymmetric incentive fee arrangements but the entity or unit responsible for paying the fees is compensated on the basis of net results. Typically this risk is managed through a process that establishes absolute negative performance thresholds for individual accounts and aggressively cuts risk for individual portfolio managers at performance levels at, near, or below zero for the period in question.[19]

Distinct from performance netting risk, **settlement netting risk** (or again, simply netting risk) refers to the risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.[20] Such risk is mitigated by netting agreements that can survive legal challenge.

MEASURING RISK

5

Having spent some time identifying some of the major sources of risk, both financial and nonfinancial, we now turn our attention toward the measurement of those risks. In particular, we look at some techniques for measuring market risk and credit risk. Subsequently, we briefly survey some of the issues for measuring nonfinancial risk, a very difficult area but also a very topical one—particularly after the advent of the Basel II standards on risk management for international banks, which we will discuss.

5.1 Measuring Market Risk

Market risk refers to the exposure associated with actively traded financial instruments, typically those whose prices are exposed to the changes in interest rates, exchange rates, equity prices, commodity prices, or some combination thereof.[21]

Over the years, financial theorists have created a simple and finite set of statistical tools to describe market risk. The most widely used and arguably the most important of these is the standard deviation of price outcomes associated with an underlying asset. We usually refer to this measure as the asset's **volatility**, typically represented by the Greek letter sigma (σ). Volatility is often an adequate description of portfolio

19 For more information on this topic, see Grant (2004).
20 See www.foa.co.uk/documentation/netting/index.jsp.
21 The definition of market risk given here is the one used in the practice of risk management. The term market risk, however, is often used elsewhere to refer to the risk of the market as a whole, which is usually known as systematic risk. In this reading, we define market risk as risk management professionals do.

risk, particularly for those portfolios composed of instruments with linear payoffs.[22] In some applications, such as indexing, volatility relative to a benchmark is paramount. In those cases, our focus should be on the volatility of the deviation of a portfolio's returns in excess of a stated benchmark portfolio's returns, known as **active risk**, **tracking risk**, tracking error volatility, or by some simply as tracking error.

As we will see shortly, the volatility associated with individual positions, in addition to being a very useful risk management metric in its own right, can be combined with other simple statistics, such as correlations, to form the building blocks for the portfolio-based risk management systems that have become the industry standard in recent years. We cover these systems in the next section of this reading.

A portfolio's exposure to losses because of market risk typically takes one of two forms: sensitivity to adverse movements in the value of a key variable in valuation (primary or first-order measures of risk) and risk measures associated with *changes in* sensitivities (secondary or second-order measures of risk). Primary measures of risk often reflect linear elements in valuation relationships; secondary measures often take account of curvature in valuation relationships. Each asset class (e.g., bonds, foreign exchange, equities) has specific first- and second-order measures.

Let us consider measures of primary sources of risk first. For a stock or stock portfolio, **beta** measures sensitivity to market movements and is a linear risk measure. For bonds, **duration** measures the sensitivity of a bond or bond portfolio to a small parallel shift in the yield curve and is a linear measure, as is **delta** for options, which measures an option's sensitivity to a small change in the value of its underlying. These measures all reflect the expected change in price of a financial instrument for a unit change in the value of another instrument.

Second-order measures of risk deal with the change in the price sensitivity of a financial instrument and include convexity for fixed-income portfolios and gamma for options. **Convexity** measures how interest rate sensitivity changes with changes in interest rates.[23] **Gamma** measures the delta's sensitivity to a change in the underlying's value. Delta and gamma together capture first- and second-order effects of a change in the underlying.

For options, two other major factors determine price: volatility and time to expiration, both first-order or primary effects. Sensitivity to volatility is reflected in **vega**, the change in the price of an option for a change in the underlying's volatility. Most early option-pricing models (e.g., the Black–Scholes–Merton model) assume that volatility does not change over the life of an option, but in fact, volatility does generally change. Volatility changes are sometimes easy to observe in markets: Some days are far more volatile than others. Moreover, new information affecting the value of an underlying instrument, such as pending product announcements, will discernibly affect volatility. Because of their nonlinear payoff structure, options are typically very responsive to a change in volatility. Swaps, futures, and forwards with linear payoff functions are much less sensitive to changes in volatility. Option prices are also sensitive to changes in time to expiration, as measured by **theta**, the change in price of an option associated with a one-day reduction in its time to expiration.[24] Theta, like vega, is a risk that is associated exclusively with options. Correlation is a source of risk for certain types of options—for example, options on more than one underlying (when the correlations between the underlyings' returns constitute a risk variable).[25]

Having briefly reviewed traditional notions of market risk measurement, we introduce a new topic, one that took the industry by storm: value at risk.

---

22 The contrast is with instruments such as options that have nonlinear or piecewise linear payoffs. See Chance (2003) for more on the payoff functions of options.

23 Convexity is covered in some detail in Fabozzi (2004a), Chapter 7.

24 For more information on theta, see Chance (2003).

25 For more information, see Chance (2003).

5.2 Value at Risk

During the 1990s, value at risk—or VaR, as it is commonly known—emerged as the financial service industry's premier risk management technique.[26] JPMorgan (now JPMorgan Chase) developed the original concept for internal use but later published the tools it had developed for managing risk (as well as related information).[27] Probably no other risk management topic has generated as much attention and controversy as has value at risk. In this section, we take an introductory look at VaR, examine an application, and look at VaR's strengths and limitations.

VaR is a probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy. It is usually expressed either as a percentage or in units of currency. Any position that exposes one to loss is potentially a candidate for VaR measurement. VaR is most widely and easily used to measure the loss from market risk, but it can also be used—subject to much greater complexity—to measure the loss from credit risk and other types of exposures.

We have noted that VaR is a probability-based measure of loss potential. This definition is very general, however, and we need something more specific. More formally: **Value at risk (VaR)** is an estimate of the loss (in money terms) that we expect to be exceeded with a given level of probability over a specified time period.[28]

Readers are encouraged to think very carefully about the implications of this definition, which has a couple of important elements. First, we see that VaR is an estimate of the loss that we expect to be exceeded. Hence, it measures a minimum loss. The actual loss may be much worse without necessarily impugning the VaR model's accuracy. Second, we see that VaR is associated with a given probability. Say the VaR is €10,000,000 at a probability of 5 percent for a given time period. All else equal, if we lower the probability from 5 percent to 1 percent, the VaR will be larger in magnitude because we now are referring to a loss that we expect to be exceeded with only a 1 percent probability. Third, we see that VaR has a time element and that as such, VaRs cannot be compared directly unless they share the same time interval. There is a big difference among potential losses that are incurred daily, weekly, monthly, quarterly, or annually. Potential losses over longer periods should be larger than those over shorter periods, but in most instances, longer time periods will not increase exposure in a linear fashion.

Consider the following example of VaR for an investment portfolio: *The VaR for a portfolio is $1.5 million for one day with a probability of 0.05.* Recall what this statement says: *There is a 5 percent chance that the portfolio will lose at least $1.5 million in a single day.* The emphasis here should be on the fact that *the $1.5 million loss is a minimum.* With due care, it is also possible to describe VaR as a maximum: The probability is 95 percent that the portfolio will lose no more than $1.5 million in a single day. We see this equivalent perspective in the common practice of stating VaR using a confidence level: For the example just given, we would say that *with 95 percent confidence* (or *for a 95 percent confidence level*), *the VaR for a portfolio is $1.5 million*

26 The terminology "Value-at-Risk" is expressed in different ways. For example, sometimes hyphens are used and sometimes it is just written as "Value at Risk." Sometimes it is abbreviated as VAR and sometimes as VaR. Those who have studied econometrics should be alert to the fact that the letters VAR also refer to an estimation technique called Vector Autoregression, which has nothing to do with Value at Risk. We shall use the abbreviation "VaR."

27 RiskMetrics Group has now spun off from JPMorgan and is an independent company. See www.riskmetrics.com.

28 In the terminology of statistics, VaR with an x percent probability for a given time interval represents the xth percentile of the distribution of outcomes (ranked from worst to best) over that time period.

for one day.[29] We prefer to express VaR in the form of a minimum loss with a given probability. This approach is a bit more conservative, because it reminds us that the loss could be worse.[30]

5.2.1 *Elements of Measuring Value at Risk*

Although VaR has become an industry standard, it may be implemented in several forms, and establishing an appropriate VaR measure requires the user to make a number of decisions about the calculation's structure. Three important ones are picking a probability level, selecting the time period over which to measure VaR, and choosing the specific approach to modeling the loss distribution.[31]

The probability chosen is typically either 0.05 or 0.01 (corresponding to a 95 percent or 99 percent confidence level, respectively). The use of 0.01 leads to a more conservative VaR estimate, because it sets the figure at the level where there should be only a 1 percent chance that a given loss will be worse than the calculated VaR. The trade-off, however, is that the VaR risk estimate will be much larger with a 0.01 probability than it will be for a 0.05 probability. In the above example, we might have to state that the VaR is $2.1 million for one day at a probability of 0.01. The risk manager selects 0.01 or 0.05; no definitive rule exists for preferring one probability to the other. For portfolios with largely linear risk characteristics, the two probability levels will provide essentially identical information. However, the tails of the loss distribution may contain a wealth of information for portfolios that have a good deal of optionality or nonlinear risks, and in these cases risk managers may need to select the more conservative probability threshold.

The second important decision for VaR users is choosing the time period. VaR is often measured over a day, but other, longer time periods are common. Banking regulators prefer two-week period intervals. Many companies report quarterly and annual VaRs to match their performance reporting cycles. Investment banks, hedge funds, and dealers seem to prefer daily VaR, perhaps because of the high turnover in their positions. Regardless of the time interval selected, the longer the period, the greater the VaR number will be because the magnitude of potential losses varies directly with the time span over which they are measured. The individual or individuals responsible for risk management will choose the time period.

Once these primary parameters are set, one can proceed to actually obtain the VaR estimate. This procedure involves another decision: the choice of technique. The basic idea behind estimating VaR is to identify the probability distribution characteristics of portfolio returns. Consider the information in Exhibit 4, which is a simple probability distribution for the return on a portfolio over a specified time period. Suppose we were interested in the VaR at a probability of 0.05. We would add up the probabilities for the class intervals until we reached a cumulative probability of 0.05. Observe that the probability is 0.01 that the portfolio will lose at least 40 percent, 0.01 that the portfolio will lose between 30 percent and 40 percent, and 0.03 that the portfolio will lose between 20 percent and 30 percent. Thus, the probability is 0.05 that the portfolio will lose at least 20 percent. Because we want to express our risk measure in units of money, we would then multiply 20 percent by the portfolio's initial market value to obtain VaR. The VaR for a probability of 0.01 would be 40 percent multiplied by

29 This would be referred to as 95% one-day VaR.

30 For a long position, the maximum possible loss is the entire value of the portfolio. For a short position, or a portfolio with both long and short positions, it is impossible to state the maximum possible loss because at least in theory, a short faces the possibility of unlimited losses.

31 As we will learn in this section, users can select from three basic VaR methodologies, each of which uses a slightly different algorithm to estimate exposure.

the market value. From a confidence-level perspective, we estimate with 99 percent confidence that our portfolio will lose no more than 40 percent of its value over the specified time period.

Exhibit 4 Sample Probability Distribution of Returns on a Portfolio

Return on Portfolio	Probability
Less than –40%	0.010
–40% to –30%	0.010
–30% to –20%	0.030
–20% to –10%	0.050
–10% to –5%	0.100
–5% to –2.5%	0.125
–2.5% to 0%	0.175
0% to 2.5%	0.175
2.5% to 5%	0.125
5% to 10%	0.100
10% to 20%	0.050
20% to 30%	0.030
30% to 40%	0.010
Greater than 40%	0.010
	1.000

Exhibit 4 offers a simplified representation of the information necessary to estimate VaR. This method for calculating VaR is rather cumbersome, and the information is not always easy to obtain. As such, the industry has developed a set of three standardized methods for estimating VaR: the analytical or variance–covariance method, the historical method, and the Monte Carlo simulation method. We will describe and illustrate each of these in turn.

5.2.2 *The Analytical or Variance–Covariance Method*

The analytical or variance–covariance method begins with the assumption that portfolio returns are normally distributed. Recall from your study of portfolio management that a normal distribution can be completely described by its expected value and standard deviation.

Consider the standard normal distribution, a special case of the normal distribution centered on an expected value of zero and having a standard deviation of 1.0. We can convert any outcome drawn from a nonstandard normal distribution to a standard normal value by taking the outcome of interest, subtracting its mean, and dividing the result by its standard deviation. The resulting value then conforms to the standard normal distribution.[32] With the standard normal distribution, 5 percent

32 For example, suppose you were interested in knowing the probability of obtaining a return of –15 percent or less when the expected return is 12 percent and the standard deviation is 20 percent. You would calculate the standard normal value, called a "*z*", as (–0.15 – 0.12)/0.20 = –1.35. Then you would look up this value in a table or use a spreadsheet function, such as Microsoft Excel's "=normsdist()" function. In this case, the probability is 0.0885.

of possible outcomes are likely to be smaller than −1.65.[33] Therefore, to calculate a 5 percent VaR for a portfolio (i.e., VaR at a probability of 0.05), we would estimate its expected return and subtract 1.65 times its estimated standard deviation of returns. So, the key to using the analytical or variance–covariance method is to estimate the portfolio's expected return and standard deviation of returns. An example follows.[34]

Suppose the portfolio contains two asset classes, with 75 percent of the money invested in an asset class represented by the S&P 500 Index and 25 percent invested in an asset class represented by the NASDAQ Composite Index.[35] Recall that a portfolio's expected return is a weighted average of the expected returns of its component stocks or asset classes. A portfolio's variance can be derived using a simple quadratic formula that combines the variances and covariances of the component stocks or asset classes. For example, assume that μ_S and μ_N are the expected returns of the S&P 500 and NASDAQ, respectively; σ_S and σ_N are their standard deviations; and ρ is the correlation between the two asset classes. The expected return, μ_P, and variance, σ_P^2, of the combined positions are given as

$$\mu_P = w_S\mu_S + w_N\mu_N$$
$$\sigma_P^2 = w_S^2\sigma_S^2 + w_N^2\sigma_N^2 + 2\rho w_S w_N \sigma_S \sigma_N$$

where w indicates the percentage allocated to the respective classes. The portfolio's standard deviation is just the square root of its variance. Exhibit 5 provides estimates of the portfolio's expected value and standard deviation using actual numbers, where we obtain μ_P of 0.135 and σ_P of 0.244.

Exhibit 5 Estimating the Expected Return and Standard Deviation of a Portfolio Combining Two Asset Classes

	S&P 500	NASDAQ	Combined Portfolio
Percentage invested (w)	0.75	0.25	1.00
Expected annual return (μ)	0.12	0.18	0.135[a]
Standard deviation (σ)	0.20	0.40	0.244[b]
Correlation (ρ)	0.90		

[a] Expected return of portfolio: $\mu_P = w_S\mu_S + w_N\mu_N = 0.75(0.12) + 0.25(0.18) = 0.135$

[b] Standard deviation of portfolio:

$$\sigma_P^2 = w_S^2\sigma_S^2 + w_N^2\sigma_N^2 + 2\rho w_S w_N \sigma_S \sigma_N$$
$$= (0.75)^2(0.20)^2 + (0.25)^2(0.40)^2 + 2(0.90)(0.75)(0.25)(0.20)(0.40) = 0.0595$$
$$\sigma_P = \left(\sigma_P^2\right)^{1/2} = (0.0595)^{1/2} = 0.244$$

Note that the example provided above is quite simplistic, involving only two assets, and thus only two variances and one covariance. As such, the calculation of portfolio variance is relatively manageable. As the number of instruments in the portfolio increases, however, the calculation components expand dramatically and the equation quickly becomes unwieldy. The important thing to remember is that in

33 See DeFusco, McLeavey, Pinto, and Runkle (2004), pp. 255–56.
34 For more detailed information, see DeFusco et al. (2004), Chapter 11.
35 The extension to three or more classes is relatively straightforward once one knows how to calculate the variance of a portfolio of more than two assets. We shall focus here on the two-asset-class case.

order to derive the variance for a portfolio of multiple financial instruments, all we require are the associated variances and covariances, along with the ability to calculate their quadratic relationship.

If we are comfortable with the assumption of a normal distribution and the accuracy of our estimates of the expected returns, variances, and correlations, we can confidently use the analytical-method estimate of VaR. Exhibit 6 illustrates the calculation of this estimate. VaR is first expressed in terms of the return on the portfolio. With an expected return of 0.135, we move 1.65 standard deviations along the x-axis in the direction of lower returns. Each standard deviation is 0.244. Thus we would obtain 0.135 – 1.65(0.244) = –0.268.[36] At this point, VaR could be expressed as a loss of 26.8 percent. We could say that there is a 5 percent chance that the portfolio will lose at least 26.8 percent in a year. It is also customary to express VaR in terms of the portfolio's currency unit. Therefore, if the portfolio is worth $50 million, we can express VaR as $50,000,000(0.268) = $13.4 million.

This figure is an annual VaR. If we prefer a daily VaR, we can adjust the expected return to its daily average of approximately 0.135/250 = 0.00054 and the standard deviation to its daily value of $0.244/\sqrt{250} = 0.01543$, which are based on the assumption of 250 trading days in a year and statistical independence between days. Then the daily VaR is 0.00054 – 1.65(0.01543) = –0.0249. On a dollar basis, the daily VaR is $50,000,000(0.0249) = $1.245 million.

Exhibit 6 Annual VaR for a Portfolio with Expected Return of 0.135 and Standard Deviation of 0.244

For a 1 percent VaR, we would move 2.33 standard deviations in the direction of lower returns. Thus the annual VaR would be 0.135 – 2.33(0.244) = –0.434 or $50,000,000(0.434) = $21.7 million. The daily VaR would be 0.00054 – 2.33(0.01543) = –0.035 or $50,000,000(0.035) = $1.75 million.

36 The reader can confirm that 1.65 and 2.33 standard deviations give the correct VaR at the 5 percent and 1 percent probability levels, respectively, using the Microsoft Excel function "=normsdist()".

Some approaches to estimating VaR using the analytical method assume an expected return of zero. This assumption is generally thought to be acceptable for daily VaR calculations because expected daily return will indeed tend to be close to zero. Because expected returns are typically positive for longer time horizons, shifting the distribution by assuming a zero expected return will result in a larger projected loss, so the VaR estimate will be greater. Therefore, this small adjustment offers a slightly more conservative result and avoids the problem of having to estimate the expected return, a task typically much harder than that of estimating associated volatility. Another advantage of this adjustment is that it makes it easier to adjust the VaR for a different time period. For example, if the daily VaR is estimated at \$100,000, the annual VaR will be $\$100{,}000\sqrt{250} = \$1{,}581{,}139$. This simple conversion of a shorter-term VaR to a longer-term VaR (or vice versa) does not work, however, if the average return is not zero. In these cases, one would have to convert the average return and standard deviation to the different time period and compute the VaR from the adjusted average and standard deviation.

EXAMPLE 5

VaR with Different Probability Levels and Time Horizons

Consider a portfolio consisting of stocks as one asset class and bonds as another. The expected return on the portfolio's stock portion is 12 percent, and the standard deviation is 22 percent. The expected return on the bond portion is 5 percent, and the standard deviation is 7 percent. All of these figures are annual. The correlation between the two asset classes is 0.15. The portfolio's market value is \$150 million and is allocated 65 percent to stocks and 35 percent to bonds. Determine the VaR using the analytical method for the following cases:

1. a 5 percent yearly VaR.
2. a 1 percent yearly VaR.
3. a 5 percent weekly VaR.
4. a 1 percent weekly VaR.

Solutions:

First, we must calculate the annual portfolio expected return and standard deviation. Using S to indicate stocks and B to indicate bonds, we have

$$\mu_P = w_S\mu_S + w_B\mu_B = 0.65(0.12) + 0.35(0.05) = 0.0955$$

$$\begin{aligned}\sigma_P^2 &= w_S^2\sigma_S^2 + w_B^2\sigma_B^2 + 2\rho w_S w_B \sigma_S \sigma_B \\ &= (0.65)^2(0.22)^2 + (0.35)^2(0.07)^2 + 2(0.15)(0.65)(0.35)(0.22)(0.07) \\ &= 0.0221\end{aligned}$$

$$\sigma_P = \sqrt{0.0221} = 0.1487$$

Solution to 1:

For a 5 percent yearly VaR, we have $\mu_P - 1.65\sigma_P = 0.0955 - 1.65(0.1487) = -0.1499$. Then the VaR is \$150,000,000(0.1499) = \$22.485 million.

Solution to 2:

For a 1 percent yearly VaR, we have $\mu_P - 2.33\sigma_P = 0.0955 - 2.33(0.1487) = -0.251$. Then the VaR is \$150,000,000(0.251) = \$37.65 million.

Solution to 3:

For weekly VaR, we adjust the expected return to 0.0955/52 = 0.00184 and the standard deviation to $0.1487/\sqrt{52} = 0.02062$.

The 5 percent weekly VaR is then $\mu_P - 1.65\sigma = 0.00184 - 1.65(0.02062) = -0.03218$. Then the VaR is \$150,000,000(0.03218) = \$4.827 million.

Solution to 4:

The 1 percent weekly VaR is $\mu_P - 2.33\sigma_P = 0.00184 - 2.33(0.02062) = -0.0462$. Then the VaR is \$150,000,000(0.0462) = \$6.93 million.

The analytical or variance–covariance method's primary advantage is its simplicity. Its primary disadvantage is its reliance on several simplifying assumptions, including the normality of return distributions. In principle, there is no reason why the calculation demands a normal distribution, but if we move away from the normality assumption, we cannot rely on variance as a complete measure of risk. Distributions can deviate from normality because of skewness and kurtosis. Skewness is a measure of a distribution's deviation from the perfect symmetry (the normal distribution has a skewness of zero). A positively skewed distribution is characterized by relatively many small losses and a few extreme gains and has a long tail on its right side. A negatively skewed distribution is characterized by relatively many small gains and a few extreme losses and has a long tail on its left side. When a distribution is positively or negatively skewed, the variance–covariance method of estimating VaR will be inaccurate.

In addition, many observed distributions of returns have an abnormally large number of extreme events. This quality is referred to in statistical parlance as leptokurtosis but is more commonly called the property of fat tails.[37] Equity markets, for example, tend to have more frequent large market declines than a normal distribution would predict. Therefore, using a normality assumption to estimate VaR for a portfolio that features fat tails could understate the actual magnitude and frequency of large losses. VaR would then fail at precisely what it is supposed to do: measure the risk associated with large losses.

A related problem that surfaces with the analytical or variance–covariance method is that the normal distribution assumption is inappropriate for portfolios that contain options. The return distributions of options portfolios are often far from normal. Remember that a normal distribution has an unlimited upside and an unlimited downside. Call options have unlimited upside potential, as in a normal distribution, but their downside is a fixed value (the call's premium) and the distribution of call returns is highly skewed. Put options have a large but limited upside and a fixed downside (the put's premium), and the distribution of put returns is also highly skewed. In the same vein, covered calls and protective puts have return distributions that are sharply skewed in one direction or the other.

Therefore, when portfolios contain options, the assumption of a normal distribution to estimate VaR presents a significant problem. One common solution is to estimate the option's price sensitivity using its delta. Recall that delta expresses a linear relationship between an option's price and the underlying's price (i.e., Delta = Change in option price/Change in underlying). A linear relationship lends itself more easily to treatment with a normal distribution. That is, a normally distributed random variable remains normally distributed when multiplied by a constant. In this case, the constant is the delta. The change in the option price is assumed to equal the change in the underlying price multiplied by the delta. This trick converts the normal distribution for the return on the underlying into a normal distribution for the option

37 See DeFusco, McLeavey, Pinto, and Runkle (2004), Chapter 5.

return. As such, the use of delta to estimate the option's price sensitivity for VaR purposes has led some to call the analytical method (or variance–covariance method) the **delta-normal method**. The use of delta is appropriate only for small changes in the underlying, however. As an alternative, some users of the delta-normal method add the second-order effect, captured by gamma. Unfortunately, as these higher-order effects are added, the relationship between the option price and the underlying's price begins to approximate the true nonlinear relationship. At that point, using a normal distribution becomes completely inappropriate. Therefore, using the analytical method could cause problems if a portfolio has options or other financial instruments that do not follow the normal distribution. Moreover, it is often difficult, if not impossible, to come up with a single second-order estimate that both is accurate and fits seamlessly into a variance/covariance VaR model.

5.2.3 *The Historical Method*

Another widely used VaR methodology is the historical method. Using historical VaR, we calculate returns for a given portfolio using actual daily prices from a user-specified period in the recent past, graphing these returns into a histogram. From there, it becomes easy to identify the loss that is exceeded with a probability of 0.05 (or 0.01 percent, if preferred).

Consider the portfolio we have been examining, consisting of 75 percent invested in the S&P 500 and 25 percent invested in the NASDAQ Composite Index. Exhibit 7, a histogram, shows the daily returns on this portfolio for a recent calendar year. First, we note that the distribution is similar, but by no means identical, to that of a normal distribution. This portfolio has a few more returns slightly lower than the midpoint of the return sample than it would if its distribution were perfectly normal. With the historical method, however, we are not constrained to using the normal distribution. We simply collect the historical data and identify the return below which 5 (or 1) percent of returns fall. Although we could attempt to read this number from the histogram, it is much easier to simply rank-order the returns and determine the VaR figure from the sorted returns and the portfolio's dollar value.

Exhibit 7 Historical Daily Returns on a Portfolio Invested 75 Percent in S&P 500 and 25 Percent in NASDAQ

The year examined here contains 248 returns. Having 5 percent of the returns in the distribution's lower tail would mean that about 12 return observations should be less than the VaR estimate. Thus the approximate VaR figure would be indicated by the 12th-worst return. A rank ordering of the data reveals that the 12th-worst return is –0.0294. For a $50,000,000 portfolio, the one-day VaR would thus be 0.0294($50,000,000) = $1.47 million.[38]

The historical method is also sometimes called the **historical simulation method**. This term is somewhat misleading because the approach involves not a *simulation* of the past returns but rather what *actually happened* in the past. In this context, note that a portfolio that an investor might have held in the past might not be the same as the one that investor will have in the future. When using the historical method, one must always keep in mind that the purpose of the exercise is to apply *historical* price changes to the *current* portfolio.[39] In addition, instruments such as bonds and most derivatives behave differently at different times in their lives, and any accurate historical VaR calculation must take this into account by adjusting current bond/derivative pricing parameters to simulate their current characteristics across the period of analysis. For example, a historical VaR calculation that goes back one year for a portfolio that contains bonds that mature in the year 2027 should actually use otherwise identical bonds maturing in 2026 as proxies; these bonds are the most accurate representations of the current risk profile because they would have presented themselves one year ago in time. When a company uses a different portfolio composition to calculate its historical VaR than the one it actually had in the past, it may be more appropriate to call the method a historical simulation.

The historical method has the advantage of being **nonparametric** (i.e., involving minimal probability-distribution assumptions), enabling the user to avoid any assumptions about the type of probability distribution that generates returns. The disadvantage, however, is that this method relies completely on events of the past, and whatever distribution prevailed in the past might not hold in the future. In particular, periods of unusually large negative returns, such as the 23 percent one-day decline in the Dow Jones Industrial Average on 19 October 1987, might be questionable as an assumption for the future. This problem applies to the other types of VaR methodologies as well, however, including the analytical method and Monte Carlo simulation, both of which derive their inputs, more often than not, entirely from the historical prices associated with the securities contained in the portfolio.

EXAMPLE 6

Calculating VaR Using the Historical Method

For simplicity, we use a one-stock portfolio. Exhibit 8 shows the 40 worst monthly returns on IBM stock during the last 20 years, in descending order, as of 2011 (minus signs omitted):

Exhibit 8 IBM Stock: Worst Monthly Returns

0.26190	0.11692	0.09077	0.07537
0.22645	0.11553	0.08926	0.07298

(continued)

38 Technically, the VaR would fall between the 12th- and 13th-worst returns. Using the 13th-worst return gives a more conservative VaR. Alternatively, we might average the 12th- and 13th-worst returns.

39 For example, in the two-asset portfolio we illustrated here, the weights were 75 percent S&P 500 and 25 percent NASDAQ. If the company were going forward with a different set of weights, it would obviously need to use the weights it planned to use in the future when calculating the VaR by the historical method.

Exhibit 8 (Continued)

0.20511	0.10838	0.08585	0.07260
0.19462	0.10805	0.08481	0.07247
0.18802	0.10687	0.08422	0.07075
0.17183	0.10503	0.08356	0.06894
0.16415	0.09873	0.08234	0.06782
0.14834	0.09550	0.08197	0.06746
0.14773	0.09276	0.08143	0.06501
0.12444	0.09091	0.07547	0.06437

For both calculations below, assume the portfolio value is $100,000.

1 Calculate a 5 percent monthly VaR using the historical method.

2 Calculate a 1 percent monthly VaR using the historical method.

Solutions:

First, we note that during the last 20 years, there were 240 monthly returns. We see here only the worst 40 returns. Therefore, although we lack the entire distribution of returns, we do have enough to calculate the VaR.

Solution to 1:

Out of 240 returns, the 5 percent worst are the 12 worst returns. Therefore, the historical VaR would be about the 12th-worst return. From the exhibit, we see that this return is –0.11553. So, the one-month VaR is 0.11553($100,000) = $11,553.

Solution to 2:

The 1 percent worst returns include 2.4 returns. We would probably use the second-worst return, which is –0.22645. The VaR is 0.22645($100,000) = $22,645. Alternatively, we might average the second- and third-worst returns to obtain (–0.22645 + –0.20511)/2 = –0.21578. Then the one-month VaR would be 0.21578($100,000) = $21,578.

The excerpt from The Goldman Sachs Group, Inc. Form 10-K that follows in Example 7 shows how this firm reports its VaR. We see that Goldman Sachs reports average daily VaR (at a 95% confidence level) for its last three fiscal years. In addition, the firm reports the high and low daily VaR values for the last fiscal year along with the year end values for the last two fiscal years. Goldman Sachs reports VaRs for these four risk categories (interest rate, equity prices, currency rates, and commodity prices) as well as its firm-wide risk exposure (total VaR). Total VaR is less than the sum of the individual VaRs because Goldman Sachs' exposures to the various risk categories are less than perfectly correlated. The **diversification effect** reported in the Average Daily VaR table in Example 7 equals the difference between the total VaR and the sum of the individual VaRs. For example, for 2010, the diversification effect is $134 – ($93 + $68 + $32 + $33) = –$92.

EXAMPLE 7

Value at Risk and the Management of Market Risk at Goldman Sachs

The following excerpt is from the 2010 Form 10-K of Goldman Sachs:

Value-at-Risk

VaR is the potential loss in value of inventory positions due to adverse market movements over a defined time horizon with a specified confidence level. We typically employ a one-day time horizon with a 95% confidence level. Thus, we would expect to see reductions in the fair value of inventory positions at least as large as the reported VaR once per month. The VaR model captures risks including interest rates, equity prices, currency rates and commodity prices. As such, VaR facilitates comparison across portfolios of different risk characteristics. VaR also captures the diversification of aggregated risk at the firmwide level.

Inherent limitations to VaR include:

- VaR does not estimate potential losses over longer time horizons where moves may be extreme.
- VaR does not take account of the relative liquidity of different risk positions.
- Previous moves in market risk factors may not produce accurate predictions of all future market moves.

The historical data used in our VaR calculation is weighted to give greater importance to more recent observations and reflect current asset volatilities. This improves the accuracy of our estimates of potential loss. As a result, even if our inventory positions were unchanged, our VaR would increase with increasing market volatility and vice versa.

Given its reliance on historical data, VaR is most effective in estimating risk exposures in markets in which there are no sudden fundamental changes or shifts in market conditions.

We evaluate the accuracy of our VaR model through daily backtesting (i.e., comparing daily trading net revenues to the VaR measure calculated as of the prior business day) at the firmwide level and for each of our businesses and major regulated subsidiaries.

VaR does not include:

- positions that are best measured and monitored using sensitivity measures; and
- the impact of changes in counterparty and our own credit spreads on derivatives as well as changes in our own credit spreads on unsecured borrowings for which the fair value option was elected.

Stress Testing

We use stress testing to examine risks of specific portfolios as well as the potential impact of significant risk exposures across the firm. We use a variety of scenarios to calculate the potential loss from a wide range of market moves on the firm's portfolios. These scenarios include the default of single corporate or sovereign entities, the impact of a move in a single risk factor across all positions (e.g., equity prices or credit spreads) or a combination of two or more risk factors.

Unlike VaR measures, which have an implied probability because they are calculated at a specified confidence level, there is generally no implied probability that our stress test scenarios will occur. Instead, stress tests are used to

model both moderate and more extreme moves in underlying market factors. When estimating potential loss, we generally assume that our positions cannot be reduced or hedged (although experience demonstrates that we are generally able to do so).

Stress test scenarios are conducted on a regular basis as part of the firm's routine risk management process and on an ad hoc basis in response to market events or concerns. Stress testing is an important part of the firm's risk management process because it allows us to highlight potential loss concentrations, undertake risk/reward analysis, and assess and mitigate our risk positions.

Limits

We use risk limits at various levels in the firm (including firmwide, product and business) to govern risk appetite by controlling the size of our exposures to market risk. Limits are reviewed frequently and amended on a permanent or temporary basis to reflect changing market conditions, business conditions or tolerance for risk.

The Firmwide Risk Committee sets market risk limits at firmwide and product levels and our Securities Division Risk Committee sets sub-limits for market-making and investing activities at a business level. The purpose of the firmwide limits is to assist senior management in controlling the firm's overall risk profile. Sub-limits set the desired maximum amount of exposure that may be managed by any particular business on a day-to-day basis without additional levels of senior management approval, effectively leaving day-to-day trading decisions to individual desk managers and traders. Accordingly, sub-limits are a management tool designed to ensure appropriate escalation rather than to establish maximum risk tolerance. Sub-limits also distribute risk among various businesses in a manner that is consistent with their level of activity and client demand, taking into account the relative performance of each area.

Our market risk limits are monitored daily by Market Risk Management, which is responsible for identifying and escalating, on a timely basis, instances where limits have been exceeded. The business-level limits that are set by the Securities Division Risk Committee are subject to the same scrutiny and limit escalation policy as the firmwide limits.

When a risk limit has been exceeded (e.g., due to changes in market conditions, such as increased volatilities or changes in correlations), it is reported to the appropriate risk committee and a discussion takes place with the relevant desk managers, after which either the risk position is reduced or the risk limit is temporarily or permanently increased.

Metrics

We analyze VaR at the firmwide level and a variety of more detailed levels, including by risk category, business, and region. The tables below present average daily VaR and year-end VaR by risk category.

Average Daily VaR (in millions)

	Year Ended		
Risk Categories	**December 2010**	**December 2009**	**November 2008**
Interest rates	**$ 93**	$176	$ 142
Equity prices	**68**	66	72
Currency rates	**32**	36	30
Commodity prices	**33**	36	44

(Continued)

Risk Categories	Year Ended December 2010	December 2009	November 2008
Diversification effect[a]	**(92)**	(96)	(108)
Total	**$134**	**$218**	**$ 180**

[a] Equals the difference between total VaR and the sum of the VaRs for the four risk categories. This effect arises because the four market risk categories are not perfectly correlated.

Our average daily VaR decreased to $134 million in 2010 from $218 million in 2009, principally due to a decrease in the interest rates category which was primarily due to reduced exposures, lower levels of volatility and tighter spreads.

Our average daily VaR increased to $218 million in 2009 from $180 million in 2008, principally due to an increase in the interest rates category and a reduction in the diversification benefit across risk categories, partially offset by a decrease in the commodity prices category. The increase in the interest rates category was primarily due to wider spreads. The decrease in the commodity prices category was primarily due to lower energy prices.

Year-End VaR and High and Low VaR (in millions)

Risk Categories	As of December 2010	2009	Year Ended December 2010 High	Low
Interest rates	**$ 78**	$ 122	**$123**	**$ 76**
Equity prices	**51**	99	**186**	**39**
Currency rates	**27**	21	**62**	**14**
Commodity prices	**25**	33	**62**	**18**
Diversification effect[a]	**(70)**	(122)		
Total	**$111**	**$ 153**	**$223**	**$105**

[a] Equals the difference between total VaR and the sum of the VaRs for the four risk categories. This effect arises because the four market risk categories are not perfectly correlated.

Our daily VaR decreased to $111 million as of December 2010 from $153 million as of December 2009, principally due to a decrease in the equity prices and interest rates categories, partially offset by a decrease in the diversification benefit across risk categories. The decreases in the equity prices and interest rates categories were primarily due to reduced exposures and lower levels of volatility.

During the year ended December 2010, the firmwide VaR risk limit was exceeded on one occasion in order to facilitate a client transaction and was resolved by a reduction in the risk position on the following day. Separately, during the year ended December 2010, the firmwide VaR risk limit was reduced on one occasion reflecting lower risk utilization.

During the year ended December 2009, the firmwide VaR risk limit was exceeded on two successive days. It was resolved by a reduction in the risk position without a permanent or temporary VaR limit increase. Separately,

during the year ended December 2009, the firmwide VaR risk limit was raised on one occasion and reduced on two occasions as a result of changes in the risk utilization and the market environment.

The chart below reflects the VaR over the last four quarters.

Daily VaR ($ in millions)

The chart below presents the frequency distribution of our daily trading net revenues for substantially all inventory positions included in VaR for the year ended December 2010.

Daily Trading Net Revenues ($ in millions)

As noted above, daily trading net revenues are compared with VaR calculated as of the end of the prior business day. Trading losses incurred on a single day exceeded our 95% one-day VaR on two occasions during 2010. Trading losses incurred on a single day did not exceed our 95% one-day VaR during 2009.

Source: Goldman Sachs 2010 Form 10-K, pp. 85-87. The Goldman Sachs Group, Inc. All rights reserved.

The next section addresses the third method of estimating VaR, Monte Carlo simulation.

5.2.4 *The Monte Carlo Simulation Method*

The third approach to estimating VaR is Monte Carlo simulation. In general, Monte Carlo simulation produces random outcomes so we can examine what might happen given a particular set of risks. It is used widely in the sciences as well as in business to study a variety of problems. In the financial world in recent years, it has become an extremely important technique for measuring risk. Monte Carlo simulation generates random outcomes according to an assumed probability distribution and a set of input parameters. We can then analyze these outcomes to gauge the risk associated with the events in question. When estimating VaR, we use Monte Carlo simulation to produce random portfolio returns. We then assemble these returns into a summary distribution from which we can determine at which level the lower 5 percent (or 1 percent, if preferred) of return outcomes occur. We then apply this figure to the portfolio value to obtain VaR.

Monte Carlo simulation uses a probability distribution for each variable of interest and a mechanism to randomly generate outcomes according to each distribution. Our goal here is to gain a basic understanding of the technique and how to use it. Therefore, we illustrate it without explaining the full details of how to generate the random values.

Suppose we return to the example of our $50 million portfolio invested 75 percent in the S&P 500 and 25 percent in the NASDAQ Composite Index. We assume, as previously, that this portfolio should have an annual expected return of 13.5 percent and a standard deviation of 24.4 percent. We shall now conduct a Monte Carlo simulation using the normal distribution with these parameters. Keep in mind that in practice, one advantage of Monte Carlo simulation is that it does not require a normal distribution, but the normal distribution is often used and we shall stay with it for illustrative purposes.

We use a random number generator to produce a series of random values, which we then convert into a normally distributed stream of outcomes representing a rate of return for this portfolio over a period of one year. Suppose the first value it produces is a return of –21.87 percent. This rate corresponds to an end-of-year portfolio value of $39.07 million. The second random return it produces is –4.79 percent, which takes the portfolio value to $47.61 million.[40] The third random return it produces is 31.38 percent, which makes the portfolio value $65.69 million. We continue this process a large number of times, perhaps several thousand or even several million. To keep the simulation to a manageable size for illustrative purposes, we generate only 300 outcomes.

Exhibit 9 shows the histogram of portfolio outcomes. Notice that even though we used a normal distribution to generate the outcomes, the resulting distribution does not look entirely normal. Of course, we should be surprised if it did because we used only 300 random outcomes, a relatively small sample.

To obtain the point in the lower tail that 5 percent of the outcomes exceed, we rank order the data and find the 15th-lowest outcome, which is a portfolio value of $34.25 million, corresponding to a loss of $15.75 million. This value is higher than the annual VaR estimated using the analytical method ($13.4 million). These two values would be identical (or nearly so) if we had employed a sufficiently large sample size in the Monte Carlo simulation so that the sample VaR would converge to the true population VaR.

40 The random outcomes are independent, not sequential. Each outcome thus represents a return relative to the full initial portfolio value of $50 million.

Exhibit 9 Simulated Values after One Year for a Portfolio Invested 75 Percent in S&P 500 and 25 Percent in NASDAQ

In Monte Carlo simulation, we can make any distributional assumption that we believe is appropriate. In many practical applications, it is inappropriate to assume a normal return distribution. In particular, for many derivatives dealers, the problems in managing the risk of these instruments are compounded by the fact that an extremely large number of random variables may affect the value of their overall position. These variables are often not normally distributed, and furthermore, they often interact with each other in complex ways. Monte Carlo simulation is often the only practical means of generating the information necessary to manage the risk.

5.2.5 *"Surplus at Risk": VaR as It Applies to Pension Fund Portfolios*

You will recall from earlier points in our discussion that pension funds face a slightly different set of challenges in the measurement of market exposures, primarily because of the fact that the assets must fund pension obligations whose present value is itself subject to interest rate risk and other risks.[41] The difference between the value of the pension fund's assets and liabilities is referred to as the **surplus**, and it is this value that pension fund managers seek to enhance and protect. If this surplus falls into negative territory, the plan sponsor must contribute funds to make up the deficit over a period of time that is specified as part of the fund's plan.

In order to reflect this set of realities in their risk estimations, pension fund managers typically apply VaR methodologies not to their portfolio of assets but to the surplus. To do so, they simply express their liability portfolio as a set of short securities and calculate VaR on the net position. VaR handles this process quite elegantly, and once this adjustment is made, all three VaR methodologies can be applied to the task.

5.3 The Advantages and Limitations of VaR

Although value at risk has become the industry standard for risk assessment, it also has widely documented imperfections. VaR can be difficult to estimate, and different estimation methods can give quite different values. VaR can also lull one into a false sense of security by giving the impression that the risk is properly measured and under

41 An example of a defined-benefit pension plan's obligation is the promise to pay, for each year of service, a certain percentage of a vested participant's average salary in their final five years of service; this promise may include cost-of-living adjustments.

control. VaR often underestimates the magnitude and frequency of the worst returns, although this problem often derives from erroneous assumptions and models. As we discuss later, VaR for individual positions does not generally aggregate in a simple way to portfolio VaR. Also, VaR fails to incorporate positive results into its risk profile, and as such, it arguably provides an incomplete picture of overall exposures.

Users of VaR should routinely test their system to determine whether their VaR estimates prove accurate in predicting the results experienced over time. For example, if daily VaR at 0.05 is estimated at $1 million, then over a reasonable period of time, such as a year, a loss of at least $1 million should be exceeded approximately 250(0.05) = 12.5 days. If the frequency of losses equal to or greater than this amount is markedly different, then the model is not accomplishing its objectives. This process of comparing the number of violations of VaR thresholds with the figure implied by the user-selected probability level is part of a process known as **backtesting**. It is extremely important to go through this exercise, ideally across multiple time intervals, to ensure that the VaR estimation method adopted is reasonably accurate. For example, if the VaR estimate is based on daily observations and targets a 0.05 probability, then in addition to ensuring that approximately a dozen threshold violations occur during a given year, it is also useful to check other, shorter time intervals, including the most recent quarter (for which, given 60-odd trading days, we would expect approximately three VaR exceptions—i.e., losses greater than the calculated VaR), and the most recent month (20 observations, implying a single VaR exception). Note that the results should not be expected to precisely match the probability level predictions but should at a minimum be of similar magnitude. If the results vary much from those that the model predicts, then users must examine the reasons and make appropriate adjustments.

An accurate VaR estimate can also be extremely difficult to obtain for complex organizations. In the simple example we used previously, VaR was driven solely by the large- and small-cap US stocks. For a large international bank, however, the exposures might be to a variety of domestic and international interest rate markets, numerous exchange rates, perhaps some equity markets, and even some commodity markets. A bank could have exposure to literally thousands of risks. Consolidating the effects of these exposures into a single risk measure can be extremely difficult. Nonetheless, most large banks manage to do so.

VaR has the attraction of quantifying the potential loss in simple terms and can be easily understood by senior management. Regulatory bodies have taken note of VaR as a risk measure, and some require that institutions provide it in their reports. In the United States, the Securities and Exchange Commission now requires publicly traded companies to report how they are managing financial risk. VaR is one acceptable method of reporting that information.

Another advantage of VaR is its versatility. Many companies use VaR as a measure of their capital at risk. They will estimate the VaR associated with a particular activity, such as a line of business, an individual asset manager, a subsidiary, or a division. Then, they evaluate performance, taking into account the VaR associated with this risky activity. In some cases, companies allocate capital based on VaR. For example, a pension fund might determine its overall acceptable VaR and then inform each asset class manager that it can operate subject to its VaR not exceeding a certain amount. The manager's goal is to earn the highest return possible given its VaR allocation. This activity is known as risk budgeting; we cover it in more detail in a later section.

In summary, VaR has notable advantages and disadvantages. Controversy and criticism have surrounded it.[42] Nevertheless, if a risk manager uses VaR with full awareness of its limitations, he should definitely gain useful information about risk. Even if VaR gives an incorrect measure of the loss potential, the risk manager can take this risk measurement error into account when making the key overall decisions—provided, of course, that the magnitude of the error can be measured and adjusted for with some level of precision, e.g., through backtesting a VaR method against historical data. The controversy remains, but VaR as a risk measure is unlikely to ever be completely rejected. It should not, however, be used in isolation. VaR is often paired with stress testing, discussed in a subsequent section. Remember too that no risk measure can precisely predict future losses. It is important to ensure that the inputs to the VaR calculation are as reliable as possible and relevant to the current investment mix.

5.4 Extensions and Supplements to VaR

Risk managers have developed several useful extensions and supplements to VaR. In this section, we review several of the more noteworthy.

A key concern to risk managers is the evaluation of the portfolio effect of a given risk. The ability to isolate the effect of a risk, particularly in complex portfolios with high correlation effects, is very important. We can use incremental VaR (IVaR) to investigate the effect. **Incremental VaR** measures the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.[43] We can also use IVaR to assess the incremental effect of a subdivision on an enterprise's overall VaR. Although IVaR gives an extremely limited picture of the asset's or portfolio's contribution to risk, it nonetheless provides useful information about how adding the asset will affect the portfolio's overall risk as reflected in its VaR.

Some variations of VaR are **cash flow at risk** (CFAR) and **earnings at risk (EAR)**. CFAR and EAR measure the risk to a company's cash flow or earning, respectively, instead of its market value as in the case of VaR. CFAR is the minimum cash flow loss that we expect to be exceeded with a given probability over a specified time period. EAR is defined analogously to CFAR but measures risk to accounting earnings. CFAR and EAR can be used when a company (or portfolio of assets) generates cash flows or profits but cannot be readily valued in a publicly traded market, or when the analyst's focus is on the risk to cash flow and earnings, for example, in a valuation. CFAR and EAR can complement VaR's perspective on risk.

Another useful tool to supplement VaR is the **tail value at risk** (TVaR), also known as the conditional tail expectation. TVaR is defined as the VaR plus the expected loss in excess of VaR, when such excess loss occurs. For example, given a 5 percent daily VaR, TVaR might be calculated as the average of the worst 5 percent of outcomes in a simulation.

VaR developed initially as a measure for market risk, which is the risk associated with the primary market forces of interest rates, exchange rates, stock prices, and commodity prices. With some difficulty, VaR can be extended to handle credit risk,

42 A well-known critic of VaR has likened its use to flying an aircraft with a potentially flawed altimeter. With an altimeter, a pilot may think he knows the correct altitude. Without an altimeter, the pilot will look out the window. Of course, this argument presumes that there are no clouds below. The probability of hitting trees or a mountain is the joint probability that the aircraft is too low and that the altimeter gives a false signal, which is less than the simple probability that the aircraft is too low. Aware of the potential for the altimeter to be flawed, the pilot will also seek information from other sources, which themselves are less than 100 percent accurate. So will the risk manager when using VaR. Both will gauge the risk against their tolerance for risk and take appropriate action. We look at some of these other sources of risk information in the next section.

43 For more details, see Crouhy, Galai, and Mark (2001), Chapter 6.

the risk that a counterparty will not pay what it owes. More recent extensions of VaR have tended to focus on modeling assets with nonnormal underlying distributions. The use of conditional normal distribution based on different regimes is a very intriguing concept, but the mathematics used in this area can be daunting.[44]

5.5 Stress Testing

Managers often use stress testing (a term borrowed from engineering) to supplement VaR as a risk measure. The main purpose of VaR analysis is to quantify potential losses under normal market conditions. Stress testing, by comparison, seeks to identify unusual circumstances that could lead to losses in excess of those typically expected. Clearly, different scenarios will have attached probabilities of occurring that vary from the highly likely to the almost totally improbable. It is, therefore, the natural complement to VaR analysis. Two broad approaches exist in stress testing: scenario analysis and stressing models.

5.5.1 *Scenario Analysis*

Scenario analysis is the process of evaluating a portfolio under different states of the world. Quite often it involves designing scenarios with deliberately large movements in the key variables that affect the values of a portfolio's assets and derivatives.

One type of scenario analysis, that of **stylized scenarios**, involves simulating a movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio. These movements might range from fairly modest changes to quite extreme shifts. Many practitioners use standard sets of stylized scenarios to highlight potentially risky outcomes for the portfolio. Some organizations have formalized this process; for example, the Derivatives Policy Group recommends its members look at the following seven scenarios:

- parallel yield curve shifting by ±100 basis points (1 percentage point);
- yield curve twisting by ±25 basis points;[45]
- each of the four combinations of the above shifts and twists;
- implied volatilities changing by ±20 percent from current levels;
- equity index levels changing by ±10 percent;
- major currencies moving by ±6 percent and other currencies by ±20 percent;
- swap spread changing by ±20 basis points.

In 1988, the Chicago Mercantile Exchange introduced a system call SPAN to calculate collateral requirements based on their members' total portfolios of futures and options. The objective of this system was to stress portfolios under a variety of scenarios. SPAN has become a very popular system among futures and options exchanges worldwide to set margin requirements. It offers a very useful, generalized form of scenario analysis that combines elements of VaR with some specified overlay based on real-world observation of the relationship among financial instruments.

Scenario analysis is a very useful enhancement to VaR, enabling those interested in risk analysis to identify and analyze specific exposures that might affect a portfolio. The results, of course, are only as good as implied by the accuracy of the scenarios devised. One problem with the stylized scenario approach is that the shocks tend to

44 For an extremely entertaining tour of some of the pitfalls of traditional risk analysis and some solutions, see Osband (2002).

45 A **twist** is a nonparallel movement in the yield curve. An example of a twist is a 25-bps increase in short rates and no change in long rates, which would result in a flattening of the yield curve.

be applied to variables in a sequential fashion. In reality, these shocks often happen at the same time, have much different correlations than normal, or have some causal relationship connecting them.

Another approach to scenario analysis involves using **actual extreme events** that have occurred in the past. Here, we might want to put our portfolio through price movements that simulate the stock market crash of October 1987; the collapse of Long-Term Capital Management in 1998; the technology stock bubble of the late 1990s; the abrupt bursting of said bubble, beginning in the spring of 2000; or the market reaction to the terrorist attacks of 11 September 2001. This type of scenario analysis might be particularly useful if we think that the occurrence of extreme market breaks has a higher probability than that given by the probability model or historical time period being used in developing the VaR estimate. Stress testing of actual extreme events forces one to direct attention to these outcomes.

We might also create scenarios based on **hypothetical events**—events that have never happened in the markets or market outcomes to which we attach a small probability. These types of scenarios are very difficult to analyze and may generate confusing outcomes, so it is important to carefully craft hypothetical analyses if they are to generate information that adds value to the risk management processes.

Having devised a series of appropriate scenarios, the next step in the process is to apply them to the portfolio. The key task here is to understand the instruments' sensitivities to the underlying risk factors being stressed. This process is often a complex one that demands an understanding of the portfolio's risk parameters such that we can make appropriate approximations from standardized risk characteristics such as betas, deltas, gammas, duration, and convexity. Market liquidity is often a consideration also, especially when the underlying valuation models for assets assume arbitrage-free pricing, which assumes the ability to transact in any quantity. In addition, liquidity often dries up completely in a market crisis.

5.5.2 *Stressing Models*

Given the difficulty in estimating the sensitivities of a portfolio's instruments to the scenarios we might design, another approach might be to use an existing model and apply shocks and perturbations to the model inputs in some mechanical way. This approach might be considered more scientific because it emphasizes a range of possibilities rather than a single set of scenarios, but it will be more computationally demanding. It is also possible to glean some idea of the likelihood of different scenarios occurring.

The simplest form of stressing model is referred to as **factor push**, the basic idea of which to is to push the prices and risk factors of an underlying model in the most disadvantageous way and to work out the combined effect on the portfolio's value. This exercise might be appropriate for a wide range of models, including option-pricing models such as Black–Scholes–Merton, multifactor equity risk models, and term structure factor models. But factor push also has its limitations and difficulties—principally the enormous model risk that occurs in assuming the underlying model will function in an extreme risk climate.

Other approaches include **maximum loss optimization**—in which we would try to optimize mathematically the risk variable that will produce the maximum loss—and **worst-case scenario analysis**—in which we can examine the worst case that we actually expect to occur.

Overall stress testing is a valuable complement to VaR analysis and can highlight weaknesses in risk management procedures.

5.6 Measuring Credit Risk

Credit risk is present when there is a positive probability that one party owing money to another will renege on the obligation (i.e., the counterparty could default). If the defaulting party has insufficient resources to cover the loss or the creditor cannot impose a claim on any assets the debtor has that are unrelated to the line of business in which the credit was extended, the creditor can suffer a loss.[46] A creditor might be able to recover some of the loss, perhaps by having the debtor sell assets and pay the creditors a portion of their claim.

Credit losses have two dimensions: the likelihood of loss and the associated amount of loss (reflecting, of course, the amount of credit outstanding and the associated recovery rate). The likelihood of loss is a probabilistic concept: In every credit-based transaction, a given probability exists that the debtor will default. When a default does occur, however, creditors are often able to recover at least a portion of their investment, and as such, it is necessary and appropriate to assess the magnitude of this recovery (i.e., the recovery rate) in order to fully understand the risk profile of the credit dynamic. In relation to data on market risk, the amount of information available on credit losses is much smaller. Credit losses occur infrequently, and as such, the empirical data set from which to draw exposure inferences is quite limited. Although some statistical data are available, historical recovery rates can be unreliable. It can be hard to predict what an asset could be sold for in bankruptcy proceedings, and claims are not always paid in the order specified by bankruptcy law.

In the risk management business, exposure must often be viewed from two different time perspectives. We must assess first the risk associated with immediate credit events and second the risk associated with events that may happen later. With respect to credit, the risk of events happening in the immediate future is called **current credit risk** (or, alternatively, jump-to-default risk); it relates to the risk that amounts due at the present time will not be paid. For example, some risk exists that the counterparty could default on an interest or swap payment due immediately. Assuming, however, that the counterparty is solvent and that it will make the current payment with certainty, the risk remains that the entity will default at a later date. This risk is called potential credit risk, and it can differ quite significantly from current credit risk; the relationship between the two is a complex one. A company experiencing financial difficulties at present could, with sufficient time, work out its problems and be in better financial condition at a later date. Regardless of which risk is greater, however, a creditor must assess credit risk at different points in time. In doing so, the creditor must understand how different financial instruments have different patterns of credit risk, both across instruments and across time within a given instrument. This point will be discussed later in this section.

Another element of credit risk, which blends current and potential credit risk, is the possibility that a counterparty will default on a current payment to a different creditor. Most direct lending or derivative-based credit contracts stipulate that if a borrower defaults on any outstanding credit obligations, the borrower is in default on them all (this is known as a **cross-default provision**). Creditors stipulate this condition as one means of controlling credit exposure; in particular, it allows them to act quickly to mitigate losses to counterparties unable to meet any of their obligations. For example, suppose Party A owes Party B, but no payments are due for some time. Party A, however, currently owes a payment to Party C and is unable to pay. A is,

46 The personal assets of a corporation's owners are shielded from creditors by the principle of limited liability, which can also apply to certain partnerships. The law supporting limited liability is a fundamental one in most societies and supports the notion that default is a right. Indeed, option-pricing theory has been used to value this right as the option that it actually is.

therefore, in default to Party C. Depending on what actions C takes, A may be forced into bankruptcy. If so, then B's claim simply goes into the pool of other claims on A. In that case, A has technically defaulted to B without actually having a payment due.

In a previous section, we discussed how VaR is used to measure market risk. VaR is also used, albeit with greater difficulty, to measure credit risk. This measure is sometimes called **credit VaR**, default VaR, or credit at risk. Like ordinary VaR, it reflects the minimum loss with a given probability during a period of time. A company might, for example, quote a credit VaR of €10 million for one year at a probability of 0.05 (or a confidence level of 95 percent). In other words, the company has a 5 percent chance of incurring default-related losses of at least €10 million in one year. Note that credit VaR cannot be separated from market VaR because credit risk arises from gains on market positions held. Therefore, to accurately measure credit VaR, a risk manager must focus on the upper tail of the distribution of market returns, where the return to the position is positive, in contrast to market risk VaR, which focuses on the lower tail. Suppose the 5 percent upper tail of the market risk distribution is €5 million. The credit VaR can be roughly thought of as €5 million, but this thinking assumes that the probability of loss is 100 percent and the net amount recovered in the event of a loss is zero. Further refinements incorporating more-accurate measures of the default probability and recovery rate should lead to a lower and more accurate credit VaR. In addition, the explosion of volume and liquidity in the credit derivatives market has vastly increased the amount of information available to risk managers with respect to the problem of understanding how the marketplace values credit risk on a real-time basis. Nevertheless, estimating credit VaR is more complicated than estimating market VaR because credit events are rare and recovery rates are hard to estimate. Credit risk is less easily aggregated than market risk; the correlations between the credit risks of counterparties must be considered.

In the next sections, we present the perspective of option pricing theory on credit risk and the measurement of credit risk exposures for certain derivative contracts.

5.6.1 *Option-Pricing Theory and Credit Risk*

Option theory enables us to better understand the nature of credit risk. In this section, we will see that the stock of a company with leverage can be viewed as a call option on its assets. This approach will lead to the result that a bond with credit risk can be viewed as a default-free bond plus an implicit short put option written by the bondholders for the stockholders.

Consider a company with assets with a market value of A_0 and debt with a face value of F. The debt is in the form of a single zero-coupon bond due at time T. The bond's market value is B_0. Thus the stock's market value is

$$S_0 = A_0 - B_0$$

At time T, the assets will be worth A_T and the company will owe F. If $A_T \geq F$, the company will pay off its debt, leaving the amount $A_T - F$ for the stockholders. Thus S_T will be worth $A_T - F$. If the assets' value is insufficient to pay off the debt ($A_T < F$), the stockholders will discharge their obligation by turning over the assets to the bondholders. Thus the bondholders will receive A_T, which is less than their claim of F, and the stockholders will receive nothing. The company is, therefore, bankrupt. Exhibit 10 illustrates these results by showing the payoffs to the two suppliers of capital.

Exhibit 10 Payoffs to the Suppliers of Capital to the Company

Source of Capital	Market Value at Time 0	Payoffs at Time T	
		$A_T < F$	$A_T \geq F$
Bondholders	B_0	A_T	F
Stockholders	S_0	0	$A_T - F$
Total	$B_0 + S_0 = A_0$	A_T	A_T

Notice that the payoffs to the stockholders resemble those of a call option in which the underlying is the assets, the exercise price is F, and the option expires at time T, the bond maturity date. Indeed, the stock of a company with a single zero-coupon bond issue is a call option on the assets.

To better understand the nature of stock as a call option, let us recall the concept of put–call parity,[47] where $p_0 + S_0 = c_0 + X/(1 + r)^T$. The put price plus the underlying price equals the call price plus the present value of the exercise price. So, working this through for our own problem, we find the correspondences shown in Exhibit 11.

Exhibit 11 Equity as a Call Option on the Value of a Company

Variable	Traditional Framework	Current Framework
Underlying	S_0 (stock)	A_0 (value of assets)
Exercise price	X	F (face value of bond)
Time to expiration	T	T (maturity of bond)
Risk-free rate	r	r
Call price	c_0	S_0 (value of stock)
Put price	p_0	p_0

Note the last line. We see that in the traditional framework, there is a put option, which we know is an option to sell the underlying at a fixed price. In fact, we know from put–call parity that $p_0 = c_0 - S_0 + X/(1 + r)^T$. The put is equivalent to a long call, a short position in the underlying stock, and a long position in a risk-free bond with face value equal to the exercise price. In the current framework, the standard expression of put–call parity is $p_0 + A_0$ (put plus underlying) $= S_0 + F/(1 + r)^T$ (stock plus present value of bond principal). Turning this expression around and reversing the order of the put and bond, we obtain

$$A_0 = S_0 + F\big/(1 + r)^T - p_0$$

Noting, however, that by definition the asset value, A_0, equals the stock's market value, S_0, plus the bond's market value, B_0,

$$A_0 = S_0 + B_0$$

we see that the bond's market value must be equivalent to

$$B_0 = F\big/(1 + r)^T - p_0$$

47 See Chance (2003), Chapter 4.

The first term on the right-hand side is equivalent to a default-free zero-coupon bond paying F at maturity. The second term is a short put. The bondholders' claim, which is subject to default, can thus be viewed as a default-free bond and a short put on the assets. In other words, the bondholders have implicitly written the stockholders a put on the assets. From the stockholders' perspective, this put is their right to fully discharge their liability by turning over the assets to the bondholders, even though those assets could be worth less than the bondholders' claim. In legal terminology, this put option is called the stockholders' right of limited liability.

The existence of this implicit put option is the difference between a default-free bond and a bond subject to default. This approach to understanding credit risk forms the basis for models that use option-pricing theory to explain credit risk premiums, probabilities of default, and the valuation of companies that use leverage. In practice, the capital structures of most companies are more complex than the one used here, but practical applications of model variants appear in the financial industry.

5.6.2 *The Credit Risk of Forward Contracts*

Recall that forward contracts involve commitments on the part of each party. No cash is due at the start, and no cash is paid until expiration, at which time one party owes the greater amount to the other. The party that owes the larger amount could default, leaving the other with a claim of the defaulted amount. Each party assumes the other's credit risk. Prior to expiration, no current credit risk exists, because no current payments are owed, but there is potential credit risk in connection with the payments to be made at expiration. Current credit risk arises when the contract is at its expiration. Below we will examine how potential credit risk changes during the life of the contract as the value of the underlying changes.

From the perspective of a given party, a forward contract's market value can be easily calculated as the present value of the amount owed to the party minus the present value of the amount it owes. So, the market value at a given time reflects the potential credit risk. This is another reason why the calculation of market value is important: It indicates the amount of a claim that would be subject to loss in the event of a default.

For example, look at a forward contract that expires in one year. The underlying asset price is \$100 and the risk-free interest rate is 5 percent. We can determine that the forward price is \$100(1.05) = \$105. We could then assume that three months later, the asset price is \$102. We can determine that the long forward contract's value at that time is $\$102 - \$105/(1.05)^{0.75} = \$0.7728$. This is the value to the long because the contract is a claim on the asset, which is currently worth \$102, and an obligation to pay \$105 for it in nine months. To the holder of the long position, this contract is worth \$0.7728, and to the holder of the short position, it is worth –\$0.7728.

Which party bears the potential credit risk? The long's claim is positive; the short's claim is negative. Therefore, the long currently bears the credit risk. As it stands right now, the value of the long's claim is \$0.7728. No payment is currently due, and hence no current credit risk exists, but the payments that are due later have a present value of \$0.7728. Actual default may or may not occur at expiration. Moreover, at expiration, the amount owed is unlikely to be this same amount. In fact, if the spot price falls enough, the situation will have turned around and the long could owe the short the greater amount. Nonetheless, in assessing the credit risk three months into the contract, the long's claim is \$0.7728. This claim has a probability of not being paid and also has the potential for recovery of a portion of the loss in the event of default. If the counterparty declares bankruptcy before the contract expires, the claim of the non-defaulting counterparty is the forward contract's market value at the time of the bankruptcy, assuming this value is positive. So, if the short declares bankruptcy at this time, the long has a claim worth \$0.7728. If the long declares bankruptcy, the long holds an asset worth \$0.7728.

5.6.3 *The Credit Risk of Swaps*

A swap is similar to a series of forward contracts. The periodic payments associated with a swap imply, however, that credit risk will be present at a series of points during the contract's life. As with forward contracts, the swap's market value can be calculated at any time and reflects the present value of the amount at risk for a credit loss (i.e., the potential credit risk).

Consider, for example, the case of a plain vanilla interest rate swap with a one-year life and quarterly payments at Libor. Using the term structure, we can determine that the swap has a fixed rate of 3.68 percent, leading to quarterly fixed payments of \$0.0092 per \$1 notional principal. We then can move forward 60 days into the life of the swap and, with a new term structure, we can determine that the swap's market value is \$0.0047 per \$1 notional principal. To the party that is long (i.e., paying fixed and receiving floating), the swap has a positive market value. To the counterparty, which pays floating and receives fixed, the claim has a market value of –\$0.0047.

As with a forward contract, the market value indicates the present value of the payments owed to the party minus the present value of the payments the party owes. Only 60 days into the life of a swap with quarterly payments, no payment is due for 30 more days. Thus there is no current credit risk. There is, however, potential credit risk. The market value of \$0.0047 represents the amount that is at risk of loss for default. Of course, if default occurs, it will be at a later date when the amount will probably be different. Moreover, the market value could reverse its sign. At this time, the amount owed by the short to the long is greater, but at a later date, the amount owed by the long to the short could be greater. As with forward contracts, if the party to which the value is negative defaults, the counterparty has a claim of that value. If the party to which the value is positive defaults, the defaulting party holds an asset with the positive market value. Also, the counterparty could default to someone else, thereby being forced to declare bankruptcy before a payment on this swap is due. In that case, the swap's market value at that time is either the claim of the creditor or the asset held by the bankrupt party in bankruptcy proceedings.

The credit risk of swaps can vary greatly across product types within this asset class and over a given swap's lifetime. For interest rate and equity swaps, the potential credit risk is largest during the middle period of the swap's life. During the beginning of a swap's life, typically we would assume that the credit risk is small because, presumably, the involved counterparties have performed sufficient current credit analysis on one another to be comfortable with the arrangement or otherwise they would not engage in the transaction. At the end of the life of the swap, the credit risk is diminished because most of the underlying risk has been amortized through the periodic payment process. There are fewer payments at the end of a swap than at any other time during its life; hence, the amount a party can lose because of a default is smaller. This leaves the greatest exposure during the middle period, a point at which 1) the credit profile of the counterparties may have changed for the worse and 2) the magnitude and frequency of expected payments between counterparties remain material. One exception to this pattern involves currency swaps, which often provide for the payment of the notional principal at the beginning and at the end of the life of the transaction. Because the notional principal tends to be a large amount relative to the payments, the potential for loss caused by the counterparty defaulting on the final notional principal payment is great. Thus, whereas interest rate swaps have their greatest credit risk midway during the life of the swap, currency swaps have their greatest credit risk between the midpoint and the end of the life of the swap.

5.6.4 *The Credit Risk of Options*

Forward contracts and swaps have bilateral default risk. Although only one party will end up making a given payment, each party could potentially be the party owing the net amount. Options, on the other hand, have unilateral credit risk. The buyer of an option pays a cash premium at the start and owes nothing more unless, under the buyer's sole discretion, he decides to exercise the option. Once the premium is paid, the seller assumes no credit risk from the buyer. Instead, credit risk accrues entirely to the buyer and can be quite significant. If the buyer exercises the option, the seller must meet certain terms embedded in the contract. If the option is a call, the seller must deliver the underlying or pay an equivalent cash settlement. If the option is a put, the seller must accept delivery of the underlying and pay for it or meet these obligations in the form of cash payments. If the seller fails to fulfill her end of the obligation, she is in default. Like forward contracts, European options have no payments due until expiration. Hence, they have no current credit risk until expiration, although significant potential credit risk exists.

Consider a European call option for which the underlying security has a price of 52.75 and a standard deviation of 0.35. The exercise price is 50, the risk-free rate is 4.88 percent continuously compounded, and the option expires in nine months. Using the Black–Scholes–Merton model, we find that the value of the option is 8.5580. The holder thus has potential credit risk represented by a present claim of 8.5580. This amount can be thought of as the amount that is at risk, even though at expiration the option will probably be worth a different amount. In fact, the option might even expire out of the money, in which case it would not matter if the short were bankrupt. If the short declares bankruptcy before expiration, the long has a claim on the value of the option under bankruptcy law.

If the option were American, the value could be greater. Moreover, with American options, current credit risk could arise if the option holder decides to exercise the option early. This alternative creates the possibility of the short defaulting before expiration.

EXAMPLE 8

Calculating Credit Risk Exposures

Calculate the amount at risk of a credit loss in the following situations:

1 A US party goes long a forward contract on €1 denominated in dollars in which the underlying is the euro. The original term of the contract was two years, and the forward rate was $0.90. The contract now has 18 months or 1.5 years to maturity. The spot or current exchange rate is $0.862. The US interest rate is 6 percent, and the euro interest rate is 5 percent. The interest rates are based on discrete compounding/discounting. At the point when the contract has 1.5 years remaining, the value of the contract to the long per $1 notional principal equals the spot exchange rate, $0.862, discounted at the international interest rate for 1.5 years, minus the forward rate, $0.90, discounted at the domestic interest rate for 1.5 years:[48]

$$\frac{\$0.862}{(1.05)^{1.5}} - \frac{\$0.90}{(1.06)^{1.5}} = -\$0.0235$$

Evaluate the credit risk characteristics of this situation.

48 See Chance (2003), pp. 58–59.

2 Consider a plain vanilla interest rate swap with two months to go before the next payment. Six months after that, the swap will have its final payment. The swap fixed rate is 7 percent, and the upcoming floating payment is 6.9 percent. All payments are based on 30 days in a month and 360 days in a year. Two-month Libor is 7.250 percent, and eight-month Libor is 7.375 percent. The present value factors for two and eight months can be calculated as follows:

$$\frac{1}{1 + 0.0725(60/360)} = 0.9881$$

$$\frac{1}{1 + 0.07375(240/360)} = 0.9531$$

The next floating payment will be 0.069(180/360) = 0.0345. The present value of the floating payments (plus hypothetical notional principal) is 1.0345(0.9881) = 1.0222. Given an annual rate of 7 percent, the fixed payments will be 0.07(180/360) = 0.035.

The present value of the fixed payments (plus hypothetical notional principal) is, therefore, 0.035(0.9881) + 1.035(0.9531) = 1.0210. Determine the amount at risk of a credit loss and state which party currently bears the risk. Assume a $1 notional principal.

3 A dealer has sold a call option on a stock for $35 to an investor. The option is currently worth $46, as quoted in the market. Determine the amount at risk of a credit loss and state which party currently bears the risk.

Solution to 1:

The position has a negative value to the long, so the credit risk is currently borne by the short. From the short's point of view, the contract has a value of $0.0235 per $1 notional principal. No payments are due for 18 months, but the short's claim on the long is worth $0.0235 more than the long's claim on the short. Therefore, this amount is the current value of the amount at risk for a credit loss. Of course, the amount could, and probably will, change over the life of the contract. The credit risk exposure might even shift to the other party.

Solution to 2:

The market value of the swap to the party paying fixed and receiving floating is 1.0222 – 1.0210 = 0.0012. This value is positive to the party paying fixed and receiving floating; thus this party currently assumes the credit risk. Of course, the value will change over the life of the swap and may turn negative, meaning that the credit risk is then assumed by the party paying floating and receiving fixed.

Solution to 3:

All of the credit risk is borne by the investor (the owner of the call), because he will look to the dealer (the seller) for the payoff if the owner exercises the option. The current value of the amount at risk is the market price of $46.

Derivatives' credit risk can be quite substantial, but this risk is considerably less than that faced by most lenders. When a lender makes a loan, the interest and principal are at risk. The loan principal corresponds closely to the notional principal of most derivative contracts. With the exception of currency swaps, the notional principal is never exchanged in a swap. Even with currency swaps, however, the risk is much smaller than on a loan. If a counterparty defaults on a currency swap, the amount

owed to the defaulting counterparty serves as a type of collateral because the creditor is not required to pay it to the defaulting party. Therefore, the credit risk on derivative transactions tends to be quite small relative to that on loans. On forward and swap transactions, the netting of payments makes the risk extremely small relative to the notional principal and to the credit risk on a bond or loan of equivalent principal.

5.7 Liquidity Risk

One of the implicit assumptions in risk management with VaR is that positions can be liquidated when they approach or move outside pre-agreed risk limits. In practice, some assets are far more liquid than others and practitioners will often liquidity-adjust VaR estimates accordingly. Wide bid–ask spreads in proportion to price are an obvious measure of the cost of trading an illiquid instrument or underlying security. But some instruments simply trade very infrequently at any price—a far more complex problem, because infrequently quoted prices often give the statistical illusion of low or lower volatility. This dynamic is counterintuitive, because we would expect instruments that are illiquid to have a higher bid–ask spread and higher volatilities.

A famous case of underestimating liquidity risk is the failure of the hedge fund Long-Term Capital Management (LTCM) in 1998. LTCM was set up by a group of bond traders and academics and was engaged in arbitrage or relative value trading on world fixed-income markets through the use of the swap market. The total equity in the fund peaked at around $5 billion, but this amount was leveraged around 25 times (perhaps substantially more when the full impact of derivatives is considered). The BIS estimated that the notional value of the swaps entered into by LTCM was around 2.4 percent of the entire world swap market. LTCM failed to appreciate the market moves that would occur when it attempted to liquidate positions, particularly those in illiquid, emerging, fixed-income markets. The New York Federal Reserve was forced to act for fear of a global financial crisis and organized a consortium of 14 international banks to manage the assets of the fund. In the end, and after substantial financial help, LTCM's investors lost more than 90 percent of their equity.

5.8 Measuring Nonfinancial Risks

Nonfinancial risks are intrinsically very difficult to measure. Indeed, some of the nonfinancial exposures we have discussed, such as regulatory risk, tax risk, legal risk, and accounting risk, could easily be thought of as not measurable in any precise mathematical way. They are unlike market risk and the VaR concept because we usually lack an observable distribution of losses related to these factors.

Some of these risks could be thought of as more suitable for insurance than measurement and hedging. Like a flood that occurs every 50 years, they might well affect a large number of instruments or contracts. Here, it is possible to learn from best practice in the insurance industry. Insurance companies usually have sufficient assets and are capitalized to withstand these uncertain events. Where it is possible to model a source of risk, actuaries often use techniques like extreme value theory, but even these techniques are only as good as the historical data on which they are based.

5.8.1 *Operational Risk*

Until a few years ago, the subject of operational risk received little attention, and ideas about actually measuring operational risk were practically unheard of. But a number of well-publicized losses at financial institutions, ranging from a breakdown of internal systems to rogue employees and in some cases employee theft, have put operational risk justifiably into the forefront.

Furthermore, the explicit mention of operational risk requirements in the Basel II banking regulations has created real advantages for banks that can credibly measure their operational risks. This, in turn, has led to an explosion in the academic literature relating to the measurement of operational risk and its role in enterprise risk systems.

EXAMPLE 9

Basel II—A Brief Overview

The Basel banking regulations apply only to large international banks, but national governments use them as a guideline in formulating their own financial laws and regulations, so the regulations have much more widespread importance. In January 2001, the Basel Committee on Banking Supervision issued a proposal for a New Basel Capital Accord that would replace the 1988 Capital Accord. This first accord, "Basel I," was widely criticized for being too inflexible in applying an across-the-board 8 percent capital adequacy ratio that made no discrimination between a well risk-managed bank and one that was not.[49]

The Basel II proposal incorporates three mutually reinforcing pillars that allow banks and supervisors to evaluate properly the various risks that banks face:

- Pillar 1: Capital Requirements;
- Pillar 2: Supervisory Review;
- Pillar 3: Market Discipline.

The first pillar of Basel II moves away from a blanket, one-size-fits-all approach and allows banks to develop their own mathematically based financial models. Once these internally developed techniques have been successfully demonstrated to the regulators, banks are able to progress to higher levels of risk management that within the accord are offset by reduced regulatory capital charges. Key to these higher levels of risk management are advanced systems for managing credit risk and operational risk.

The second pillar, supervisory review, requires banks to meet Basel-recommended operational risk requirements that have been tailored by their host country. "Risky" banks, whose risk management systems score lowly in the areas of market risk and operational risk, face penalties. Better-risk-managed banks will have major competitive advantages over rivals, in that, all else equal, they are likely to be subject to reduced capital requirements per unit of risk.

The third pillar says that banks must fulfill the Basel requirements for transparency and disclosing company data. A key point here is that banks must reveal more detail about their profits and losses, which may lead to a supervisory authority reviewing risk systems and changing the capital allocation under the first pillar.

49 A **capital adequacy ratio** is a measure of the adequacy of capital in relation to assets. The purpose of capital is to absorb unanticipated losses with sufficient margin to permit the entity to continue as a going concern. Basel I specified a capital adequacy ratio as a percent of the credit-risk-weighted assets on the bank's balance sheet, where bank assets were divided into four broad categories. For more details, see Saunders and Cornett (2003).

6 MANAGING RISK

Having established methods for the identification and measurement of risk, we turn our attention to a critical stage of any solid risk management program: that of *managing* risk. The key components, which by now should be somewhat intuitive to you, are as follows:

- An effective risk governance model, which places overall responsibility at the senior management level, allocates resources effectively and features the appropriate separation of tasks between revenue generators and those on the control side of the business.
- Appropriate systems and technology to combine information analysis in such a way as to provide timely and accurate risk information to decision makers.
- Sufficient and suitably trained personnel to evaluate risk information and articulate it to those who need this information for the purposes of decision making.

A recent advertisement for the RiskMetrics Group (www.riskmetrics.com) identified the following nine principles of effective risk management:

- There is no return without risk. Rewards go to those who take risks.
- Be transparent. Risk should be fully understood.
- Seek experience. Risk is measured and managed by people, not mathematical models.
- Know what you don't know. Question the assumptions you make.
- Communicate. Risk should be discussed openly.
- Diversify. Multiple risks will produce more consistent rewards.
- Show discipline. A consistent and rigorous approach will beat a constantly changing strategy.
- Use common sense. It is better to be approximately right than to be precisely wrong.
- Return is only half the equation. Decisions should be made only by considering the risk and return of the possibilities.

Risk management is in so many ways just good common business sense. It is quite remarkable, however, that commonsense rules are violated so easily and so often. But that problem is not unique to risk management.

Currently, two professional organizations are devoted to risk management. The Global Association of Risk Professionals (GARP) and the Professional Risk Managers' International Association (PRMIA) are actively involved in promoting knowledge in the field of risk management. You may wish to visit their websites at www.garp.com and www.prmia.org.

With these principles in mind, in the following section, we will discuss the various components of a well-adapted risk-control program.

6.1 Managing Market Risk

Let us assume we have correctly identified the sources of market risk that affect our business. Further assume that we have decided on an appropriate way to measure market risk and successfully deployed the systems we need to monitor our positions and measure our risk in a timely way. The result is an appropriate firmwide VaR estimate and associated breakdown by business area. Now we must ask ourselves the following questions: How do we know how much risk is acceptable for us to take? What is the overall exposure assumption capacity for the enterprise, and how close

to full capacity should we run? We already know that VaR is not a measure of the maximum possible loss but only a probabilistic guide to the minimum loss we might expect with a certain frequency over a certain time frame.

Our **enterprise risk management** system will be incomplete without a well-thought-out approach to setting appropriate **risk tolerance** levels and identifying the proper corrective behavior to take if our actual risks turn out to be significantly higher or lower than is consistent with our risk tolerance. Note here that in many circumstances, it could cause as many problems to take too little risk as to take too much risk. As we noted at the beginning of this reading, companies are in business to take risk and taking too little risk will more than likely reduce the possible rewards; it could even make the company vulnerable to takeover. In a more extreme scenario, insufficient risk-taking may lead to situations in which the expected return stands little chance of covering variable (let alone fixed) costs.

Corrective behavior in the case of excessive market risk will almost always result in the need for additional hedging or the scaling back of tradable positions. Quite often, however, liquidity and other factors will prevent perfect hedging, perhaps exacerbating risk concerns rather than mitigating them.

6.1.1 *Risk Budgeting*

In recent years, companies and portfolio managers have begun to implement a new approach to risk management called **risk budgeting**. It focuses on questions such as, "Where do we want to take risk?" and "What is the efficient allocation of risk across various units of an organization or investment opportunities?" Risk budgeting is relevant in both an organizational and a portfolio management context.

To take an organizational perspective first, risk budgeting involves establishing objectives for individuals, groups, or divisions of an organization that take into account the allocation of an acceptable level of risk. As an example, the foreign exchange (FX) trading desk of a bank could be allocated capital of €100 million and permitted a daily VaR of €5 million. In other words, the desk is granted a budget, expressed in terms of allocated capital and an acceptable level of risk, expressed in euro amounts of VaR. In variations on this theme, instead of using VaR units an organization might allocate risk based on individual transaction size, the amount of working capital needed to support the portfolio, or the amount of losses acceptable for any given time period (e.g., one month). In any case, the innovation here is that the enterprise allocates risk capital before the fact in order to provide guidance on the acceptable amount of risky activities that a given unit can undertake.

A well-run risk-taking enterprise manages these limits carefully and constantly monitors their implementation. Any excesses are reported to management immediately for corrective action. Under this type of regime, management can compare the profits generated by each unit with the amount of capital and risk employed. So, to continue our example from above, say the FX trading desk made a quarterly profit of €20 million from its allocation. The bank's fixed-income trading desk was allocated capital of €200 million and permitted a daily VaR of €5 million; the fixed-income trading desk made €25 million in quarterly trading profits. We note that the allocated daily VaRs for the two business areas are the same, so each area has the same risk budget, and that the fixed-income desk generated better returns on the VaR allocation, but worse on the allocation of actual capital, than did the FX desk. (The FX desk shows a €20/€100 = 20% return on capital versus €25/€200 = 12.5% for the fixed-income desk.) This type of scenario is quite common and highlights the complexities of the interaction between risk management and capital allocation. Risk and capital are finite resources that must be allocated carefully.

The sum of risk budgets for individual units will typically exceed the risk budget for the organization as a whole because of the impacts of diversification. Returning to our example, let us assume that for the enterprise in question, its FX and bond trading

desks engage in activities that are only weakly correlated. In this case, our present allocation of capital and risk might make perfect sense. For example, the daily VaR of the two business areas combined might be €7 million (i.e., 70 percent of the combined risk allocation for the two desks), for which we again generate a total quarterly profit of €20,000,000 + €25,000,000 = €45 million.

Alternatively, say the two business areas are very highly correlated (their correlation coefficient equals 1) and their combined daily VaR is €5,000,000 + €5,000,000 = €10 million (i.e., 100 percent of the aggregate VaR allocation across desks). The combined profit is still €20,000,000 + €25,000,000 = €45 million. Under these circumstances—and particularly if the bank's management believes that the correlations will remain strong—management might consider closing down the fixed-income desk to generate 0.20(€100,000,000 + €200,000,000) = €60 million of returns on the 3(€5,000,000) = €15 million of VaR. Contrast this strategy with that of closing down the foreign exchange trading desk and allocating all of the capital and risk to the bond trading desk, which would produce 0.125(€200,000,000 + €100,000,000) = €37.5 million in profit for the €7.5 million in VaR, representing a lower return on capital and a higher return on VaR.

A risk-budgeting perspective has also been applied to allocating funds to portfolio managers. Consider an active investor who wants to allocate funds optimally to several domestic and nondomestic equity and fixed-income investment managers. Such an investor might focus on tracking risk as the primary risk measure and decide on an overall maximum acceptable level for it, such as 200 basis points. The expected information ratio (IR) for each manager is one possible measure of each manager's ability to add value, considering the managers in isolation.[50] In this application, however, it is appropriate for the investor to adjust each manager's IR to eliminate the effect of asset class correlations; such correlation-adjusted IRs will capture each manager's incremental ability to add value in a portfolio context. Using such correlation-adjusted IRs, we can determine the optimal tracking risk allocation for each investment manager (which, intuitively, is positively related to his correlation-adjusted IR).[51]

Through these two examples, we edge toward some understanding of risk-adjusted performance measures, which we will discuss in greater detail later in the reading. The point about risk budgeting is that it is a comprehensive methodology that empowers management to allocate capital and risk in an optimal way to the most profitable areas of a business, taking account of the correlation of returns in those business areas.

It once again bears mention that for many portfolio managers, risk budget allocations should be measured in relation to risk to the surplus—that is, the difference between the values of assets and liabilities.

EXAMPLE 10

A Fund Management Company and Risk Budgeting

We can readily illustrate the methodology and underlying economics of risk budgeting with the example of a fund management company. We choose, for this example, a multistrategy hedge fund, because although mutual funds and other types of institutional money managers certainly face similar risk management issues, they are often bound by strict guidelines that tie their risk budgeting to factors such as the performance of a benchmark index and other mandated fund management protocols. For example, the Vanguard family of mutual funds offers

50 The information ratio is active return divided by active risk; it measures active return per unit of active risk.

51 See Waring, Whitney, Pirone, and Castile (2000) and references therein for further reading.

a wide range of indexed mutual funds. These funds' associated risk budgets are very narrowly defined, as the managers are called on at all times to track the underlying index very closely in terms of securities held, associated portfolio weightings, and so forth. As investor funds flow in and out of these securities, portfolio managers execute trades that do little more than reestablish this replication balance. Of course, many institutional fund products allow for much broader deviations from market benchmarks; in most cases, however, risk budgeting will be constrained by certain principles associated with benchmarking.

Hedge funds with multiple portfolio managers (as well as, in some cases, the proprietary trading divisions of banks and broker/dealers) have many fewer risk constraints than indexed mutual funds; they have more freedom, therefore, in establishing risk budgets. Because of the absolute return (as opposed to benchmark-driven) nature of their performance, and because of issues such as performance netting risk covered earlier in this reading, it is very much in their interest to ensure that each portfolio in the enterprise operates within a well-conceived risk budget framework. Included among the critical components of such a program might be the following:

- **Performance Stopouts** A performance stopout is the maximum amount that a given portfolio is allowed to lose in a period (e.g., a month or a year).
- **Working Capital Allocations** Most funds will allocate a specific amount of working capital to each portfolio manager, both as a means of enforcing risk disciplines and also to ensure the ability to fund all operations.
- **VaR Limits** Discussed above.
- **Scenario Analysis Limits** The risk manager of the fund company may establish risk limits based on the scenario analysis discussed in the preceding section. Under such an approach, the portfolio manager would be compelled to construct a portfolio such that under specified scenarios, it did not produce losses greater than certain predetermined amounts.
- **Risk Factor Limits** Portfolio managers may be subject to limits on individual risk factors, as generated by a VaR analysis (e.g., VaR exposure to a certain risk cannot exceed, say, $X or X%) or driven by linear (e.g., duration, beta) or nonlinear (e.g., convexity, gamma) risk estimation methodologies.
- **Position Concentration Limits** Many risk managers seek to enforce diversification by mandating a specific maximum amount for individual positions.
- **Leverage Limits** A maximum amount of leverage in the portfolio may be specified.
- **Liquidity Limits** To help manage liquidity exposure, large funds will often also set position limits as a specified maximum percentage of daily volume, float, or open interest.

Of course, other types of limits are imposed on portfolio managers in a multistrategy environment, and by the same token, the risk-budgeting strategy of a given enterprise may include only a subset of the examples provided immediately above. Nevertheless, some subset of these limit structures is present in nearly every multistrategy fund vehicle, and it is difficult to imagine an effective risk control system that does not set limits.

6.2 Managing Credit Risk

It is important that creditors do a good job of measuring and controlling credit risk. Estimating default probabilities is difficult because of the infrequency of losses for many situations where credit risk exists. Moreover, credit losses differ considerably from losses resulting from market moves. Credit is a one-sided risk. If Party B owes Party A the amount of £1,000, B will end up paying A either £1,000 or some amount ranging from zero to £1,000. A's rate of return is certainly not normally distributed and not even symmetric. All of the risk is downside. Thus credit risk is not easily analyzed or controlled using such measures as standard deviation and VaR. Creditors need to regularly monitor the financial condition of borrowers and counterparties. In addition, they can use the risk management techniques for credit discussed below.

6.2.1 *Reducing Credit Risk by Limiting Exposure*

Limiting the amount of exposure to a given party is the primary means of managing credit risk. Just as a bank will not lend too much money to one entity, neither will a party engage in too many derivatives transactions with one counterparty. Exactly how much exposure to a given counterparty is "too much" is still not easy to quantify. Experienced risk managers often have a good sense of when and where to limit their exposure, and they make extensive use of quantitative credit exposure measures to guide them in this process. Banks have regulatory constraints on the amount of credit risk they can assume, which are specified in terms of formulas.

6.2.2 *Reducing Credit Risk by Marking to Market*

One device that the futures market uses to control credit risk is marking tradable positions to market. The OTC derivatives market also uses **marking to market** to deal with credit risk: Some OTC contracts are marked to market periodically during their lives. Recall that a forward contract or swap has a market value that is positive to one party and negative to another. When a contract calls for marking to market, the party for which the value is negative pays the market value to the party for which the value is positive. Then the fixed rate on the contract is recalculated, taking into account the new spot price, interest rate, and time to expiration.

Recall that we examined a one-year forward contract with an initial forward price of \$105. Three months later, when the asset price was \$102, its value was \$0.7728 to the long. If the contract were marked to market at that time, the short would pay the long \$0.7728. Then, the two parties would enter into a new contract expiring in nine months with a new forward price, which would be $\$102(1.05)^{0.75} = \$105.80$.

EXAMPLE 11

Repricing a Forward Contract

Consider a one-year forward contract established at a rate of \$105. The contract is four months into its life. The spot price is \$108, the risk-free rate is 4.25 percent, and the underlying makes no cash payments. The two parties decided at the start that they will mark the contract to market every four months. The market value of the contract is $\$108 - \$105/(1.0425)^{8/12} = \$5.873$. Determine how the cash flows and resets would work under these circumstances.

Solution:

The contract is positive to the long, so the short pays the long \$5.873. The parties then reprice the contract. The new price is $\$108(1.0425)^{8/12} = \$111.04$. At this point, the forward price is reset to \$111.04. The parties will then mark to market again at the eight-month point and reset the forward price. This price will then stay in force until expiration.

OTC options usually are not marked to market because their value is always positive to one side of the transaction. Of course, one party of the option certainly bears credit risk, but marking to market is usually done only with contracts with two-way credit risk. Option credit risk is normally handled by collateral.

6.2.3 *Reducing Credit Risk with Collateral*

The posting of collateral is a widely accepted credit exposure mitigant in both lending and derivatives transactions. One very prominent example of its use comes from futures markets, which require that all market participants post margin collateral. Beyond this, many OTC derivative markets have collateral posting provisions, with the collateral usually taking the form of cash or highly liquid, low-risk securities. A typical arrangement involves the routine, periodic posting of values sufficient to cover mark-to-market deficiencies. To illustrate, if a given derivatives contract has a positive value to Party A and a negative value to Party B, then Party B owes more than Party A, and Party B must put collateral into an account designated for this purpose. As the contract's market value changes, the amount of collateral that must be maintained will vary, increasing as the market value increases and vice versa. At some point, if the market value of the transaction changes sign (i.e., goes from positive to negative for one of the participants), the collateral position will typically reverse itself, with the entity previously posting collateral seeing a release of these assets and the other participant in the transaction experiencing a collateral obligation. In addition to market values, collateral requirements are sometimes also based on factors such as participants' credit ratings.

6.2.4 *Reducing Credit Risk with Netting*

One of the most common features used in two-way contracts with a credit risk component, such as forwards and swaps, is netting. This process, which we have already briefly discussed, involves the reduction of all obligations owed between counterparties into a single cash transaction that eliminates these liabilities. For example, if a payment is due and Party A owes more to Party B than B owes to A, the difference between the amounts owed is calculated and Party A pays the net amount owed. This procedure, called **payment netting**, reduces the credit risk by reducing the amount of money that must be paid. If Party A owes €100,000 to Party B, which owes €40,000 to A, then the net amount owed is €60,000, which A owes to B. Without netting, B would need to send €40,000 to A, which would send €100,000 to B. Suppose B was in the process of sending its €40,000 to A but was unaware that A was in default and unable to send the €100,000 to B. If the €40,000 is received by A, B might be unable to get it back until the bankruptcy court decides what to do, which could take years. Using netting, only the €60,000 owed by A to B is at risk.

In the examples we have seen so far, netting is applied on the payment date. The concept of netting can be extended to the events and conditions surrounding a bankruptcy. Suppose A and B are counterparties to a number of derivative contracts. On some of the contracts, the market value to A is positive, while on others, the market value to B is positive. If A declares bankruptcy, the parties can use netting to solve a number of problems. If A and B agree to do so before the bankruptcy, they can net

the market values of *all* of their derivative contracts to determine one overall value owed by one party to another. It could well be the case that even though A is bankrupt, B might owe more to A than A owes to B. Then, rather than B being a creditor to A, A's claim on B becomes one of A's remaining assets. This process is referred to as **closeout netting**.

During this bankruptcy process, netting plays an important role in reducing a practice known in the financial services industry as cherry picking, which in this case would involve a bankrupt company attempting to enforce contracts that are favorable to it while walking away from those that are unprofitable. In our example, without netting, A could default on the contracts in which it owes more to B than B owes to A, but B could be forced to pay up on those contracts in which it owes more to A than A owes to B.

To be supported through the bankruptcy process, however, netting must be recognized by the legal system and works best when each party's rights and obligations are specified at the time before or contemporaneous to the executions of transactions. Most, but not all, legal jurisdictions recognize netting.

6.2.5 *Reducing Credit Risk with Minimum Credit Standards and Enhanced Derivative Product Companies*

As noted above, the first line of defense against credit risk is limiting the amount of business one party engages in with another. An important and related concept is to ensure that all credit-based business is undertaken with entities that have adequate levels of credit quality. The historical standard measures for such credit quality come from rating agencies such as Moody's Investors Service and Standard & Poor's. Some companies will not do business with an enterprise unless its rating from these agencies meets a prescribed level of credit quality. This practice can pose a problem for some derivatives dealers, most of which engage in other lines of business that expose them to a variety of other risks; for example, banks are the most common derivatives dealers. To an end user considering engaging in a derivative contract with a dealer, the potential for the dealer's other business to cause the dealer to default is a serious concern. Banks, in particular, are involved in consumer and commercial lending, which can be quite risky. In the United States, for example, we have seen banking crises involving bad loans to the real estate industry and underdeveloped countries.

The possibility that bad loans will cause a bank to default on its derivatives transactions is quite real, and credit ratings often reflect this possibility. In turn, ratings are a major determinant in business flows for banks that act as dealers. Hence, many derivatives dealers have taken action to control their exposure to rating downgrades. One such action is the formation of a type of subsidiary that is separate from the dealer's other activities. These subsidiaries are referred to as **enhanced derivatives products companies** (EDPCs), sometimes known as special purpose vehicles (SPVs). These companies are usually completely separate from the parent organization and are not liable for the parent's debts. They tend to be very heavily capitalized and are committed to hedging all of their derivatives positions. As a result of these features, these subsidiaries almost always receive the highest credit quality rating by the rating agencies. In the event that the parent goes bankrupt, the EDPC is not liable for the parent company's debts; if the EDPC goes under, however, the parent is liable for an amount up to its equity investment and may find it necessary to provide even more protection. Hence, an EDPC would typically have a higher credit rating than its parent. In fact, it is precisely for the purpose of obtaining the highest credit rating, and thus the most favorable financing terms with counterparties, that banks and broker dealers go through the expense of putting together EDPCs.

6.2.6 *Transferring Credit Risk with Credit Derivatives*

Another mechanism for managing credit risk is to transfer it to another party. Credit derivatives provide mechanisms for such transfers. Credit derivatives include such contracts as credit default swaps, total return swaps, credit spread options, and credit spread forwards. These transactions are typically customized, although the wording of contract provisions is often standardized. In a **credit default swap**, the protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event. In a **total return swap**, the protection buyer pays the total return on a reference obligation (or basket of reference obligations) in return for floating-rate payments. If the reference obligation has a credit event, the total return on the reference obligation should fall; the total return should also fall in the event of an increase in interest rates, so the protection seller (total return receiver) in this contract is actually exposed to both credit risk and interest rate risk. A **credit spread option** is an option on the yield spread of a reference obligation and over a referenced benchmark (such as the yield on a specific default-free security of the same maturity); by contrast, a **credit spread forward** is a forward contract on a yield spread. Credit derivatives may be used not only to eliminate credit risk but also to assume credit risk. For example, an investor may be well positioned to assume a credit risk because it is uncorrelated with other credit risks in her portfolio.[52]

6.3 Performance Evaluation

In order to maximize risk-adjusted return through the capital allocation process, we must measure performance against risks assumed and budgeted at both the business unit or substrategy level and enterprise or overall portfolio level. All business activities should be evaluated against the risk taken, and a considerable body of knowledge has developed concerning the evaluation of investment performance from a risk-adjusted perspective. Traditional approaches, which take into account return against a risk penalty, are now used in other areas of business activity besides portfolio management. Some banks and service providers have developed sophisticated performance evaluation systems that account for risk, and they have marketed these systems successfully to clients. Risk-adjusted performance, as measured against sensible benchmarks, is a critically important capital allocation tool because it allows for the comparison of results in terms of homogeneous units of exposure assumption. Absent these measurement tools, market participants with high risk profiles are likely to be given higher marks for positive performance than they arguably deserve because they derive more from increased exposure assumption than they do from superior portfolio management methodologies. Furthermore, most investment professionals are compensated on the basis of the performance of their portfolios, trading positions, or investment ideas, and it is appropriate to judge performance in risk-adjusted terms.

52 For more information on credit derivatives, see Fabozzi (2004b), Chapter 9, and Chance (2003), Chapter 9.

Following is a list of standard methodologies for expressing return in units of exposure assumption:

- **Sharpe Ratio** The seminal measure for risk-adjusted return, the Sharpe ratio has become the industry standard. The traditional definition of this measure is as follows:[53]

$$\text{Sharpe ratio} = \frac{\text{Mean portfolio return} - \text{Risk-free rate}}{\text{Standard deviation of portfolio return}}$$

  The basic idea, therefore, is entirely intuitive: The Sharpe ratio is the mean return earned in excess of the risk-free rate per unit of volatility or total risk. By subtracting a risk-free rate from the mean return, we can isolate the performance associated with risk-taking activities. One elegant outcome of the calculation is that a portfolio engaging in "zero risk" investment, such as the purchase of Treasury bills for which the expected return is precisely the risk-free rate, earns a Sharpe ratio of exactly zero.

  The Sharpe ratio calculation is the most widely used method for calculating risk-adjusted return. Nevertheless, it can be inaccurate when applied to portfolios with significant nonlinear risks, such as options positions. In part for these reasons, alternative risk-adjusted return methodologies have emerged over the years, including the following.

- **Risk-Adjusted Return on Capital (RAROC)** This concept divides the expected return on an investment by a measure of capital at risk, a measure of the investment's risk that can take a number of different forms and can be calculated in a variety of ways that may have proprietary features. The company may require that an investment's expected RAROC exceed a RAROC benchmark level for capital to be allocated to it.[54]

- **Return over Maximum Drawdown (RoMAD)** Drawdown, in the field of hedge fund management, is defined as the difference between a portfolio's maximum point of return (known in industry parlance as its "high-water" mark), and any subsequent low point of performance. *Maximum* drawdown is the largest difference between a high-water and a subsequent low. Maximum drawdown is a preferred way of expressing the risk of a given portfolio—particularly as associated track records become longer—for investors who believe that observed loss patterns over longer periods of time are the best available proxy for actual exposure.

  Return over maximum drawdown is simply the average return in a given year that a portfolio generates, expressed as a percentage of this drawdown figure. It enables investors to ask the following question: Am I willing to accept an occasional drawdown of X percent in order to generate an average return of Y percent? An investment with X = 10 percent and Y = 15 percent (RoMAD = 1.5) would be more attractive than an investment with X = 40 percent and Y = 10 percent (RoMAD = 0.25).

---

53 This traditional definition of the Sharpe ratio can be directly linked to the capital market line and related capital market theory concepts (see Elton, Gruber, Brown, and Goetzmann, 2003). Sharpe (1994), however, defines the Sharpe ratio as a general construct using the mean excess return in relation to a benchmark in the numerator and the standard deviation of returns in excess of the benchmark in the denominator (see the discussion of the information ratio in the reading on evaluating portfolio performance for an illustration of this usage). Using the risk-free rate as the benchmark, the numerator would be as given in the text but the denominator would be the standard deviation of returns in excess of the risk-free rate (which, in practice, would infrequently result in significant discrepancies).

54 For more information on RAROC, see Saunders and Cornett (2003).

- **Sortino Ratio** One school of thought concerning the measurement of risk-adjusted returns argues, with some justification, that portfolio managers should not be penalized for volatility deriving from outsized positive performance. The Sortino ratio adopts this perspective. The numerator of the Sortino ratio is the return in excess of the investor's minimum acceptable return (MAR). The denominator is the downside deviation using the MAR as the target return.[55] **Downside deviation** computes volatility using only rate of return data points below the MAR. Thus the expression for the Sortino ratio is

  Sortino ratio = (Mean portfolio return – MAR)/Downside deviation

  If the MAR is set at the risk-free rate, the Sortino ratio is identical to the Sharpe ratio, save for the fact that it uses downside deviation instead of the standard deviation in the denominator. A side-by-side comparison of rankings of portfolios according to the Sharpe and Sortino ratios can provide a sense of whether outperformance may be affecting assessments of risk-adjusted performance. Taken together, the two ratios can tell a more detailed story of risk-adjusted return than either will in isolation, but the Sharpe ratio is better grounded in financial theory and analytically more tractable. Furthermore, departures from normality of returns can raise issues for the Sortino ratio as much as for the Sharpe ratio.

These approaches are only a subset of the methodologies available to investors wishing to calculate risk-adjusted returns. Each approach has both its merits and its drawbacks. Perhaps the most important lesson to bear in mind with respect to this mosaic is the critical need to understand the inputs to any method, so as to be able to interpret the results knowledgeably, with an understanding of their possible limitations.

6.4 Capital Allocation

In addition to its unquestionable value in the task of capital preservation, risk management has become a vital, if not central, component in the process of allocating capital across units of a risk-taking enterprise. The use of inputs, such as volatility/correlation analysis, risk-adjusted return calculations, scenario analysis, etc., provides the allocators of risk capital with a much more informed means of arriving at the appropriate conclusions on how best to distribute this scarce resource. The risk management inputs to the process can be used in formal, mathematical, "optimization" routines, under which enterprises input performance data into statistical programs that will then offer appropriate capital allocation combinations to make efficient use of risk. Quantitative output may simply serve as background data for qualitative decision-making processes. One way or another, however, risk management has become a vital input into the capital allocation process, and it is fair to describe this development as positive from a systemic perspective.

As part of the task of allocating capital across business units, organizations must determine how to measure such capital. Here there are multiple methodologies, and we will discuss five of them in further detail:

1. **Nominal, Notional, or Monetary Position Limits** Under this approach, the enterprise simply defines the amount of capital that the individual portfolio or business unit can use in a specified activity, based on the actual amount of money exposed in the markets. It has the advantage of being easy to understand, and, in addition, it lends itself very nicely to the critical task of

55 Downside deviation, the term usually used in presenting the Sortino ratio, could also be called a target semideviation (using MAR as the target).

calculating a percentage-based return on capital allocated. Such limits, however, may not capture effectively the effects of correlation and offsetting risks. Furthermore, an individual may be able to work around a nominal position using other assets that can replicate a given position. For these reasons, although it is often useful to establish notional position limits, it is seldom a *sufficient* capital allocation method from a risk control perspective.

2 **VaR-Based Position Limits** As an alternative or supplement to notional limits, enterprises often assign a VaR limit as a proxy for allocated capital. This approach has a number of distinct advantages, most notably the fact that it allocates capital in units of estimated exposure and thus acts in greater harmony with the risk control process. This approach has potential problems as well, however. Most notably, the limit regime will be only as effective as the VaR calculation itself; when VaR is cumbersome, less than completely accurate, not well understood by traders, or some combination of the above, it is difficult to imagine it providing rational results from a capital allocation perspective. In addition, the relation between overall VaR and the VaRs of individual positions is complex and can be counterintuitive.[56] Nevertheless, VaR limits probably have an important place in any effective capital allocation scheme.

3 **Maximum Loss Limits** Irrespective of other types of limit regimes that it might have in place, it is crucial for any risk-taking enterprise to establish a maximum loss limit for each of its risk-taking units. In order to be effective, this figure must be large enough to enable the unit to achieve performance objectives but small enough to be consistent with the preservation of capital. This limit must represent a firm constraint on risk-taking activity. Nevertheless, even when risk-taking activity is generally in line with policy, management should recognize that extreme market discontinuities can cause such limits to be breached.

4 **Internal Capital Requirements** Internal capital requirements specify the level of capital that management believes to be appropriate for the firm. Some regulated financial institutions, such as banks and securities firms, typically also have regulatory capital requirements that, if they are higher, overrule internal requirements. Traditionally, internal capital requirements have been specified heuristically in terms of the capital ratio (the ratio of capital to assets). Modern tools permit a more rigorous approach. If the value of assets declines by an amount that exceeds the value of capital, the firm will be insolvent. Say a 0.01 probability of insolvency over a one-year horizon is acceptable. By requiring capital to equal at least one-year aggregate VaR at the 1 percent probability level, the capital should be adequate in terms of the firm's risk tolerance. If the company can assume a normal return distribution, the required amount of capital can be stated in standard deviation units (e.g., 1.96 standard deviations would reflect a 0.025 probability of insolvency). A capital requirement based on aggregate VaR has an advantage over regulatory capital requirements in that it takes account of correlations. Furthermore, to account for extraordinary shocks, we can stress test the VaR-based recommendation.

5 **Regulatory Capital Requirements** In addition, many institutions (e.g., securities firms and banks) must calculate and meet regulatory capital requirements. Wherever and whenever this is the case, it of course makes sense to allocate this responsibility to business units. Meeting regulatory capital requirements can be a difficult process, among other reasons because such requirements are sometimes inconsistent with rational capital allocation schemes that have

56 For example, one cannot add the VaR of individual positions to obtain a conservative measure (i.e., maximum) of overall VaR because it is possible for the sum of the VaRs to be greater than the VaR of the combined positions.

capital preservation as a primary objective. Nevertheless, when regulations demand it, firms must include regulatory capital as part of their overall allocation process.

Depending on such factors as the type of enterprise, its corporate culture, fiduciary obligations, etc., the most effective approach to capital allocation probably involves a combination of most, if not all, of the above methodologies. The trick, of course, is to combine the appropriate ones in a rational and consistent manner that creates the proper incentives for balance between the dual objectives of profit maximization and capital preservation.

6.5 Psychological and Behavioral Considerations

Over the past several years, a body of research has emerged that seeks to model the behavioral aspects of portfolio management. This concept has important implications for risk management for two reasons. First, risk takers may behave differently at different points in the portfolio management cycle, depending on such factors as their recent performance, the risk characteristics of their portfolios, and market conditions. Second, and on a related note, risk management would improve if these dynamics could be modeled.

Although the topic merits more discussion than we can possibly include in this context, the main factor to consider from a risk management perspective is the importance of establishing a risk governance framework that anticipates the points in a cycle when the incentives of risk takers diverge from those of risk capital allocators. One prominent example (although by no means the only one) occurs when portfolio managers who are paid a percentage of their profits in a given year fall into a negative performance situation. The trader's situation does not deteriorate from a compensation perspective with incremental losses at this point (i.e., the trader is paid zero, no matter how much he loses), but of course the organization as a whole suffers from the trader's loss. Moreover, the risks at the enterprise level can be nonlinear under these circumstances because of concepts of netting risk covered earlier in this reading. These and other behavioral issues can be handled best by risk control and governance processes that contemplate them. One such example is limit setting, which can, with some thought, easily incorporate many of these issues.[57]

SUMMARY

Financial markets reward competence and knowledge in risk management and punish mistakes. Portfolio managers must therefore study and understand the discipline of successful risk management. In this reading, we have introduced basic concepts and techniques of risk management and made the following points:

- Risk management is a process involving the identification of the exposures to risk, the establishment of appropriate ranges for exposures, the continuous measurement of these exposures, and the execution of appropriate adjustments to bring the actual level and desired level of risk into alignment. The process involves continuous monitoring of exposures and new policies, preferences, and information.

57 Those interested in studying these topics further may wish to refer to Grant (2004) and Kiev (2002).

- Typically, risks should be minimized wherever and whenever companies lack comparative advantages in the associated markets, activities, or lines of business.
- Risk governance refers to the process of setting risk management policies and standards for an organization. Senior management, which is ultimately responsible for all organizational activities, must oversee the process.
- Enterprise risk management is a centralized risk management system whose distinguishing feature is a firm-wide or across-enterprise perspective on risk.
- Financial risk refers to all risks derived from events in the external financial markets. Nonfinancial risk refers to all other forms of risk. Financial risk includes market risk (risk related to interest rates, exchange rates, stock prices, and commodity prices), credit risk, and liquidity risk. The primary sources of nonfinancial risk are operations risk, model risk, settlement risk, regulatory risk, legal risk, tax risk, and accounting risk.
- Traditional measures of market risk include linear approximations such as beta for stocks, duration for fixed income, and delta for options, as well as second-order estimation techniques such as convexity and gamma. For products with option-like characteristics, techniques exist to measure the impact of changes in volatility (vega) and the passage of time (theta). Sensitivity to movements in the correlation among assets is also relevant for certain types of instruments.
- Value at risk (VaR) estimates the minimum loss that a party would expect to experience with a given probability over a specified period of time. Using the complementary probability (i.e., 100 percent minus the given probability stated as a percent), VaR can be expressed as a maximum loss at a given confidence level. VaR users must make decisions regarding appropriate time periods, confidence intervals, and specific VaR methodologies.
- The analytical or variance–covariance method can be used to determine VaR under the assumption that returns are normally distributed by subtracting a multiple of the standard deviation from the expected return, where the multiple is determined by the desired probability level. The advantage of the method is its simplicity. Its disadvantages are that returns are not normally distributed in any reliable sense and that the method does not work well when portfolios contain options and other derivatives.
- The historical method estimates VaR from data on a portfolio's performance during a historical period. The returns are ranked, and VaR is obtained by determining the return that is exceeded in a negative sense 5 percent or 1 percent (depending on the user's choice) of the time. The historical method has the advantage of being simple and not requiring the assumption of a normal distribution. Its disadvantage is that accurate historical time-series information is not always easily available, particularly for instruments such as bonds and options, which behave differently at different points in their life spans.
- Monte Carlo simulation estimates VaR by generating random returns and determining the 5 percent or 1 percent (depending on the user's choice) worst outcomes. It has the advantages that it does not require a normal distribution and can handle complex relationships among risks.
- VaR can be difficult to estimate, can give a wide range of values, and can lead to a false sense of security that risk is accurately measured and under control. VaR for individual positions do not generally aggregate in a simple way to portfolio VaR. VaR also puts all emphasis on the negative outcomes, ignoring the positive outcomes. It can be difficult to calculate VaR for a large complex

organization with many exposures. On the other hand, VaR is a simple and easy-to-understand risk measure that is widely accepted. It is also adaptable to a variety of uses, such as allocating capital.

- Incremental VaR measures the incremental effect of an asset on the VaR of a portfolio. Cash flow at risk and earnings at risk measure the risk to a company's cash flow or earnings instead of market value, as in the case of VaR. Tail value at risk is VaR plus the expected loss in excess of VaR, when such excess loss occurs. Stress testing is another important supplement to VaR.
- Credit risk has two dimensions, the probability of default and the associated recovery rate.
- Credit risk in a forward contract is assumed by the party to which the market value is positive. The market value represents the current value of the claim that one party has on the other. The actual payoff at expiration could differ, but the market value reflects the current value of that future claim.
- Credit risk in swaps is similar to credit risk in forward contracts. The market value represents the current value of the claim on the future payments. The party holding the positive market value assumes the credit risk at that time. For interest rate and equity swaps, credit risk is greatest near the middle of the life of the swap. For currency swaps with payment of notional principal, credit risk is greatest near the end of the life of the swap.
- Credit risk in options is one-sided. Because the seller is paid immediately and in full, she faces no credit risk. By contrast, the buyer faces the risk that the seller will not meet her obligations in the event of exercise. The market value of the option is the current value of the future claim the buyer has on the seller.
- VaR can be used to measure credit risk. The interpretation is the same as with standard VaR, but a credit-based VaR is more complex because it must interact with VaR based on market risk. Credit risk arises only when market risk results in gains to trading. Credit VaR must take into account the complex interaction of market movements, the possibility of default, and recovery rates. Credit VaR is also difficult to aggregate across markets and counterparties.
- Risk budgeting is the process of establishing policies to allocate the finite resource of risk capacity to business units that must assume exposure in order to generate return. Risk budgeting has also been applied to allocation of funds to investment managers.
- The various methods of controlling credit risk include setting exposure limits for individual counterparties, exchanging cash values that reflect mark-to-market levels, posting collateral, netting, setting minimum credit, using special-purpose vehicles that have higher credit ratings than the companies that own them, and using credit derivatives.
- Among the measures of risk-adjusted performance that have been used in a portfolio context are the Sharpe ratio, risk-adjusted return on capital, return over maximum drawdown, and the Sortino ratio. The Sharpe ratio uses standard deviation, measuring total risk as the risk measure. Risk-adjusted return on capital accounts for risk using capital at risk. The Sortino ratio measures risk using downside deviation, which computes volatility using only rate-of-return data points below a minimum acceptable return. Return over maximum drawdown uses maximum drawdown as a risk measure.
- Methods for allocating capital include nominal position limits, VaR-based position limits, maximum loss limits, internal capital requirements, and regulatory capital requirements.

PRACTICE PROBLEMS

1 Discuss the difference between centralized and decentralized risk management systems, including the advantages and disadvantages of each.

2 Stewart Gilchrist follows the automotive industry, including Ford Motor Company. Based on Ford's 2003 annual report, Gilchrist writes the following summary:

Ford Motor Company has businesses in several countries around the world. Ford frequently has expenditures and receipts denominated in non-US currencies, including purchases and sales of finished vehicles and production parts, subsidiary dividends, investments in non-US operations, etc. Ford uses a variety of commodities in the production of motor vehicles, such as non-ferrous metals, precious metals, ferrous alloys, energy, and plastics/resins. Ford typically purchases these commodities from outside suppliers. To finance its operations, Ford uses a variety of funding sources, such as commercial paper, term debt, and lines of credit from major commercial banks. The company invests any surplus cash in securities of various types and maturities, the value of which are subject to fluctuations in interest rates. Ford has a credit division, which provides financing to customers wanting to purchase Ford's vehicles on credit. Overall, Ford faces several risks. To manage some of its risks, Ford invests in fixed-income instruments and derivative contracts. Some of these investments do not rely on a clearing house and instead effect settlement through the execution of bilateral agreements.

Based on the above discussion, recommend and justify the risk exposures that should be reported as part of an Enterprise Risk Management System for Ford Motor Company.

3 NatWest Markets (NWM) was the investment banking arm of National Westminster Bank, one of the largest banks in the United Kingdom. On 28 February 1997, NWM revealed that a substantial loss had been uncovered in its trading books. During the 1990s, NatWest was engaged in trading interest rate options and swaptions on several underlying currencies. This trading required setting appropriate prices of the options by the traders at NatWest. A key parameter in setting the price of an interest rate option is the implied volatility of the underlying asset—that is, the interest rate on a currency. In contrast to other option parameters that affect the option prices, such as duration to maturity and exercise price, implied volatility is not directly observable and must be estimated. Many option pricing models imply that the implied volatility should be the same for all options on the same underlying, irrespective of their exercise price or maturity. In practice, however, implied volatility is often observed to have a curvilinear relationship with the option's moneyness (i.e., whether the option is out of the money, at the money, or in the money), a relationship sometimes called the *volatility smile.* Implied volatility tended to be higher for out-of-the-money options than for at-the-money options on the same underlying.

NWM prices on certain contracts tended to consistently undercut market prices, as if the out-of-the money options were being quoted at implied volatilities that were too low. When trading losses mounted in an interest rate option contract, a trader undertook a series of off-market-price transactions between the options portfolio and a swaptions portfolio to transfer the losses to a type

Practice Problems and Solutions: 1–18 taken from *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All other problems and solutions © CFA Institute. All rights reserved.

of contract where losses were easier to conceal. A subsequent investigation revealed that the back office did not independently value the trading positions in question and that lapses in trade reconciliation had occurred.

What type or types of risk were inadequately managed in the above case?

4 Sue Ellicott supervises the trading function at an asset management firm. In conducting an in-house risk management training session for traders, Ellicott elicits the following statements from traders:

Trader 1 "Liquidity risk is not a major concern for buyers of a security as opposed to sellers."

Trader 2 "In general, derivatives can be used to substantially reduce the liquidity risk of a security."

Ellicott and the traders then discuss two recent cases of a similar risk exposure in an identical situation that one trader (Trader A) hedged and another trader (Trader B) assumed as a speculation. A participant in the discussion makes the following statement concerning the contrasting treatment:

Trader 3 "Our traders have considerable experience and expertise in analyzing the risk, and this risk is related to our business. Trader B was justified in speculating on the risk within the limits of his risk allocation."

State and justify whether each trader's statement is correct or incorrect.

5 A large trader on the government bond desk of a major bank loses €20 million in a year, in the process reducing the desk's overall profit to €10 million. Senior management, on looking into the problem, determines that the trader repeatedly violated his position limits during the year. They also determine that the bulk of the loss took place in the last two weeks of the year, when the trader increased his position dramatically and experienced 80 percent of his negative performance. The bank dismisses both the trader and his desk manager. The bank has an asymmetric incentive compensation contract arrangement with its traders.

A Discuss the performance netting risk implications of this scenario.

B Are there any reasons why the timing of the loss is particularly significant?

C What mistakes did senior management make? Explain how these errors can be corrected.

6 Ford Credit is the branch of Ford Motor Company that provides financing to Ford's customers. For this purpose, it obtains funding from various sources. As a result of its interest rate risk management process, including derivatives, Ford Credit's debt reprices faster than its assets. This situation means that when interest rates are rising, the interest rates paid on Ford Credit's debt will increase more rapidly than the interest rates earned on assets, thereby initially reducing Ford Credit's pretax net interest income. The reverse will be true when interest rates decline.

Ford's annual report provides a quantitative measure of the sensitivity of Ford Credit's pretax net interest income to changes in interest rates. For this purpose, it uses interest rate scenarios that assume a hypothetical, instantaneous increase or decrease in interest rates of 1 percentage point across all maturities. These scenarios are compared with a base case that assumes that interest rates remain constant at existing levels. The differences between the scenarios and the base case over a 12-month period represent an estimate of the sensitivity of Ford Credit's pretax net interest income. This sensitivity as of year-end 2003 and 2002 is as follows:

	Pretax Net Interest Income Impact Given a One Percentage Point Instantaneous *Increase* in Interest Rates (in Millions)	Pretax Net Interest Income Impact Given a One Percentage Point Instantaneous *Decrease* in Interest Rates (in Millions)
December 31, 2003	($179)	$179
December 31, 2002	($153)	$156

Source: Annual Report of Ford Motor Company, 2003.

Describe the strengths and weaknesses of the interest rate risk analysis presented in the foregoing table.

7 **A** An organization's risk management function has computed that a portfolio held in one business unit has a 1 percent weekly value at risk (VaR) of £4.25 million. Describe what is meant in terms of a minimum loss.

B The portfolio of another business unit has a 99 percent weekly VaR of £4.25 million (stated using a confidence limit approach). Describe what is meant in terms of a maximum loss.

8 Each of the following statements about VaR is true *except*:

A VaR is the loss that would be exceeded with a given probability over a specific time period.

B Establishing a VaR involves several decisions, such as the probability and time period over which the VaR will be measured and the technique to be used.

C VaR will be larger when it is measured at 5 percent probability than when it is measured at 1 percent probability.

D VaR will be larger when it is measured over a month than when it is measured over a day.

9 Suppose you are given the following sample probability distribution of annual returns on a portfolio with a market value of $10 million.

Return on Portfolio	Probability
Less than –50%	0.005
–50% to –40%	0.005
–40% to –30%	0.010
–30% to –20%	0.015
–20% to –10%	0.015
–10% to –5%	0.165
–5% to 0%	0.250
0% to 5%	0.250
5% to 10%	0.145
10% to 20%	0.075
20% to 30%	0.025
30% to 40%	0.020
40% to 50%	0.015
Greater than 50%	0.005
	1.000

Based on this probability distribution, determine the following:

A 1 percent yearly VaR.

B 5 percent yearly VaR.

10 An analyst would like to know the VaR for a portfolio consisting of two asset classes: long-term government bonds issued in the United States and long-term government bonds issued in the United Kingdom. The expected monthly return on US bonds is 0.85 percent, and the standard deviation is 3.20 percent. The expected monthly return on UK bonds, in US dollars, is 0.95 percent, and the standard deviation is 5.26 percent. The correlation between the US dollar returns of UK and US bonds is 0.35. The portfolio market value is $100 million and is equally weighted between the two asset classes. Using the analytical or variance–covariance method, compute the following:

A 5 percent monthly VaR.

B 1 percent monthly VaR.

C 5 percent weekly VaR.

D 1 percent weekly VaR.

11 You invested $25,000 in the stock of Dell Computer Corporation in early 2011. You have compiled the monthly returns on Dell's stock during the period 2006–2010, as given below.

2006	2007	2008	2009	2010
–0.0214	–0.0347	–0.1824	–0.0723	–0.1017
–0.0106	–0.0566	–0.0070	–0.1021	0.0264
0.0262	0.0158	0.0010	0.1114	0.1344
–0.1196	0.0862	–0.0648	0.2257	0.0786
–0.0313	0.0675	0.2378	–0.0043	–0.1772
–0.0362	0.0609	–0.0512	0.1867	–0.0953
–0.1137	–0.0203	0.1229	–0.0255	0.0978
0.0401	0.0100	–0.1156	0.1831	–0.1110
0.0129	–0.0230	–0.2416	–0.0360	0.1020
0.0652	0.1087	–0.2597	–0.0531	0.1099
0.1196	–0.1980	–0.0844	–0.0228	–0.0816
–0.0789	–0.0012	–0.0833	0.0170	0.0250

Using the historical method, compute the following:

A 5 percent monthly VaR.

B 1 percent monthly VaR.

12 Consider a $10 million portfolio of stocks. You perform a Monte Carlo simulation to estimate the VaR for this portfolio. You choose to perform this simulation using a normal distribution of returns for the portfolio, with an expected annual return of 14.8 percent and a standard deviation of 20.5 percent. You generate 700 random outcomes of annual return for this portfolio, of which the worst 40 outcomes are given below.

–0.400	–0.320	–0.295	–0.247
–0.398	–0.316	–0.282	–0.233
–0.397	–0.314	–0.277	–0.229
–0.390	–0.310	–0.273	–0.226
–0.355	–0.303	–0.273	–0.223
–0.350	–0.301	–0.261	–0.222

(continued)

–0.347	–0.301	–0.259	–0.218
–0.344	–0.300	–0.253	–0.216
–0.343	–0.298	–0.251	–0.215
–0.333	–0.296	–0.248	–0.211

Using the above information, compute the following:

A 5 percent annual VaR.

B 1 percent annual VaR.

13 **A** A firm runs an investment portfolio consisting of stocks as well as options on stocks. Management would like to determine the VaR for this portfolio and is thinking about which technique to use. Discuss a problem with using the analytical or variance–covariance method for determining the VaR of this portfolio.

B Describe a situation in which an organization might logically select each of the three VaR methodologies.

14 An organization's 5 percent daily VaR shows a number fairly consistently around €3 million. A backtest of the calculation reveals that, as expected under the calculation, daily portfolio losses in excess of €3 million tend to occur about once a month. When such losses do occur, however, they typically are more than double the VaR estimate. The portfolio contains a very large short options position.

A Is the VaR calculation accurate?

B How can the VaR figure best be interpreted?

C What additional measures might the organization take to increase the accuracy of its overall exposure assessments?

15 Indicate which of the following statements about credit risk is (are) false, and explain why.

A Because credit losses occur often, it is easy to assess the probability of a credit loss.

B One element of credit risk is the possibility that the counterparty to a contract will default on an obligation to another (i.e., third) party.

C Like the buyer of a European-style option, the buyer of an American-style option faces no current credit risk until the expiration of the option.

16 Ricardo Colón, an analyst in the investment management division of a financial services firm, is developing an earnings forecast for a local oil services company. The company's income is closely linked to the price of oil. Furthermore, the company derives the majority of its income from sales to the United States. The economy of the company's home country depends significantly on export oil sales to the United States. As a result, movements in world oil prices in US dollar terms and the US dollar value of the home country's currency are strongly positively correlated. A decline in oil prices would reduce the company's sales in US dollar terms, all else being equal. On the other hand, the appreciation of the home country's currency relative to the US dollar would reduce the company's sales in terms of the home currency.

According to Colón's research, Raúl Rodriguez, the company's chief risk officer, has made the following statement:

"The company has rejected hedging the market risk of a decline in oil prices by selling oil futures and hedging the currency risk of a depreciation of the US dollar relative to our home currency by buying home currency futures in US markets. We have decided that a more effective risk management strategy for our company is to not hedge either market risk or currency risk."

A State whether the company's decision to not hedge market risk was correct. Justify your answer with one reason.

B State whether the company's decision to not hedge currency risk was correct. Justify your answer with one reason.

C Critique the risk management strategy adopted.

17 Tony Smith believes that the price of a particular underlying, currently selling at $96, will increase substantially in the next six months, so he purchases a European call option expiring in six months on this underlying. The call option has an exercise price of $101 and sells for $6.

A How much is the current credit risk, if any?

B How much is the current value of the potential credit risk, if any?

C Which party bears the credit risk(s), Tony Smith or the seller?

18 Following are four methods for calculating risk-adjusted performance: the Sharpe ratio, risk-adjusted return on capital (RAROC), return over maximum drawdown (RoMAD), and the Sortino ratio. Compare and contrast the measure of risk that each method uses.

The following information relates to Questions 19–24

Monika Kreuzer chairs the risk management committee for DGI Investors, a European money management firm. The agenda for the 1 June committee meeting includes three issues concerning client portfolios:

1 Estimating a new value at risk (VaR) for the Stimson Industries portfolio.

2 Answering questions from Kalton Corporation managers.

3 Revising the VaR for Muth Company given new capital market expectations.

1. VaR for Stimson Industries. DGI currently provides a 5 percent yearly VaR on the equity portfolio that it manages for Stimson. The €50 million portfolio has an expected annual return of 9.6 percent and an annual standard deviation of 18.0 percent. With a standard normal distribution, 5 percent of the possible outcomes are 1.65 standard deviations or more below the mean. Using the analytical (variance–covariance) method for calculating VaR, DGI estimates the 5 percent yearly VaR to be €10.05 million. Assuming that monthly returns are independent, committee member Eric Stulz wants to estimate a 5 percent *monthly* VaR for Stimson's portfolio.

Stulz asks his fellow committee members for feedback on the following statements about VaR in a report he is preparing for Stimson Industries:

(continued)

Statement #1: "Establishing a VaR involves several decisions, such as the probability and time period over which the VaR will be measured and the technique to be used."

Statement #2: "A portfolio's VaR will be larger when it is measured at a 5 percent probability than when it is measured at a 1 percent probability."

Statement #3: "A portfolio's VaR will be larger when it is measured over a month than when it is measured over a day."

2. Questions from Kalton Corporation Managers. Kalton Corporation has two large derivatives positions with a London securities house. The first position is a long forward currency contract to buy pounds at €1.4500. The current exchange rate is €1.4000 per pound. The second position is a long put position on the DJ Euro STOXX Index with a strike price of 305.00. The current closing price of the index is 295.00. A Kalton manager has written, "I am concerned about the risks of these two large positions. Who is bearing the credit risks, Kalton Corporation or the counterparty (the London securities house)?" Kreuzer suggests that DGI reply: "Kalton Corporation is bearing the credit risk of the currency forward contract, but the London securities house is bearing the credit risk of the put option on the DJ Euro STOXX Index."

Because they believe that the credit risk in corporate bonds is going to decline, Kalton Corporation managers have decided to increase Kalton's credit risk exposure in corporate bonds. They have asked Kreuzer and the risk management committee to recommend derivatives positions to accomplish this change.

3. Revising the VaR for Muth Company. Kreuzer provides a variety of statistics to Muth, for whom DGI manages a portfolio composed of 50 percent in Asia-Pacific equities and 50 percent in European equities. One of the statistics that Kreuzer supplies Muth is a 5 percent monthly VaR estimate based on the analytical (variance–covariance) method. Kreuzer is concerned that changes in the market outlook will affect Muth's risk. DGI is updating its capital market expectations, which will include 1) an increase in the expected return on Asia-Pacific equities and 2) an increase in the correlation between Asia-Pacific equities and European equities. Kreuzer comments: "Considered independently, and assuming that other variables are held constant, each of these changes in capital market expectations will increase the monthly VaR estimate for the Muth portfolio."

Kreuzer also discusses the limitations and strengths of applying VaR to the Muth portfolio. She states that: "One of the advantages of VaR is that the VaR of individual positions can be simply aggregated to find the portfolio VaR." Kreuzer also describes how VaR can be supplemented with performance evaluation measures, such as the Sharpe ratio. She states: "The Sharpe ratio is widely used for calculating a risk-adjusted return, although it can be an inaccurate measure when applied to portfolios with significant options positions."

19 The monthly VaR that Stulz wants to estimate for the Stimson portfolio is *closest* to:

A €0.8 million.

B €2.9 million.

C €3.9 million.

20 Regarding the three statements in the report that Stulz is preparing for Stimson Industries, the statement that is *incorrect* is:

A Statement #1.

B Statement #2.

C Statement #3.

21 Regarding Kalton's two derivatives positions, is Kreuzer correct about which party is bearing the credit risk of the currency forward contract and the put option on the DJ Euro STOXX Index, respectively?

	Currency Forward Contract	Put Option on the DJ Euro STOXX Index
A	No	No
B	No	Yes
C	Yes	Yes

22 To make the desired change in Kalton's credit risk exposure in corporate bonds, Kreuzer could recommend that Kalton take a position as a:

A seller in a credit default swap.

B buyer in a credit default swap.

C buyer of a put option on a corporate bond.

23 Is Kreuzer correct in predicting the independent effects of the increase in the expected return and the increase in the correlation, respectively, on the calculated VaR of the Muth portfolio?

	Effect of Increase in the Expected Return	Effect of Increase in the Correlation
A	No	No
B	No	Yes
C	Yes	No

24 Are Kreuzer's statements about an advantage of VaR and about the Sharpe ratio, respectively, correct?

	Statement about an Advantage of VaR	Statement about the Sharpe Ratio
A	No	No
B	No	Yes
C	Yes	Yes

SOLUTIONS

1 Centralized risk control systems bring all risk management activities under the responsibility of a single risk control unit. Under decentralized systems, each business unit is responsible for its own risk control. The advantages of a centralized system are that it brings risk control closer to the key decision makers in the organization and enables the organization to better manage its risk budget by recognizing the diversification embedded across business units. The decentralized approach has the advantage of placing risk control in nearer proximity to the source of risk taking. However, it has the disadvantage of not accounting for portfolio effects across units.

2 The following risk exposures should be reported as part of an Enterprise Risk Management System for Ford Motor Company:

- *Market risks*
  - Currency risk, because expenditures and receipts denominated in non-domestic currencies create exposure to changes in exchange rates.
  - Interest rate risk, because the values of securities that Ford has invested in are subject to changes in interest rates. Also, Ford has borrowings and loans, which could be affected by interest rate changes.
  - Commodity risk, because Ford has exposure in various commodities and finished products.
- *Credit risk*, because of financing provided to customers who have purchased Ford's vehicles on credit.
- *Liquidity risk*, because of the possibility that Ford's funding sources may be reduced or become unavailable and Ford may then have to sell its securities at a short notice with a significant concession in price.
- *Settlement risk*, because of Ford's investments in fixed-income instruments and derivative contracts, some of which effect settlement through the execution of bilateral agreements and involve the possibility of default by the counterparty.
- *Political risk*, because Ford has operations in several countries. This exposes it to political risk. For example, the adoption of a restrictive policy by a non-US government regarding payment of dividends by a subsidiary in that country to the parent company could adversely affect Ford.

3 Two types of risk that were inadequately managed were model risk and operational risk. Systematic errors in a major input of the options pricing model, implied volatility, resulted in mispricing options and trading losses. Thus model risk was inadequately managed. Furthermore, the systems and procedures at NatWest failed to prevent or detect and bring to the attention of senior management the trading losses. Thus operational risk also was not well managed.

4 Trader 1's statement is incorrect. Buyers are concerned about the transaction costs of trades as much as sellers, so a security's liquidity is highly relevant to buyers. In certain cases, such as a short position in a stock with limited float, the liquidity risk for the purchase side of a trade can be considerable.

Trader 2's statement is incorrect. Derivatives usually do not help in managing liquidity risk because the lack of liquidity in the spot market typically passes right through to the derivatives market.

Trader 3's statement is correct. Businesses need to take risks in areas in which they have expertise and possibly a comparative advantage in order to earn profits. Risk management can entail taking risk as well as reducing risk.

5 **A** Assuming that the desk pays its traders a percentage of the profits on their own trading books, the –€20 million loss generated by an individual trader implies that the rest of the desk made €30 million and that the bank will have to pay the other traders an incentive fee on this larger amount, even though it generated only €10 million in net revenues. By contrast, if every trader had made money and the revenues to the desk were €10 million, the incentive payouts to traders would have been much lower and the net profits to the bank much higher.

B In the scenario described above, the trader in question appears to have increased his risk exposure at year-end. The asymmetric nature of the incentive fee arrangement may induce risk taking because it is a call option on a percentage of profits and the value of a call option increases in the volatility of the underlying. In this sense, the interests of the bank and the trader diverged to the detriment of the bank.

C First and foremost, it is clear that senior management was out of touch with the risk dynamics of the desk because it should have known that the trader in question was over his limits at some points much earlier in the scenario. The fact that management discovered this violation only after the loss occurred reflects poor risk governance.

6 *Strengths*: The sensitivity analysis reported by Ford is useful in highlighting the possible adverse effect of a 1 percent increase in interest rates on Ford Credit's net income. It also is based on an objective measure of interest rate risk, duration.

Weaknesses: The sensitivity analysis reported in the table assumes that interest rate changes are instantaneous, small, parallel shifts in the yield curve. From a risk management perspective, one would have a special interest in the effects of larger interest rate changes, including major discontinuities in interest rates. The inclusion of value at risk would help fill this gap in the analysis. Furthermore, changes in the yield curve other than parallel shifts should be examined, such as nonparallel shifts (twists) in the yield curve. The text mentions the recommendation of the Derivatives Policy Group to examine both parallel shifts and twists of the yield curve.

7 **A** There is a 1 percent chance that the portfolio will lose at least £4.25 million in any given week.

B There is a 99 percent chance that the portfolio will lose no more than £4.25 million in one week.

8 Statement A, which is the definition of VaR, is clearly correct. Statement B is also correct, because it lists the important decisions involved in measuring VaR. Statement D is correct: The longer the time period, the larger the possible losses. Statement C, however, is incorrect. The VaR number would be larger for a 1 percent probability than for a 5 percent probability. Accordingly, the correct answer is C.

9 **A** The probability is 0.005 that the portfolio will lose at least 50 percent in a year. The probability is 0.005 that the portfolio will lose between 40 percent and 50 percent in a year. Cumulating these two probabilities implies that the probability is 0.01 that the portfolio will lose at least 40 percent in a year. So, the 1 percent yearly VaR is 40 percent of the market value of $10 million, which is $4 million.

B The probability is 0.005 that the portfolio will lose at least 50 percent in a year, 0.005 that it will lose between 40 and 50 percent, 0.010 that it will lose between 30 and 40 percent, 0.015 that it will lose between 20 and 30 percent, and 0.015 that it will lose between 10 and 20 percent. Cumulating these probabilities indicates that the probability is 0.05 that the portfolio will lose at least 10 percent in a year. So, the 5 percent yearly VaR is 10 percent of the market value of $10 million, which is $1 million.

10 First, we must calculate the monthly portfolio expected return and standard deviation. Using "1" to indicate the US government bonds and "2" to indicate the UK government bonds, we have

$$\begin{aligned}
\mu_P &= w_1\mu_1 + w_2\mu_2 = 0.50(0.0085) + 0.50(0.0095) = 0.0090 \\
\sigma_P^2 &= w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_1\sigma_2\rho \\
&= (0.50)^2(0.0320)^2 + (0.50)^2(0.0526)^2 \\
&\quad + 2(0.50)(0.50)(0.0320)(0.0526)(0.35) \\
&= 0.001242 \\
\sigma_P &= \sqrt{0.001242} = 0.0352
\end{aligned}$$

A For a 5 percent monthly VaR, we have $\mu_P - 1.65\sigma_P = 0.0090 - 1.65(0.0352) = -0.0491$. Then the VaR would be $100,000,000(0.0491) = $4.91 million.

B For a 1 percent monthly VaR, we have $\mu_P - 2.33\sigma_P = 0.0090 - 2.33(0.0352) = -0.0730$. Then the VaR would be $100,000,000(0.0730) = $7.30 million.

C There are 12 months or 52 weeks in a year. So, to convert the monthly return of 0.0090 to weekly return, we first multiply the monthly return by 12 to convert it to an annual return, and then we divide the annual return by 52 to convert it to a weekly return. So, the expected weekly return is 0.0090(12/52) = 0.0021. Similarly, we adjust the standard deviation to $0.0352\left(\sqrt{12}/\sqrt{52}\right) = 0.01691$. The 5 percent weekly VaR would then be $\mu_P - 1.65\sigma_P = 0.0021 - 1.65(0.01691) = -0.0258$. Then the VaR in dollars would be $100,000,000(0.0258) = $2.58 million.

D The 1 percent weekly VaR would be $\mu_P - 2.33\sigma_P = 0.0021 - 2.33(0.01691) = -0.0373$. Then the VaR would be $100,000,000(0.0373) = $3.73 million.

11 A For the five-year period, there are 60 monthly returns. Of the 60 returns, the 5 percent worst are the 3 worst returns. Therefore, based on the historical method, the 5 percent VaR would be the third worst return. From the returns given, the third worst return is –0.1980. So, the VaR in dollars is 0.1980($25,000) = $4,950.

B Of the 60 returns, the 1 percent worst are the 0.6 worst returns. Therefore, we would use the single worst return. From the returns given, the worst return is –0.2597. So, the VaR in dollars is 0.2597($25,000) = $6,492.50.

12 A Of the 700 outcomes, the worst 5 percent are the 35 worst returns. Therefore, the 5 percent VaR would be the 35th worst return. From the data given, the 35th worst return is –0.223. So, the 5 percent annual VaR in dollars is 0.223($10,000,000) = $2,230,000.

B Of the 700 outcomes, the worst 1 percent are the 7 worst returns. Therefore, the 1 percent VaR would be the seventh worst return. From the data given, the seventh worst return is –0.347. So, the 1 percent annual VaR in dollars is 0.347($10,000,000) = $3,470,000.

13 A The analytical or variance–covariance method begins with the assumption that portfolio returns are normally distributed. A normal distribution has an unlimited upside and an unlimited downside. The assumption of a normal distribution is inappropriate when the portfolio contains options because the return distributions of options are far from normal. Call options have unlimited upside potential, as in a normal distribution, but the downside return is truncated at a loss of 100 percent. Similarly, put options have a limited upside and a large but limited downside. Likewise, covered calls and protective puts have limits in one direction or the other. Therefore, for the portfolio that has options, the assumption of a normal distribution to estimate VaR has a number of problems. In addition, it is very difficult to calculate a covariance between either two options or an option and a security with more linear characteristics—among other reasons because options have different dynamics at different points in their life cycle.

B Portfolios with simple, linear characteristics, particularly those with a limited budget for computing resources and analytical personnel, might select the variance/covariance method. For more complex portfolios containing options and time-sensitive bonds, the historical method might be more appropriate. The Monte Carlo simulation method typically would not be a wise choice unless it were managed by an organization with a portfolio of complex derivatives that is willing to make and sustain a considerable investment in technology and human capital.

14 A The observed outcomes are consistent with the VaR calculation's prediction on the frequency of losses exceeding the VaR. Therefore, the VaR calculation is accurate.

B The VaR results indicate that under "normal" market conditions that would characterize 19 out of 20 days, the portfolio ought to lose less than €3 million. It provides no other information beyond this.

C The portfolio certainly lends itself to scenario analysis. In this particular case, given the substantial short options position, it might be instructive to create a customized scenario under which the portfolio was analyzed in the wake of a large increase in option-implied volatility.

15 The fact that credit losses occur infrequently makes Statement A incorrect. Unlike a European-style option, which cannot be exercised prior to expiration and thus has no current credit risk, an American-style option does have the potential for current credit risk. Therefore, Statement C is incorrect. Statement B, however, is correct.

16 A The decision not to hedge this risk was correct. Suppose the company had hedged this risk. If the price of oil were to increase, the favorable effect of the increase on income would be offset by the loss on the oil futures, but the home currency should appreciate against the US dollar, leaving the company worse off. If the price of oil were to decrease, the unfavorable effect on income would be offset by the futures position and the home currency should depreciate, leaving the company better off. In short, the company would remain exposed to exchange rate risk associated with oil price movements.

B The decision not to hedge this risk was correct. The company should remain exposed to market risk associated with exchange rate movements (i.e., currency risk). Hedging would remove currency risk but leave the company with market risk associated with oil price movements. If the home currency declined, the price of oil would likely decline because it is positively correlated with the US dollar value of the home currency. That would be a

negative for income. On the other hand, appreciation of the home currency is likely to be accompanied by an oil price increase, which would be positive for income.

C The risk management strategy adopted is logical because it exploits a natural hedge. A decline in the price of oil (a negative) is likely to be accompanied by a depreciation of the home currency relative to the US dollar (a positive), and an increase in the price of oil (a positive) is likely to be accompanied by appreciation of the home currency (a negative). Hedging both currency and market risk would be an alternative risk management strategy to consider, but in comparison to the strategy adopted, it would incur transaction costs.

17 A Because the option is a European-style option, it cannot be exercised prior to expiration. Therefore, there is no current credit risk.

B The current value of the potential credit risk is the current market value of the option, which is $6. Of course, at expiration, the option is likely to be worth a different amount and could even expire out of the money.

C Options have unilateral credit risk. The risk is borne by the buyer of the option, Tony Smith, because he will look to the seller for the payoff at expiration if the option expires in the money.

18 The Sharpe ratio uses standard deviation of portfolio return as the measure of risk. Standard deviation is a measure of total risk. RAROC uses capital at risk (defined in various ways) as the measure of risk. RoMAD uses maximum drawdown as a risk measure. Maximum drawdown is the difference between a portfolio's maximum point of return and the lowest point of return over a given time interval. The Sortino ratio measures risk using downside deviation, which computes volatility using only rate of return data points below a minimum acceptable return. In contrast to the Sharpe ratio, its focus is on downside risk.

19 C is correct. The monthly return is 9.6%/12 = 0.8%.

The monthly standard deviation is $18.0\%/\sqrt{12} = 5.196\%$.

The percent VaR is 0.8% – 1.65 (5.196%) = –7.7734%.

The dollar VaR is 7.7734% (€50 million) = €3.8867 million, or €3.9 million.

20 B is correct. Stolz' Statement #2 is the only incorrect statement. The VaR will be larger for a 1 percent probability than for a 5 percent probability. A 1 percent probability is equivalent to a 99 percent confidence level. This requires movement 2.33 standard deviations in the direction of lower returns.

21 A is correct. Kreuzer is wrong on both. For the currency forward contract, the London securities house is bearing credit risk because the London house is the party that would be owed (or paid) at current prices. For option contracts, including puts, the option buyer is the only party with credit risk. So Kalton Corporation is bearing credit risk on its long put position.

22 A is correct. In a credit default swap, the protection seller would make payments to the protection buyer in the event of a specified credit event. Thus, the protection seller is assuming credit risk. The other positions would not give a desired increase in credit risk exposure in corporate bonds.

23 B is correct. Kreuzer's statement is incorrect with respect to the increase in expected return but correct with respect to the increased correlation. A 5% VaR would be equal to the expected monthly portfolio return minus 1.65 × (monthly portfolio standard deviation), or $-\text{VaR} = \mu_p - 1.65\sigma_p$. The increase in expected

return would result in a lower calculated VaR (smaller losses). An increase in the correlation would increase the portfolio standard deviation, which would result in a higher calculated VaR (larger losses).

24 B is correct. Kreuzer's statement about an advantage of VaR is wrong because the VaR for individual positions does not generally aggregate in a simple way into portfolio VaR. The correlation of the individual positions has to be taken into account. Kreuzer's statement about the Sharpe ratio is correct.

CUSTOMER SERVICE

68

PORTFOLIO MANAGEMENT

STUDY SESSION

15

Risk Management Applications of Derivatives

This study session addresses risk management strategies using forwards and futures, option strategies, floors and caps, and swaps. These derivatives can be used for a variety of risk management purposes, including modification of portfolio duration and beta, implementation of asset allocation changes, and creation of cash market instruments. A growing number of security types now have embedded derivatives, and portfolio managers must be able to account for the effects of derivatives on the return/risk profile of the security and the portfolio. After completing this study session, the candidate will better understand advantages and disadvantages of derivative strategies, including the difficulties in creating and maintaining a dynamic hedge.

READING ASSIGNMENTS

Reading 28	Risk Management Applications of Forward and Futures Strategies by Don M. Chance, PhD, CFA
Reading 29	Risk Management Applications of Option Strategies by Don M. Chance, PhD, CFA
Reading 30	Risk Management Applications of Swap Strategies by Don M. Chance, PhD, CFA

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

28

Risk Management Applications of Forward and Futures Strategies

by Don M. Chance, PhD, CFA

Don M. Chance, PhD, CFA, is at Louisiana State University (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** demonstrate the use of equity futures contracts to achieve a target beta for a stock portfolio and calculate and interpret the number of futures contracts required;
☐	**b.** construct a synthetic stock index fund using cash and stock index futures (equitizing cash);
☐	**c.** explain the use of stock index futures to convert a long stock position into synthetic cash;
☐	**d.** demonstrate the use of equity and bond futures to adjust the allocation of a portfolio between equity and debt;
☐	**e.** demonstrate the use of futures to adjust the allocation of a portfolio across equity sectors and to gain exposure to an asset class in advance of actually committing funds to the asset class;
☐	**f.** explain exchange rate risk and demonstrate the use of forward contracts to reduce the risk associated with a future receipt or payment in a foreign currency;
☐	**g.** explain the limitations to hedging the exchange rate risk of a foreign market portfolio and discuss feasible strategies for managing such risk.

INTRODUCTION

1

In preceding readings, we examined the characteristics and pricing of forwards, futures, options, and swaps. On occasion, we made reference to possible ways in which these instruments could be used. In the readings that follow, we examine more specifically the strategies and applications that are commonly used with these instruments. Here we focus on forward and futures contracts. These instruments are quite similar. Both

Analysis of Derivatives for the Chartered Financial Analyst® Program, by Don M. Chance, CFA. © 2003 CFA Institute. All rights reserved.

involve commitments for one party to buy and the other to sell an underlying instrument at a future date at a price agreed on at the start of the contract. The underlying instrument might be an interest payment, a bond, a stock, or a currency. Forward contracts are customized agreements between two parties: The terms are agreed on by both parties in a formal legal contract that exists in an environment outside of regulatory constraints. Each party is subject to potential default on the part of the other. Futures contracts, on the other hand, are standardized instruments created on a futures exchange, protected against credit losses by the clearinghouse, and subject to federal regulatory oversight.

In this reading, we examine a number of scenarios in which parties facing risk management problems use forward and futures contracts to alter the risk of their positions. In some situations we use forwards and in others we use futures. For cases in which either would suffice, we pick the instrument that is most commonly used in that type of situation. Although we shall not devote a great deal of space up front to justifying why we picked the instrument we did, we shall provide some discussion of this point in Section 6.

After completing this reading, you may be surprised to observe that we do not cover an important class of derivative strategies, those that are called *arbitrage*. This omission is not because they are not important enough to cover or that they are not risk management strategies; in fact, we have *already* covered them. When we covered the pricing of forwards, futures, options, and swaps, we explained how these instruments are priced by combining the underlying and risk-free bonds to replicate the derivative or by combining a long position in the underlying and a short position in the derivative to replicate a risk-free position. From there we obtained a formula that gives us the correct price of the derivative. An arbitrage profit is possible if the derivative is not priced according to the formula. We have already looked at how those strategies are executed. We should not expect to encounter arbitrage opportunities very often in practice. They are quickly captured by derivatives trading firms, which themselves cannot expect to be able to *consistently* claim such opportunities before they disappear.[1]

Businesses make products and provide services as they attempt to increase shareholder wealth. In doing so, they face a variety of risks. Managing risk lies at the heart of what companies do. All companies specialize in managing the risk of whatever market their primary business is in: Airlines deal with the risk associated with the demand for air travel, software companies deal with the risk associated with the demand for new computer programs, movie companies deal with the risk associated with the demand for their films. But these companies also deal with other risks, such as the risk of interest rates and exchange rates. Usually these companies take calculated risks in their primary lines of business and avoid risks they do not feel qualified to take, such as interest rate risk and exchange rate risk. Naturally this approach involves a practice called **hedging**.

Hedging involves taking a market position to protect against an undesirable outcome. Suppose a company has a strong belief that interest rates will increase. It engages in a forward rate agreement (FRA) transaction to lock in the rate on a loan it will take out at a later date. This position protects the company from the undesirable outcome of an increase in interest rates, but it also prevents the company from enjoying any decline in rates. In that sense, the position is as much a speculative position as if a speculator had made the following prediction: *We believe that interest rates will*

1 Suppose market participants assume that arbitrage opportunities are so infrequent and difficult to capture before they are gone that no one monitors market prices looking for arbitrage opportunities. Then these arbitrage opportunities will begin to occur more frequently. A market in which arbitrage opportunities are rare, and therefore prices are fair and accurate, is ironically a market in which participants believe they can indeed uncover and exploit arbitrage opportunities. Thus, an arbitrage-free market requires disbelievers.

rise to an unacceptable level, and we intend to trade on that basis to make money. By engaging in the FRA to hedge this outcome, the company trades to make a profit from its FRA that will help offset any increase in the interest rate on its future loan. But by locking in a rate, it forgoes the possibility of benefiting from a decline in interest rates. The company has made a bet that rates will rise. If they fall, the company has lost the bet and lost money on its FRA that offsets the benefit of the lower interest rate on this loan planned for a later date.

In this reading we shall not overindulge in the use of the term hedging. We shall say that companies do more than hedge: *They manage risk.* They carefully consider scenarios and elect to adjust the risk they face to a level they feel is acceptable. In many cases, this adjustment will involve the reduction of risk; in some cases, however, the scenario will justify increasing the company's risk. In all cases, the company is just altering the risk from its current level to the level the company desires. And that is what managing risk is all about.

This reading is divided into five main parts. Sections 2 and 3 focus on the management of interest rate and equity market risk, respectively. Section 4 combines interest rate and equity risk management applications by looking at how investors can manage an asset portfolio using futures. Section 5 looks at the management of foreign currency risk. In Section 6 we examine the general question of whether to use forwards or futures to manage risk, and in Section 7 we look at a few final issues.

STRATEGIES AND APPLICATIONS FOR MANAGING INTEREST RATE RISK

2

OPTIONAL SEGMENT

Almost every business borrows money from time to time. A company borrowing at a fixed rate may think it is immune to interest rate risk, but that is not the case. Risk arises from the possibility that interest rates can increase from the time the company decides to take the loan to the time it actually takes the loan. Most companies make plans to borrow based on their cash needs at specific future dates. The rates they pay on these loans are important determinants of their future cash needs, as reflected in their planned interest payments. Exposure to interest rate risk is, therefore, a major concern. Failing to manage interest rate risk can hinder the planning process, as well as result in unexpected demands on cash necessitated by unexpectedly higher interest payments.

2.1 Managing the Interest Rate Risk of a Loan Using an FRA

There are several situations in which a company might want to manage the interest rate risk of a loan. The two we look at here involve a company planning to take out a loan at a later date. In one situation, the loan has a single interest rate and a single interest payment. In another situation, a company takes out a floating-rate loan in which the interest rate is reset periodically.

2.1.1 *Single-Payment Loan*

Exhibit 1 presents the case of Global BioTechnology (GBT), which determines that it will need to borrow money at a later date at a rate of Libor plus 200 basis points. Fearing an increase in interest rates between now and the day it takes out the loan, it enters into a long position in an FRA. The FRA has a fixed rate, called the FRA rate. If the underlying rate at expiration is above the FRA rate, GBT as the holder of the long position will receive a lump sum of cash based on the difference between the FRA rate and the market rate at that time. This payment will help offset the higher

rate GBT would be paying on its loan. If the rate in the market falls below the FRA rate, however, GBT will end up paying the counterparty, which will offset the lower rate GBT will be paying on its loan. The end result is that GBT will pay approximately a fixed rate, the FRA rate.

Exhibit 1 Using an FRA to Lock in the Rate on a Loan

Scenario (15 April)

Global BioTechnology (GBT) is a US corporation that occasionally undertakes short-term borrowings in US dollars with the rate tied to Libor. To facilitate its cash flow planning, it uses an FRA to lock in the rate on such loans as soon as it determines that it will need the money.

On 15 April, GBT determines that it will borrow $40 million on 20 August. The loan will be repaid 180 days later on 16 February, and the rate will be at Libor plus 200 basis points. Because GBT believes that interest rates will increase, it decides to manage this risk by going long an FRA. An FRA will enable it to receive the difference between Libor on 20 August and the FRA rate quoted by the dealer on 15 April. The quoted rate from the dealer is 5.25 percent. GBT wants to lock in a 7.25 percent rate: 5.25 percent plus 200 basis points.

Action

GBT confirms that it will borrow $40 million at Libor plus 200 basis points on 20 August. GBT goes long an FRA at a rate of 5.25 percent to expire on 20 August with the underlying being 180-day Libor.

Scenario (20 August)

At contract expiration, 180-day Libor is 6 percent.

Outcome and Analysis

The FRA payoff is given by the general formula:

$$\text{Notional principal} \times \left[\frac{\left(\begin{array}{c}\text{Underlying rate}\\ \text{at expiration}\end{array} - \text{Forward contract rate}\right)\left(\dfrac{\text{Days in underlying rate}}{360}\right)}{1 + \text{Underlying rate}\left(\dfrac{\text{Days in underlying rate}}{360}\right)}\right]$$

$$\text{or } \$40{,}000{,}000 \times \left[\frac{(0.06 - 0.0525)(180/360)}{1 + 0.06(180/360)}\right] = \$145{,}631$$

GBT receives this amount in cash. Therefore, to obtain $40 million in cash, it has to borrow $40,000,000 – $145,631 = $39,854,369 at Libor plus 200 basis points, 0.06 + 0.02 = 0.08, or 8 percent.

On 16 February GBT pays back $39,854,369[1 + 0.08(180/360)] = $41,448,544. So, it effectively pays a rate of

$$\left(\frac{\$41{,}448{,}544}{\$40{,}000{,}000} - 1\right)\left(\frac{360}{180}\right) = 0.0724$$

The net effect is that GBT receives $40 million on 20 August and pays back $41,448,544 on 16 February, a rate of 7.24 percent. This rate was effectively locked in on 15 April at the FRA rate of 5.25 percent plus the 200 basis points GBT pays over Libor.

Shown below are the results for possible Libors on 20 August of 2 percent, 4 percent, …, 10 percent.

Exhibit 1 (Continued)

Libor on 20 August	FRA Payoff	Amount Borrowed	Libor + 200 bps Loan Rate	Amount Repaid on 16 February	Effective Loan Rate
0.02	–$643,564	$40,643,564	0.04	$41,456,435	0.0728
0.04	–245,098	40,245,098	0.06	41,452,451	0.0726
0.06	145,631	39,854,369	0.08	41,448,544	0.0724
0.08	528,846	39,471,154	0.10	41,444,712	0.0722
0.10	904,762	39,095,238	0.12	41,440,952	0.0720

In this problem, the FRA rate is 5.25 percent. In the exhibit, we described an outcome in which the underlying rate, 180-day Libor, is 6 percent. GBT ends up paying 6% + 2% = 8% on the loan, but the FRA pays off an amount sufficient to reduce the effective rate to 7.24 percent. Note the table at the end of the exhibit showing other possible outcomes. In all cases, the rate GBT pays is approximately the FRA rate of 5.25 percent plus 200 basis points. This rate is not precisely 7.25 percent, however, because of the way in which the FRA is constructed to pay off at expiration. When Libor on 20 August is above 5.25 percent, the FRA payoff on that day reduces the amount that has to be borrowed at Libor plus 200 basis points. This reduction works to the advantage of GBT. Conversely, when rates are below 5.25 percent, the amount that must be borrowed increases but that amount is borrowed at a lower rate. Thus, there is a slight asymmetric effect of a few basis points that prevents the effective loan rate from precisely equaling 7.25 percent.

In a similar manner, a lender could lock in a rate on a loan it plans to make by going short an FRA. Lenders are less inclined to do such transactions, however, because they cannot anticipate the exact future borrowing needs of their customers. In some cases, banks that offer credit lines at floating rates might wish to lock in lending rates using FRAs. But because the choice of whether to borrow is the borrower's and not the lender's, a lender that uses an FRA is taking considerable risk that the loan will not even be made. In that case, the lender would do better to use an option so that, in the worst case, it loses only the option premium.

EXAMPLE 1

ABTech plans to borrow $10 million in 30 days at 90-day Libor plus 100 basis points. To lock in a borrowing rate of 7 percent, it purchases an FRA at a rate of 6 percent. This contract would be referred to as a 1 × 4 FRA because it expires in one month (30 days) and the underlying Eurodollar matures four months (120 days) from now. Thirty days later, Libor is 7.5 percent. Demonstrate that ABTech's effective borrowing rate is 7 percent if Libor in 30 days is 7.5 percent.

Solution:

If Libor is 7.5 percent at the expiration of the FRA in 30 days, the payoff of the FRA is

$$\text{Notional principal} \times \left[\frac{\left(\begin{array}{c}\text{Underlying rate}\\ \text{at expiration}\end{array} - \text{Forward contract rate}\right)\left(\frac{\text{Days in underlying rate}}{360}\right)}{1 + \text{Underlying rate}\left(\frac{\text{Days in underlying rate}}{360}\right)}\right]$$

which is

$$\$10{,}000{,}000 \times \left[\frac{(0.075 - 0.06)(90/360)}{1 + 0.075(90/360)}\right] = \$36{,}810$$

Because this amount is a cash inflow, ABTech will not need to borrow a full \$10,000,000. Instead, it will borrow \$10,000,000 – \$36,810 = \$9,963,190.

The amount it will pay back in 90 days is

$$\$9{,}963{,}190[1 + (0.075 + 0.01)(90/360)] = \$10{,}174{,}908$$

The effective rate is, therefore,

$$\left(\frac{\$10{,}174{,}908}{\$10{,}000{,}000} - 1\right)\left(\frac{360}{90}\right) \approx 0.07$$

ABTech borrows at Libor plus 100 basis points. Therefore, using an FRA, it should be able to lock in the FRA rate (6 percent) plus 100 basis points, which it does.

2.1.2 *Floating-Rate Loan*

In the example above, the loan involved only a single payment and, therefore, we had only one setting of an interest rate to worry about. Many loans are floating-rate loans, meaning that their rates are reset several times during the life of the loan. This resetting of the rate poses a series of risks for the borrower.

Suppose a corporation is taking out a two-year loan. The rate for the initial six months is set today. The rate will be reset in 6, 12, and 18 months. Because the current rate is already in place, there is nothing the corporation can do to mitigate that risk.[2] It faces, however, the risk of rising interest rates over the remaining life of the loan, which would result in higher interest payments.

One way to control this risk is to enter into a series of FRA transactions with each component FRA tailored to expire on a date on which the rate will be reset. This strategy will not lock in the *same* fixed rate for each semiannual period, but different rates for each period will be locked in. Another alternative would be to use futures. For example, for a Libor-based loan, the Eurodollar futures contract would be appropriate. Nonetheless, the use of futures to manage this risk poses significant problems. One problem is that the Eurodollar futures contract has expirations only on specific days during the year. The Chicago Mercantile Exchange offers contract expirations on the current month, the next month, and a sequence of months following the pattern of March, June, September, and December. Thus, it is quite likely that no contracts would exist with expirations that align with the later payment reset dates. The Eurodollar futures contract expires on the second London business day before

2 If a corporation were planning to take out a floating-rate loan at a later date, it would also be concerned about the first interest rate and might attempt to lock in that rate. In the example used here, we placed the company in a situation in which it already knows its initial rate and, therefore, is worried only about the remaining rate resets.

the third Wednesday of the month. This date might not be the exact day of the month on which the rate is reset. In addition, the Eurodollar futures contract is based only on the 90-day Eurodollar rate, whereas the loan rate is pegged to the 180-day rate. Although many dealer firms use the Eurodollar futures contract to manage the risk associated with their over-the-counter derivatives, they do so using sophisticated techniques that measure and balance the volatility of the futures contract to the volatility of their market positions. Moreover, they adjust their positions rapidly in response to market movements. Without that capability, borrowers who simply need to align their interest rate reset dates with the dates on which their derivatives expire can do so more easily with swaps. We cover how this is done in the reading on risk management. Nevertheless, an understanding of how FRAs are used will help with an understanding of this application of swaps.

2.2 Strategies and Applications for Managing Bond Portfolio Risk

In Section 2.1, we dealt with the risk associated with short-term borrowing interest rates, which obviously affects short-term borrowers and lenders. The risk associated with longer-term loans primarily takes the form of bond market risk. Here we shall take a look at a firm managing a government bond portfolio, that is, a lending position. The firm can manage the risk associated with interest rates by using futures on government bonds. In the next three sections, we explore how to measure the risk of a bond portfolio, measure the risk of bond futures, and balance those risks.

2.2.1 *Measuring the Risk of a Bond Portfolio*

The sensitivity of a bond to a general change in interest rates is usually captured by assuming that the bond price changes in response to a change in its yield, which is driven by the general level of rates. The responsiveness of a bond price to a yield change is captured in two ways: duration and basis point value.[3]

Duration is a measure of the size and timing of the cash flows paid by a bond. It quantifies these factors by summarizing them in the form of a single number, which is interpreted as an average maturity of the bond. To speak in terms of an average maturity of a bond of a given specific maturity sounds somewhat strange, but remember that a coupon bond is really just a combination of zero-coupon bonds.[4] The average maturity of these component zero-coupon bonds is the duration. The average is not an ordinary average but a weighted average, with the weights based on the present values of the respective cash payments on the bonds. Hence, the weights are not equal, and the large principal repayment places the greatest emphasis on the final payment.

Suppose the bond price is B, the yield is y_B, and Macaulay duration is DUR_B. Then the relationship between the change in the bond price and its yield is given as

$$\Delta B \approx -DUR_B B \frac{\Delta y_B}{1 + y_B}$$

3 Readers may first wish to review some fixed-income securities material. See especially Chapter 7 of *Fixed Income Analysis for the Chartered Financial Analyst Program,* Frank J. Fabozzi (Frank J. Fabozzi Associates, 2000).

4 This analogy comes about because the coupons and final principal on a bond can be viewed as zero-coupon bonds, each maturing on the date on which a coupon or the final principal is paid. The value of a coupon or the final principal is analogous to the face value of a zero-coupon bond. In the US Treasury bond market, companies buy coupon bonds and sell claims on the individual coupons and principal, which are referred to as Treasury strips.

where the Greek symbol Δ indicates "change in" and where the overall relationship is shown as an approximation (≈). For this relationship to be exact requires that the yield change be very small.[5] The left-hand side, ΔB, is the change in the bond price. The negative sign on the right-hand side is consistent with the inverse relationship between the bond price and its yield.[6]

A somewhat simplified version of the above equation is

$$\Delta B \approx -MDUR_B B \Delta y_B$$

where $MDUR_B = DUR_B/(1 + y_B)$. $MDUR_B$ is called the **modified duration** and is just an adjustment of the duration for the level of the yield. We shall use the relationship as captured by the modified duration.[7]

As an example, suppose the bond price is $922.50, modified duration is 5.47 years, and the yield increases by 15 basis points. Then the price change should be approximately

$$\Delta B \approx -5.47(\$922.50)(0.0015) = -\$7.57$$

In response to a 15 basis point increase in yield, the bond price should decrease by approximately $7.57. So the new bond price would be predicted to be $922.50 – $7.57 = $914.93.

The relationship between the bond price and its yield is sometimes stated another way. We often speak in terms of the change in the bond price for a 1 basis point change in yield. This value is sometimes referred to as **basis point value (BPV)**, **present value of a basis point (PVBP)**, or **price value of a basis point** (again PVBP). We refer to this concept as PVBP, defined as

$$PVBP_B \approx MDUR_B B(0.0001)$$

The multiplication by 0.0001 enables PVBP to capture how much the bond price changes for a 1 basis point change. In the example above, the PVBP for our bond is

$$PVBP_B \approx (5.47)(\$922.50)(0.0001) = \$0.5046$$

So for a 1 basis point change, the bond price would change by approximately $0.5046. Accordingly, a 15 basis point change produces a price change of 15($0.5046) = $7.57. Both duration and PVBP measure the same thing, however, and we shall use only duration.

Duration and PVBP are usually thought of with respect to individual bonds, but in practice, they are typically used at the portfolio level. Hence, we should care more about the duration of a bond portfolio than about the duration of an individual bond. With respect to yield, we do not usually speak in terms of the yield of a bond portfolio, but in this case we must. A given bond portfolio can be thought of as a series of cash flows that can be captured in terms of a representative bond. Thus, we might describe this bond as a bond portfolio with a market value of $922.5 million, a modified duration of 5.47 years, and a portfolio yield that is a complex weighted average of the yields on the component bonds of the portfolio. The portfolio yield can change by a certain number of basis points. That yield change is a weighted average of the yield changes on the component bonds. Given such a yield change, the bond portfolio value will change in an approximate manner according to the duration formula shown above.

---

5 If the yield change is not sufficiently small, it may be necessary to incorporate second-order effects, which are captured by a bond's convexity.

6 The above relationship is based on annual coupons. If the coupons are paid semiannually, then $1 + y_B$ should be $1 + y_B/2$. In this case, the duration will be stated as the number of semiannual, rather than annual, periods.

7 The duration before dividing by $1 + y_B$ is sometimes called the **Macaulay duration**, to distinguish it from the modified duration. It is named for Frederick Macaulay, one of the economists who first derived it.

The way a bond price changes according to a yield change indicates its responsiveness to interest rates. Given a bond futures contract, we can also measure its sensitivity to interest rate changes.

2.2.2 *Measuring the Risk of Bond Futures*

Having measured the responsiveness of a bond portfolio to an interest rate change, we now need to measure the responsiveness of a futures contract to an interest rate change. Most bond futures contracts are based on a hypothetical benchmark bond. The Chicago Board of Trade's US Treasury bond futures contract is based on a 6 percent bond with at least 15 years from the futures expiration to maturity or the first call date. Even though the benchmark bond has a 6 percent coupon, any bond meeting the maturity requirement can be delivered. At any time, a single bond exists that the holder of the short position would find optimal to deliver if current conditions continued. That bond is called the **cheapest-to-deliver** and can be thought of as the bond on which the futures contract is based. In other words, the cheapest-to-deliver bond is the underlying. The responsiveness of the futures contract to an interest rate change is equivalent to the responsiveness of that bond on the futures expiration day to an interest rate change.

We can think of this concept as the responsiveness of the underlying bond in a forward context. This responsiveness can be measured as that bond's modified duration on the futures expiration and, as such, we can use the price sensitivity formula to capture the sensitivity of the futures contract to a yield change. Accordingly, we shall, somewhat loosely, refer to this as the implied duration of the futures contract, keeping in mind that what we mean is the duration of the underlying bond calculated as of the futures expiration. Moreover, we also mean that the underlying bond has been identified as the cheapest bond to deliver and that if another bond takes its place, the duration of that bond must be used. We use the term *implied* to emphasize that a futures contract does not itself have a duration but that its duration is implied by the underlying bond. In addition to the duration, we also require an **implied yield** on the futures, which reflects the yield on the underlying bond implied by pricing it as though it were delivered at the futures contract expiration.

Hence, we can express the sensitivity of the futures price to a yield change as

$$\Delta f \approx -\mathrm{MDUR}_f f \Delta y_f \tag{1}$$

where MDUR_f is the implied modified duration of the futures, f is the futures price, and Δy_f is the basis point change in the implied yield on the futures.

Now that we have a measure of the responsiveness of a bond portfolio and the responsiveness of a bond futures contract to interest rate changes, we should be able to find a way to balance the two to offset the risk.

2.2.3 *Balancing the Risk of a Bond Portfolio against the Risk of Bond Futures*

We now make the simple assumption that a single interest rate exists that drives all interest rates in the market. We assume that a 1 basis point change in this interest rate will cause a 1 basis point change in the yield on the bond portfolio and a 1 basis point change in the implied yield on the futures. We will relax that assumption later. For now, consider a money manager who holds a bond portfolio of a particular market value and will not be adding to it or removing some of it to balance the risk. In other words, the manager will not make any transactions in the actual bonds themselves. The manager can, however, trade any number of futures contracts to adjust the risk. Let N_f be the number of futures contracts traded. To balance the risk, suppose we

combine the change in the value of the bond portfolio and the change in the value of N_f futures and set these equal to zero: $\Delta B + N_f \Delta f = 0$. Solving for N_f produces $N_f = -\Delta B/\Delta f$. Substituting our formulas for ΔB and Δf, we obtain

$$N_f = -\left(\frac{MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)\left(\frac{\Delta y_B}{\Delta y_f}\right) = -\left(\frac{MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)$$

where we assume that $\Delta y_B/\Delta y_f = 1$; or in other words, the bond portfolio yield changes one-for-one with the implied yield on the futures.[8]

Now let us go back to the major simplifying assumption we made. We assumed that an interest rate change occurs in the market and drives the yield on the bond and the implied yield on the futures one-for-one. In reality, this assumption is unlikely to hold true. Suppose, for example, the rate driving all rates in the United States is the overnight Fed funds rate.[9] If this rate changes by 1 basis point, not all rates along the term structure are likely to change by 1 basis point. What actually matters, however, is not that all rates change by the same amount but that the yield on the bond portfolio and the implied yield on the futures change by the same amount for a 1 basis point change in this rate. If that is not the case, we need to make an adjustment.

Suppose the yield on the bond portfolio changes by a multiple of the implied yield on the futures in the following manner:

$$\Delta y_B = \beta_y \Delta y_f \qquad (2)$$

We refer to the symbol β_y as the **yield beta**. It can be more or less than 1, depending on whether the bond yield is more sensitive or less sensitive than the implied futures yield. If we take the formula we previously obtained for ΔB, substitute $\beta_y \Delta y_f$ where we previously had Δy_B, and use this new variation of the formula in the formula $N_f = -\Delta B/\Delta f$, we obtain

$$N_f = -(MDUR_B/MDUR_f)(B/f)\beta_y \qquad (3)$$

This is the more general formula, because $\beta_y = 1.0$ is just the special case we assumed at the start.

We can modify Equation 3 so that it gives us the number of futures contracts needed to change our portfolio's modified duration to meet a target. What we have done so far *completely* balances the risk of the futures position against the risk of the bond portfolio, eliminating the risk. In the practice of risk management, however, we might not always want to eliminate the risk; we might want to adjust it only a little. At some times we might even want to increase it.

The risk of the overall bond portfolio reflects the duration of the bonds and the duration of the futures. Suppose we consider a target overall modified duration of the portfolio, $MDUR_T$. This amount is our desired overall modified duration. Because the portfolio consists of bonds worth B and futures, which have zero value, the overall portfolio value is B.[10] Now we introduce the notion of a dollar duration, which is the duration times the market value. The target dollar duration of our portfolio is set equal to the dollar duration of the bonds we hold and the dollar duration of the futures contracts:

$$B(MDUR_T) = B(MDUR_B) + f(MDUR_f)N_f$$

8 Technically, this equation is the ratio of two approximate formulas, but we remove the approximation symbol from this point onward.

9 The overnight Fed funds rate is the rate that banks charge each other to borrow and lend excess reserves for one night.

10 Recall that futures contracts have value through the accumulation of price changes during a trading day. At the end of the day, all gains and losses are paid out through the marking-to-market process and the value then goes back to zero. We assume we are at one of those points at which the value is zero.

Solving for N_f, we obtain

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)$$

Observe that if we wish to increase the modified duration from $MDUR_B$ to something higher, then $MDUR_T$ is greater than $MDUR_B$ and the overall sign of N_f will be positive, so we buy futures. This relationship should make sense: Buying futures would add volatility and increase duration. If we wish to reduce the modified duration from $MDUR_B$ to something lower, then $MDUR_T$ will be less than $MDUR_B$ and the sign of N_f will be negative, meaning that we need to sell futures. Selling futures would reduce duration and volatility. In the extreme case in which we want to eliminate risk completely, we want $MDUR_T$ to equal zero. In that case, the above formula reduces to the original one we obtained earlier in this section for the case of completely eliminating risk. In a similar manner, if the bond and futures yields do not change one-for-one, we simply alter the above formula to

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)\beta_y \tag{4}$$

to incorporate the yield beta.

Now we explore how to use what we have learned in this section.

2.2.4 *Managing the Risk of a Government Bond Portfolio*

A money manager can use Equation 4 to determine the number of futures contracts to buy or sell to adjust the duration of a portfolio. Such a transaction might be done in anticipation of a strong or weak market in bonds over a temporary period of time. In Exhibit 2, we illustrate the case of a pension fund that wants to increase the portfolio duration. We see that the futures transaction was successful in increasing the duration but not as precisely as planned. In fact, even without doing the futures transaction, the portfolio duration was not exactly as the company had believed. Duration is not an exact measure, nor does the bond price change occur precisely according to the duration formula.[11]

Exhibit 2 Using Bond Futures to Manage the Risk of a Bond Portfolio

Scenario (7 July)

A portion of the pension fund of United Energy Services (UES) is a portfolio of US government bonds. On 7 July, UES obtained a forecast from its economist that over the next month, interest rates are likely to make a significant unexpected decline. Its portfolio manager would like to take a portion of the bond portfolio and increase the duration to take advantage of this forecasted market movement.

Specifically, UES would like to raise the duration on $75 million of bonds from its current level of 6.22 to 7.50. Both of these durations and all durations used in this problem are modified durations. UES has identified an appropriate Treasury bond futures contract that is currently priced at $82,500 and has an implied modified duration of 8.12. UES has estimated that the yield on the bond portfolio is about 5 percent more volatile than the implied yield on the futures. Thus, the yield beta is 1.05.

(continued)

11 For this reason, we stated that the bond price change, given the duration and yield change, is *approximately* given by the formula in the text.

Exhibit 2 (Continued)

Action

To increase the duration, UES will need to buy futures contracts. Specifically, the number of futures contracts UES should use is

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)\beta_y$$

$$= \left(\frac{7.50 - 6.22}{8.12}\right)\left(\frac{\$75{,}000{,}000}{\$82{,}500}\right)1.05 = 150.47$$

Because fractional contracts cannot be traded, UES will buy 150 contracts.

Scenario (6 August)

The implied yield on the futures has decreased by 35 basis points, and the futures price has now moved to $85,000.[12] The yield on the bond portfolio has decreased by 40 basis points, and the portfolio has increased in value by $1,933,500.

Outcome and Analysis

The profit on the futures transaction is found by multiplying the number of futures contracts by the difference between the new price and the old price:

Profit on futures contract = N_f(New futures price – Old futures price)

In this case, the profit on the futures contract is 150($85,000 – $82,500) = $375,000. Thus, the overall gain is $1,933,500 + $375,000 = $2,308,500.

How effective was the transaction? To answer this question, we compare the *ex post* duration to the planned duration. The purpose was to increase the duration from 6.22 to a planned 7.50. The return on the portfolio was

$$\frac{\$1{,}933{,}500}{\$75{,}000{,}000} = 0.0258$$

or 2.58 percent without the futures transaction, and

$$\frac{\$2{,}308{,}500}{\$75{,}000{,}000} = 0.0308$$

or 3.08 percent with the futures transaction. What does this set of calculations imply about the portfolio's *ex post* duration? Recall that duration is a measure of the percentage change in portfolio value with respect to a basis point change in yield. The *ex post* duration[13] of the portfolio can be measured by dividing the percentage change in portfolio value by the 40 basis point change in the portfolio yield:

$$\frac{0.0258}{0.0040} = 6.45$$

without the futures transaction and

$$\frac{0.0308}{0.0040} = 7.70$$

12 In the examples in this reading, bond futures prices move to a new level in the course of the scenario. These new futures prices come from the cost-of-carry model (assuming there is no mispricing in the market).

13 Of course, the *ex post* duration without the futures transaction is not exactly 6.22 because duration is an inexact measure, and the actual bond price change may not be precisely what is given by the modified duration formula.

Exhibit 2 (Continued)

with the futures transaction. UES came fairly close to achieving its desired increase in duration using futures.

In the example here, the fund increased its modified duration during a time when interest rates fell and the bond portfolio value increased. It leveraged itself to take advantage of a favorable outlook. Not all such decisions work out so well. Suppose in this example the economist had a different forecast, and as a result, UES wanted to eliminate all interest rate risk. So let us rework the problem under the assumption that the fund put on a full hedge, thereby reducing the modified duration to zero.

With $MDUR_T = 0$, the number of futures contracts would be

$$N_f = \left(\frac{0 - 6.22}{8.12}\right)\left(\frac{\$75{,}000{,}000}{\$82{,}500}\right)1.05 = -731.19$$

Thus, the fund would sell 731 contracts. The profit from the futures transaction[14] would be –731(\$85,000 – \$82,500) = –\$1,827,500. The overall transaction earned a profit of \$1,933,500 – \$1,827,500 = \$106,000, a gain of

$$\frac{\$106{,}000}{\$75{,}000{,}000} = 0.0014$$

or 0.14 percent. Thus, shorting the futures contracts virtually wiped out all of the gain from the decrease in interest rates. Our *ex ante* objective was to reduce the modified duration to zero. The *ex post* modified duration, however, turned out to be

$$\frac{0.0014}{0.0040} = 0.35$$

Thus, the modified duration was reduced almost to zero.

EXAMPLE 2

Debt Management Associates (DMA) offers fixed-income portfolio management services to institutional investors. It would like to execute a duration-changing strategy for a €100 million bond portfolio of a particular client. This portfolio has a modified duration of 7.2. DMA plans to change the modified duration to 5.00 by using a futures contract priced at €120,000, which has an implied modified duration of 6.25. The yield beta is 1.15.

A Determine how many futures contracts DMA should use and whether it should buy or sell futures.

B Suppose that the yield on the bond has decreased by 20 basis points at the horizon date. The bond portfolio increases in value by 1.5 percent. The futures price increases to €121,200. Determine the overall gain on the portfolio and the *ex post* modified duration as a result of the futures transaction.

14 Notice that in calculating the profit from a futures transaction, we multiply the number of futures contracts by the futures price at the close of the strategy minus the original futures price. It is important to maintain the correct sign for the number of futures contracts. This formulation always results in a positive number for N_f times the futures selling price and a negative number for N_f times the futures buying price, which should make sense. Of course, as previously noted, we also ignore the marking-to-market feature of futures contracts.

Solution to A:

The appropriate number of futures contracts is

$$N_f = \left(\frac{5 - 7.2}{6.25}\right)\left(\frac{100{,}000{,}000}{120.000}\right)1.15 = -337.33$$

So DMA should sell 337 contracts.

Solution to B:

The value of the bond portfolio will be €100,000,000(1.015) = €101,500,000. The profit on the futures transaction is –337(€121,200 – 120,000) = –€404,400; a loss of €404,400. Thus, the overall value of the position is €101,500,000 – €404,400 = €101,095,600, a return of approximately 1.1 percent. The bond yield decreases by 20 basis points and the portfolio gains 1.1 percent. The *ex post* modified duration would be 0.0110/0.0020 = 5.50.

Changing the duration—whether increasing it, reducing it partially, or reducing it all the way to zero—is an inexact process. More importantly, however, risk management by adjusting duration is only a means of implementing a strategy in response to an outlook. No one can guarantee that the outlook will not be wrong.

2.2.5 *Some Variations and Problems in Managing Bond Portfolio Risk*

In the examples used here, the bond portfolio consisted of government bonds. Of course, corporate and municipal bonds are widely held in bond portfolios. Unfortunately, there is no corporate bond futures contract.[15] A municipal bond futures contract exists in the United States, based on an index of municipal bonds, but its volume is relatively light and the contract may not be sufficiently liquid for a large-size transaction.[16] Government bond futures contracts tend to be relatively liquid. In fact, in the United States, different contracts exist for government securities of different maturity ranges, and most of these contracts are relatively liquid.

If one uses a government bond futures to manage the risk of a corporate or municipal bond portfolio, there are some additional risks to deal with. For instance, the relationship between the yield change that drives the futures contract and the yield change that drives the bond portfolio is not as reliable. The yield on a corporate or municipal bond is driven not only by interest rates but also by the perceived default risk of the bond. We might believe that the yield beta is 1.20, meaning that the yield on a corporate bond portfolio is about 20 percent more volatile than the implied yield that drives the futures contract. But this relationship is usually estimated from a regression of corporate bond yield changes on government bond yield changes. This relationship is less stable than if we were running a regression of government bond yield changes on yield changes of a different government bond, the one underlying the futures.

In addition, corporate and municipal bonds often have call features that can greatly distort the relationship between duration and yield change and also make the measurement of duration more complicated. For example, when a bond's yield decreases, its price should increase. The duration is meant to show approximately how much the bond's price should increase. But when the bond is callable and the yield enters into

15 There have been attempts to create futures contracts on corporate bonds, but these contracts have not been successful in generating enough trading volume to survive.

16 In the Commodity Futures Trading Commission's fiscal year 2001, the Chicago Board of Trade's municipal bond futures contract traded about 1,400 contracts a day. Each contract is worth about $100,000 of municipal bonds. Thus, the average daily volume amounts to about $140 million of municipal bonds—not a very large amount relative to the size of the municipal bond market.

the region in which a call becomes more likely, its price will increase by far less than predicted by the duration. Moreover, the call feature complicates the measurement of duration itself. Duration is no longer a weighted-average maturity of the bond.

Finally, we should note that corporate and municipal bonds are subject to default risk that is not present in government bonds. As the risk of default changes, the yield spread on the defaultable bond relative to the default-free government bond increases. This effect further destabilizes the relationship between the bond portfolio value and the futures price so that duration-based formulas for the number of futures contracts tend to be unreliable.

It is tempting to think that if one wants to increase (decrease) duration and buys (sells) futures contracts, that at least the transaction was the right type even if the number of futures contracts is not exactly correct. The problem, however, is that changes in the bond portfolio value that are driven by changes in default risk or the effects of call provisions will not be matched by movements in the futures contract. The outcome will not always be what is expected.

Another problem associated with the modified duration approach to measuring and managing bond portfolio risk is that the relationship between duration and yield change used here is an instantaneous one. It captures *approximately* how a bond price changes in response to an immediate and very small yield change. As soon as the yield changes or an instant of time passes, the duration changes. Then the number of futures contracts required would change. Thus, the positions described here would need to be revised. Most bond portfolio managers do not perform these kinds of frequent adjustments, however, and simply accept that the transaction will not work precisely as planned.

We should also consider the alternative that the fund could adjust the duration by making transactions in the bonds themselves. It could sell relatively low-duration bonds and buy relatively high-duration bonds to raise the duration to the desired level. There is still no guarantee, however, that the actual duration will be exactly as desired. Likewise, to reduce the duration to zero, the fund could sell out the entire bond portfolio and place the proceeds in cash securities that have low duration. Reducing the duration to essentially zero would be easier to do than increasing it, because it would not be hard to buy bonds with essentially zero duration. Liquidating the entire portfolio, however, would be quite a drastic thing to do, especially given that the fund would likely remain in that position for only a temporary period.

Raising the duration by purchasing higher-duration bonds would be a great deal of effort to expend if the position is being altered only temporarily. Moreover, the transaction costs of buying and selling actual securities are much greater than those of buying and selling futures.

In this reading, we shall consider these adjustments as advanced refinements that one should understand before putting these types of transactions into practice. Although we need to be aware of these technical complications, we shall ignore them in the examples here.

END OPTIONAL SEGMENT

Now let us take a look at managing risk in the equity market.

STRATEGIES AND APPLICATIONS FOR MANAGING EQUITY MARKET RISK

3

Even though interest rates are volatile, the stock market is even more volatile. Hence, the risk associated with stock market volatility is greater than that of bond market volatility. Fortunately, the stock market is generally more liquid than the bond market, at least compared with long-term and corporate and municipal bonds. The risk

associated with stock market volatility can be managed relatively well with futures contracts. As we have previously noted, these contracts are based on stock market indexes and not individual stocks. Although futures on individual stocks are available, most diversified investors manage risk at the portfolio level, thereby preferring futures on broad-based indexes. Accordingly, this will be our focus in this reading. We look more specifically at the risk of managing individual stocks in the reading on risk management applications of option strategies.

3.1 Measuring and Managing the Risk of Equities

Futures provide the best way to manage the risk of diversified equity portfolios. Although the standard deviation, or volatility, is a common measure of stock market risk, we prefer a measure that more accurately reflects the risk of a diversified stock portfolio. One reason for this preference is that we shall use futures that are based on broadly diversified portfolios. The most common risk measure of this type is the **beta**,[17] often denoted with the Greek symbol β. Beta is an important factor in capital market and asset pricing theory and, as we see here, it plays a major role in risk management. Although you may have encountered beta elsewhere, we shall take a quick review of it here.

Beta measures the relationship between a stock portfolio and the market portfolio, which is an abstract hypothetical measure of the portfolio containing *all* risky assets, not just stocks. The market portfolio is the most broadly diversified portfolio of all. We know, however, that it is impossible to identify the composition of the true market portfolio. We tend to use proxies, such as the S&P 500 Index, which do not really capture the true market portfolio. Fortunately, for the purposes of risk management, precision in the market portfolio does not matter all that much. Obviously there are no futures contracts on the true market portfolio; there can be futures contracts only on proxies such as the S&P 500. That being the case, it is appropriate to measure the beta of a portfolio relative to the index on which the futures is based.

Beta is a relative risk measure. The beta of the index we use as a benchmark is 1.0. Ignoring any asset-specific risk, an asset with a beta of 1.10 is 10 percent more volatile than the index. A beta of 0.80 is 20 percent less volatile than the index. Beta is formally measured as

$$\beta = \frac{\text{cov}_{\text{SI}}}{\sigma_{\text{I}}^2}$$

where cov_{SI} is the covariance between the stock portfolio and the index and σ_{I}^2 is the variance of the index. Covariance is a measure of the extent to which two assets, here the portfolio and the index, move together.[18] If the covariance is positive (negative), the portfolio and the index tend to move in the same (opposite) direction. By itself, the magnitude of the covariance is difficult to interpret, but the covariance divided by the product of the standard deviations of the stock and the index produces the familiar measure called the correlation coefficient. For beta, however, we divide the covariance by the variance of the index and obtain a measure of the volatility of the portfolio relative to the market.

17 At this point, we must distinguish this beta from the yield beta. When we use the term "yield beta," we mean the relationship of the yield on the instrument being hedged to the implied yield on the futures. When we use the term "beta" without a modifier, we mean the relationship of a stock or portfolio to the market.
18 More specifically, the covariance measures the extent to which the *returns* on the stock and the index move together.

It is important to emphasize that beta measures only the portfolio volatility relative to the index. Thus, it is a measure only of the risk that cannot be eliminated by diversifying a portfolio. This risk is called the systematic, nondiversifiable, or market risk. A portfolio that is not well diversified could contain additional risk, which is called the nonsystematic, diversifiable, or asset-specific risk.[19] Systematic risk is the risk associated with broad market movements; nonsystematic risk is the risk unique to a company. An example of the former might be a change in interest rates by the Federal Reserve; an example of the latter might be a labor strike on a particular company. Because it captures only systematic risk, beta may seem to be a limited measure of risk, but the best way to manage nonsystematic risk, other than diversification, is to use options, as we do in the reading on risk management applications of option strategies. At this point, we focus on managing systematic or market risk.

As a risk measure, beta is similar to duration. Recall that we captured the dollar risk by multiplying the modified duration by the dollar value of the portfolio. For the bond futures contract, we multiplied its implied modified duration by the futures price. We called this the dollar-implied modified duration. In a similar manner, we shall specify a dollar beta by multiplying the beta by the dollar value of the portfolio. For the futures, we shall multiply its beta by the futures price, f. For the futures contract, beta is often assumed to be 1.0, but that is not exactly the case, so we will specify it as β_f. The dollar beta of the futures contract is $\beta_f f$. The dollar beta of the stock portfolio is written as $\beta_S S$, where β_S is the beta of the stock portfolio and S is the market value of the stock portfolio.

If we wish to change the beta, we specify the desired beta as a target beta of β_T. Because the value of the futures starts off each day as zero, the dollar beta of the combination of stock and futures if the target beta is achieved is $\beta_T S$.[20] The number of futures we shall use is N_f, which is the unknown that we are attempting to determine. We set the target dollar beta to the dollar beta of the stock portfolio and the dollar beta of N_f futures:

$$\beta_T S = \beta_S S + N_f \beta_f f$$

We then solve for N_f and obtain

$$N_f = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right) \tag{5}$$

Observe that if we want to increase the beta, β_T will exceed β_S and the sign of N_f will be positive, which means that we must buy futures. If we want to decrease the beta, β_T will be less than β_S, the sign of N_f will be negative, and we must sell futures. This relationship should make sense: Selling futures will offset some of the risk of holding the stock. Alternatively, buying futures will add risk as $\beta_T > \beta_S$ and $N_f > 0$.

In the special case in which we want to completely eliminate the risk, β_T would be zero and the formula would reduce to

$$N_f = -\left(\frac{\beta_S}{\beta_f}\right)\left(\frac{S}{f}\right)$$

In this case, the sign of N_f will always be negative, which makes sense. To hedge away all of the risk, we definitely need to sell futures.

19 We also sometimes use the term "idiosyncratic risk."

20 Recall that the market value of the portfolio will still be the same as the market value of the stock, because the value of the futures is zero. The futures value becomes zero whenever it is marked to market, which takes place at the end of each day. In other words, the target beta does not appear to be applied to the value of the futures in the above analysis because the value of the futures is zero.

In the practical implementation of a stock index futures trade, we need to remember that stock index futures prices are quoted on an order of magnitude the same as that of the stock index. The actual futures price is the quoted futures price times a designated multiplier. For example, if the S&P 500 futures price is quoted at 1225, the multiplier of $250 makes the actual futures price 1225($250) = $306,250. This amount would be the value of f in the above formulas. In some situations, the futures price will simply be stated, as for example $306,250. In that case, we can assume the price is quoted as f = $306,250 and the multiplier is 1.

We also need to remember that the futures contract will hedge only the risk associated with the relationship between the portfolio and the index on which the futures contract is based. Thus, for example, a portfolio consisting mostly of small-cap stocks should not be paired with a futures contract on a large-cap index such as the S&P 500. Such a transaction would manage only the risk that large-cap stocks move with small-cap stocks. If any divergence occurs in the relationship between these two sectors, such as large-cap stocks going up and small-cap stocks going down, a transaction designed to increase (decrease) risk could end up decreasing (increasing) risk.

Recall also that dividends can interfere with how this transaction performs. Index futures typically are based only on price indexes; they do not reflect the payment and reinvestment of dividends. Therefore, dividends will accrue on the stocks but are not reflected in the index. This is not a major problem, however, because dividends in the short-term period covered by most contracts are not particularly risky.

3.2 Managing the Risk of an Equity Portfolio

To adjust the beta of an equity portfolio, an investment manager could use Equation 5 to calculate the number of futures contracts needed. She can use the formula to either increase or decrease the portfolio's systematic risk. The manager might increase the beta if she expects the market to move up, or decrease the beta if she expects the market to move down. Also, the betas of equity portfolios change constantly by virtue of the market value of the portfolio changing.[21] Therefore, futures can be used to adjust the beta from its actual level to the desired level.

Exhibit 3 illustrates the case of a pension fund that wants to increase its equity portfolio beta during a period in which it expects the market to be strong. It increases its beta from 0.90 to 1.10 by purchasing 29 futures contracts. Betas, however, are notoriously difficult to measure. We see after the fact that the beta actually was increased to 1.15. As long as we buy (sell) futures contracts, however, we will increase (decrease) the beta.

Exhibit 3 Using Stock Index Futures to Manage the Risk of a Stock Portfolio

Scenario (2 September)

BB Holdings (BBH) is a US conglomerate. Its pension fund generates market forecasts internally and receives forecasts from an independent consultant. As a result of these forecasts, BBH expects the market for large-cap stocks to be stronger than it believes everyone else is expecting over the next two months.

21 Consider, for example, a portfolio in which $3 million is invested in stock with a beta of 1.0 and $1 million is invested in cash with a beta of 0.0 and a rate of 5 percent. The equity market weight is, therefore, 0.75, and the overall beta is 1.0(0.75) + 0.0(0.25) = 0.75. Now suppose the following year, the stock increases by 20 percent. Then the stock value will be $3.6 million and the cash balance will be $1.05 million. The overall portfolio value will be $4.65 million, so the equity market weight will be 3.6/4.65 = 0.77. Thus, 77 percent of the portfolio will now have a beta of 1.0(0.77), and the overall beta will have drifted upward to 0.77.

Exhibit 3 (Continued)

Action

BBH decides to adjust the beta on $38,500,000 of large-cap stocks from its current level of 0.90 to 1.10 for the period of the next two months. It has selected a futures contract deemed to have sufficient liquidity; the futures price is currently $275,000 and the contract has a beta of 0.95. The appropriate number of futures contracts to adjust the beta would be

$$N_f = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right) = \left(\frac{1.10 - 0.90}{0.95}\right)\left(\frac{\$38{,}500{,}000}{\$275{,}000}\right) = 29.47$$

So it buys 29 contracts.

Scenario (3 December)

The market as a whole increases by 4.4 percent. The stock portfolio increases to $40,103,000. The stock index futures contract rises to $286,687.50,[22] an increase of 4.25 percent.

Outcome and Analysis

The profit on the futures contract is 29($286,687.50 – $275,000.00) = $338,937.50. The rate of return for the stock portfolio is

$$\frac{\$40{,}103{,}000}{\$38{,}500{,}000} - 1 = 0.0416$$

or 4.16 percent. Adding the profit from the futures gives a total market value of $40,103,000.00 + $338,937.50 = $40,441,937.50. The rate of return for the stock portfolio is

$$\frac{\$40{,}441{,}937.50}{\$38{,}500{,}000.00} - 1 = 0.0504$$

or 5.04 percent. Because the market went up by 4.4 percent and the overall gain was 5.04 percent, the effective beta of the portfolio was

$$\frac{0.0504}{0.044} = 1.15$$

Thus, the effective beta is quite close to the target beta of 1.10.

Of course, be aware that increasing the beta increases the risk. Therefore, if the beta is increased and the market falls, the loss on the portfolio will be greater than if beta had not been increased. Decreasing the beta decreases the risk, so if the market rises, the portfolio value will rise less. As an example, consider the outcome described in Exhibit 3. Suppose that instead of being optimistic, the fund manager was very pessimistic and wanted to decrease the beta to zero. Therefore, the target beta, β_T, is 0.0. Then the number of futures contracts would be

$$N_f = \left(\frac{0.0 - 0.90}{0.95}\right)\frac{\$38{,}500{,}000}{\$275{,}000.00} = -132.63$$

So the fund sells 133 futures. Given the same outcome as in Exhibit 3, the profit on the futures contracts would be

–133($286,687.50 – $275,000.00) = –$1,554,437.50

22 In the examples in this reading, stock futures prices move to a new level in the course of the scenario. These new futures prices come from the cost-of-carry model (assuming there is no mispricing in the market).

There would be a loss of more than $1.5 million on the futures contracts. The market value of the stock after it moved up was $40,103,000, but with the futures loss, the market value is effectively reduced to $40,103,000.00 – $1,554,437.50 = $38,548,562.50. This is a return of

$$\frac{\$38,548,562.50}{\$38,500,000.00} - 1 = 0.0013$$

Thus, the effective beta is

$$\frac{0.0013}{0.044} = 0.030$$

The beta has been reduced almost to zero. This reduction costs the company virtually all of the upward movement, but such a cost is to be expected if the beta were changed to zero.

EXAMPLE 3

Equity Analysts Inc. (EQA) is an equity portfolio management firm. One of its clients has decided to be more aggressive for a short period of time. It would like EQA to move the beta on its $65 million portfolio from 0.85 to 1.05. EQA can use a futures contract priced at $188,500, which has a beta of 0.92, to implement this change in risk.

A Determine the number of futures contracts EQA should use and whether it should buy or sell futures.

B At the horizon date, the equity market is down 2 percent. The stock portfolio falls 1.65 percent, and the futures price falls to $185,000. Determine the overall value of the position and the effective beta.

Solution to A:

The number of futures contracts EQA should use is

$$N_f = \left(\frac{1.05 - 0.85}{0.92}\right)\left(\frac{\$65,000,000}{\$188,500}\right) = 74.96$$

So EQA should buy 75 contracts.

Solution to B:

The value of the stock portfolio will be $65,000,000(1 – 0.0165) = $63,927,500. The profit on the futures transaction is 75($185,000 – $188,500) = –$262,500. The overall value of the position is $63,927,500 – $262,500 = $63,665,000.

Thus, the overall return is $\frac{\$63,665,000}{\$65,000,000} - 1 = -0.0205$

Because the market went down by 2 percent, the effective beta is 0.0205/0.02 = 1.025.

3.3 Creating Equity out of Cash

Stock index futures are an excellent tool for creating synthetic positions in equity, which can result in significant transaction cost savings and preserve liquidity. In this section, we explore how to create a synthetic index fund and how to turn cash into synthetic equity.

The relationship between a futures or forward contract and the underlying asset is determined by a formula that relates the risk-free interest rate to the dividends on the underlying asset. Entering into a hypothetical arbitrage transaction in which we buy stock and sell futures turns an equity position into a risk-free portfolio. In simple terms, we say that

Long stock + Short futures = Long risk-free bond

We can turn this equation around to obtain[23]

Long stock = Long risk-free bond + Long futures

If we buy the risk-free bonds and buy the futures, we replicate a position in which we would be buying the stock. This synthetic replication of the underlying asset can be a very useful transaction when we wish to construct a synthetic stock index fund, or when we wish to convert into equity a cash position that we are required to maintain for liquidity purposes. Both of these situations involve holding cash and obtaining equity market exposure through the use of futures.

3.3.1 *Creating a Synthetic Index Fund*

A synthetic index fund is an index fund position created by combining risk-free bonds and futures on the desired index. Suppose a US money manager would like to offer a new product, a fund on an index of UK stock as represented by the Financial Times Stock Exchange (FTSE) 100 Index. The manager will initiate the fund with an investment of £100 million. In other words, the US money manager would offer clients an opportunity to invest in a position in British stock with the investment made in British pounds.[24] The manager believes the fund is easier to create synthetically using futures contracts.

To create this synthetic index fund, we need to know several more pieces of information. The dividend yield on the UK stocks is 2.5 percent, and the FTSE 100 Index futures contract that we shall use expires in three months, has a quoted price of £4,000, and has a multiplier of £10.[25] The UK risk-free interest rate is 5 percent.[26] When the futures contract expires, it will be rolled over into a new contract.

23 We turn the equation around by noting that to remove a short futures position from the left-hand side, we should buy futures. If we add a long futures position to the left-hand side, we have to add it to the right-hand side.

24 If you are wondering why US investors would like to invest in a position denominated in British pounds rather than dollars, remember that the currency risk can be a source of diversification. Adding a position in the UK equity market provides one tier of diversification, while adding the risk of the dollar/pound exchange rate adds another tier of diversification, especially because the exchange rate is likely to have a low correlation with the US stock market.

25 Recall that the multiplier is a number multiplied by the quoted futures price to obtain the actual futures price. In this section, accurately pricing the futures contract is important to the success of these strategies. For example, assume the S&P 500 is at 1,000 and the multiplier is $250, so the full price is (1,000)($250) = $250,000. We wish to trade a futures contract priced at f, where f is based on the index value of 1,000 grossed up by the risk-free rate and reduced by the dividends. It is far easier to think of f in terms of its relationship to S without the multiplier. In one case, however, we shall let the multiplier be 1, so you should be able to handle either situation.

26 It might be confusing as to why we care about the UK interest rate and not the US interest rate. This transaction is completely denominated in pounds, and the futures contract is priced in pounds based on the UK dividend yield and interest rate. Hence, the UK interest rate plays a role here, and the US interest rate does not.

To create this synthetic index fund, we must buy a certain number of futures. Let the following be the appropriate values of the inputs:

V = amount of money to be invested, £100 million
f = futures price, £4,000
T = time to expiration of futures, 0.25
δ = dividend yield on the index, 0.025
r = risk-free rate, 0.05
q = multiplier, £10

We would like to replicate owning the stock and reinvesting the dividends. How many futures contracts would we need to buy and add to a long bond position? We designate N_f as the required number of futures contracts and N_f^* as its rounded-off value.

Now observe that the payoff of N_f^* futures contracts will be $N_f^*q(S_T - f)$. This equation is based on the fact that we have N_f^* futures contracts, each of which has a multiplier of q. The futures contracts are established at a price of f. When it expires, the futures price will be the spot price, S_T, reflecting the convergence of the futures price at expiration to the spot price.

The futures payoff can be rewritten as $N_f^*qS_T - N_f^*qf$. The minus sign on the second term means that we shall have to pay N_f^*qf. The (implied) plus sign on the first term means that we shall receive $N_f^*qS_T$. Knowing that we buy N_f^* futures contracts, we also want to know how much to invest in bonds. We shall call this V^* and calculate it based on N_f^*. Below we shall show how to calculate N_f^* and V^*. If we invest enough money in bonds to accumulate a value of N_f^*qf, this investment will cover the amount we agree to pay for the FTSE: $N_f^* \times q \times f$. The present value of this amount is $N_f^*qf/(1 + r)^T$.

Because the amount of money we start with is V, we should have V equal to $N_f^*qf/(1 + r)^T$. From here we can solve for N_f^* to obtain

$$N_f^* = \frac{V(1+r)^T}{qf} \quad \text{(rounded to an integer)} \tag{6}$$

But once we round off the number of futures, we do not truly have V dollars invested. The amount we actually have invested is

$$V^* = \frac{N_f^* qf}{(1+r)^T} \tag{7}$$

We can show that investing V^* in bonds and buying N_f^* futures contracts at a price of f is equivalent to buying $N_f^*q/(1 + \delta)^T$ units of stock.

As noted above, if we have bonds maturing to the value N_f^*qf, we have enough cash on hand to pay the obligation of N_f^*qf on our futures contract. The futures contract will pay us the amount $N_f^*qS_T$. If we had actually purchased units of stock, the reinvestment of dividends into new units means that we would end up with the equivalent of N_f^*q units, and means that we implicitly started off with $N_f^*q/(1 + \delta)^T$ units.

In short, this transaction implies that we synthetically start off with $N_f^*q/(1 + \delta)^T$ units of stock, collect and reinvest dividends, and end up with N_f^*q units. We emphasize that all of these transactions are synthetic. We do not actually own the stock or collect and reinvest the dividends. We are attempting only to replicate what would happen if we actually owned the stock and collected and reinvested the dividends.

Exhibit 4 illustrates this transaction. The interest plus principal on the bonds is a sufficient amount to buy the stock in settlement of the futures contract, so the fund ends up holding the stock, as it originally wanted.

Exhibit 4 Constructing a Synthetic Index Fund

Scenario (15 December)

On 15 December, a US money manager for a firm called Strategic Money Management (SMM) wants to construct a synthetic index fund consisting of a position of £100 million invested in UK stock. The index will be the FTSE 100, which has a dividend yield of 2.5 percent. A futures contract on the FTSE 100 is priced at £4,000 and has a multiplier of £10. The position will be held until the futures expires in three months, at which time it will be renewed with a new three-month futures. The UK risk-free rate is 5 percent. Both the risk-free rate and the dividend yield are stated as annually compounded figures.

Action

The number of futures contracts will be

$$N_f = \frac{V(1+r)^T}{qf} = \frac{£100{,}000{,}000(1.05)^{0.25}}{£10(4{,}000)} = 2{,}530.68$$

Because we cannot buy fractions of futures contracts, we round N_f to N_f^* = 2,531. With this rounding, we are actually synthetically investing

$$\frac{2{,}531(£10)£4{,}000}{(1.05)^{0.25}} = £100{,}012{,}622$$

in stock. So we put this much money in risk-free bonds, which will grow to £100,012,622$(1.05)^{0.25}$ = £101,240,000. The number of units of stock that we have effectively purchased at the start is

$$\frac{N_f{*}q}{(1+\delta)^T} = \frac{2{,}531(10)}{(1.025)^{0.25}} = 25{,}154.24$$

If the stock had actually been purchased, dividends would be received and reinvested into additional shares. Thus, the number of shares would grow to 25,154.24$(1.025)^{0.25}$ = 25,310.

Scenario (15 March)

The index is at S_T when the futures expires.

Outcome and Analysis

The futures contracts will pay off the amount

$$\text{Futures payoff} = 2{,}531(£10)(S_T - £4{,}000) = £25{,}310S_T - £101{,}240{,}000$$

This means that the fund will pay £101,240,000 to settle the futures contract and obtain the market value of 25,310 units of the FTSE 100, each worth S_T. Therefore, the fund will need to come up with £101,240,000, but as noted above, the money invested in risk-free bonds grows to a value of £101,240,000.

SMM, therefore, pays this amount to settle the futures contracts and effectively ends up with 25,310 units of the index, the position it wanted in the market.

There are a few other considerations to note. One is that we rounded according to the usual rules of rounding, going up if the fraction is 0.5 or greater. By rounding up, we shall have to invest more than V in bonds. If we rounded down, we shall invest less than V. It does not really matter whether we always round up on 0.5 or greater, but that is the rule we shall use here. It should also be noted that this transaction does not capture the dividends that would be earned if one held the underlying stocks directly.

The yield of 2.5 percent is important in the computations here, but the fund does not earn these dividends. All this transaction does is capture the performance of the index. Because the index is a price index only and does not include dividends, this synthetic replication strategy can capture only the index performance without the dividends.[27] Another concern that could be encountered in practice is that the futures contract could expire later than the desired date. If so, the strategy will still be successful if the futures contract is correctly priced when the strategy is completed. Consistent with that point, we should note that any strategy using futures will be effective only to the extent that the futures contract is correctly priced when the position is opened and also when it is closed. This point underscores the importance of understanding the pricing of futures contracts.

3.3.2 *Equitizing Cash*

The strategy of combining risk-free bonds and futures is used not only to replicate an index; it is also used to take a given amount of cash and turn it into an equity position while maintaining the liquidity provided by the cash. This type of transaction is sometimes called equitizing cash. Consider an investment fund that has a large cash balance. It would like to invest in equity but either is not allowed to do so or cannot afford to take the risk that it might need to liquidate a large amount of stock in a short period of time, which could be difficult to do or might result in significant losses. Nonetheless, the fund is willing to take the risk of equity market exposure provided it can maintain the liquidity. The above transaction can be altered just slightly to show how this is done.

Suppose the fund in Exhibit 4 is actually a UK insurance company that has about £100 million of cash invested at the risk-free rate. It would like to gain equity market exposure by investing in the FTSE 100 index. By policy, it is allowed to do so, provided that it maintains sufficient liquidity. If it engages in the synthetic index strategy described above, it maintains about £100 million invested in cash in the form of risk-free bonds and yet gains the exposure to about £100 million of UK stock. In the event that it must liquidate its position, perhaps to pay out insurance claims, it need only liquidate the UK risk-free bonds and close out the futures contracts. Given the liquidity of the futures market and the obvious liquidity of the risk-free bond market, doing so would be relatively easy.

There is one important aspect of this problem, however, over which the fund has no control: the pricing of the futures. Because the fund will take a long position in futures, the futures contract must be correctly priced. If the futures contract is overpriced, the fund will pay too much for the futures. In that case, the risk-free bonds will not be enough to offset the excessively high price effectively paid for the stock. If, however, the futures contract is underpriced, the fund will get a bargain and will come out much better.

Finally, we should note that these strategies can be illustrated with bond futures to gain bond market exposure, but they are more commonly implemented using stock index futures to gain equity market exposure.

EXAMPLE 4

Index Advantage (INDEXA) is a money management firm that specializes in turning the idle cash of clients into equity index positions at very low cost. INDEXA has a new client with about $500 million of cash that it would like to

27 The values of some stock indexes, called total return indexes, include reinvested dividends. If a futures contract on the total return index is used, then the strategy would capture the dividends. Doing so would, however, require a few changes to the formulas given here.

invest in the small-cap equity sector. INDEXA will construct the position using a futures contract on a small-cap index. The futures price is 1,500, the multiplier is \$100, and the contract expires in six months. The underlying small-cap index has a dividend yield of 1 percent. The risk-free rate is 3 percent per year.

A Determine exactly how the cash can be equitized using futures contracts.

B When the futures contract expires, the index is at S_T. Demonstrate how the position produces the same outcome as an actual investment in the index.

Solution to A:

INDEXA should purchase

$$N_f = \frac{\$500{,}000{,}000(1.03)^{0.5}}{\$100(1{,}500)} = 3{,}382.96$$

futures contracts. Round this amount to $N_f^* = 3{,}383$. Then invest

$$\frac{3{,}383(\$100)(1{,}500)}{(1.03)^{0.5}} = \$500{,}005{,}342$$

in risk-free bonds paying 3 percent interest. Note that this is not exactly an initial investment of \$500 million, because one cannot purchase fractions of futures contracts. The bonds will grow to a value of $\$500{,}005{,}342(1.03)^{0.5} = \$507{,}450{,}000$. The number of units of stock effectively purchased through the use of futures is

$$\frac{N_f{}^*q}{(1+\delta)^T} = \frac{3{,}383(100)}{(1.01)^{0.5}} = 336{,}621.08$$

If 336,621.08 shares were actually purchased, the accumulation and reinvestment of dividends would result in there being $336{,}621.08\ (1.01)^{0.5} = 338{,}300$ shares at the futures expiration.

Solution to B:

At expiration, the payoff on the futures is

$$3{,}383(100)(S_T - 1500) = 338{,}300S_T - \$507{,}450{,}000$$

In other words, to settle the futures, INDEXA will owe \$507,450,000 and receive the equivalent of 338,300 units of stock worth S_T.

3.4 Creating Cash out of Equity

Because we have the relation Long stock + Short futures = Long risk-free bonds, we should be able to construct a synthetic position in cash by selling futures against a long stock position. Indeed we have already done a similar transaction when we sold futures to reduce the stock portfolio beta to zero. Therefore, if we wish to sell stock, we can do so by converting it to synthetic cash. This move can save transaction costs and avoid the sale of large amounts of stock at a single point in time.

Suppose the market value of our investment in stock is V, and we would like to create synthetic cash roughly equivalent to that amount. We shall sell futures, with the objective that at the horizon date, we shall have $V(1 + r)^T$. Money in the amount of V will have grown in value at the risk-free rate. Each unit of the index is priced at S. The number of units of the index we shall effectively convert to cash would appear to be (V/S), but because of reinvested dividends, we actually end up with $(1 + \delta)^T$ units of stock for every unit we start with. Hence, the number of units we are effectively converting to cash is $(V/S)(1 + \delta)^T$.

As in the example of the synthetic index fund, we shall again have a problem in that the number of futures contracts must be rounded off to an integer. Keeping that in mind, the payoff of the futures contracts will be $qN_f^*(S_T - f) = qN_f^*S_T - qN_f^*f$. If the number of units of stock is $(V/S)(1 + \delta)^T$, then the value of the overall position (long stock plus short futures) will be $(V/S)(1 + \delta)^T S_T + qN_f^*S_T - qN_f^*f$. Because we are trying to convert to risk-free bonds (cash), we need to find a way to eliminate the S_T term. We just solve for the value of N_f^* that will cause the first two terms to offset.[28] We obtain a previous equation, Equation 6

$$N_f^* = -\frac{V(1+r)^T}{qf} \quad \text{(rounded to an integer)}$$

As usual, the minus sign means that N_f^* is less than zero, which means we are selling futures. Because of rounding, the amount of stock we are actually converting is

$$V^* = \frac{-N_f^* qf}{(1+r)^T} \tag{8}$$

Therefore, if we use N_f^* futures contracts, we have effectively converted stock worth V^* to cash. This will not be the exact amount of stock we own, but it will be close. As in the case of the synthetic index fund, reinvestment of dividends means that the number of units of stock will be $-N_f^*q/(1 + \delta)^T$ at the start and $-N_f^*q$ when the futures expires. In Exhibit 5, we illustrate the application of this strategy for a pension fund that would like to convert \$50 million of stock to synthetic cash.

Exhibit 5 Creating Synthetic Cash

Scenario (2 June)

The pension fund of Interactive Industrial Systems (IIS) holds a \$50 million portion of its portfolio in an indexed position of the NASDAQ 100, which has a dividend yield of 0.75 percent. It would like to convert that position to cash for a two-month period. It can do this using a futures contract on the NASDAQ 100, which is priced at 1484.72, has a multiplier of \$100, and expires in two months. The risk-free rate is 4.65 percent.

Action

The fund needs to use

$$N_f = \frac{-V(1+r)^T}{qf} = -\frac{\$50{,}000{,}000(1.0465)^{2/12}}{\$100(1484.72)} = -339.32$$

futures contracts. This amount should be rounded to $N_f^* = -339$. Because of rounding, the amount of stock synthetically converted to cash is really

$$\frac{-N_f^* qf}{(1+r)^T} = \frac{339(\$100)(1484.72)}{(1.0465)^{2/12}} = \$49{,}952{,}173$$

This amount should grow to $\$49{,}952{,}173(1.0465)^{2/12} = \$50{,}332{,}008$. The number of units of stock is

$$\frac{-N_f^* q}{(1+\delta)^T} = \frac{339(\$100)}{(1.0075)^{2/12}} = 33{,}857.81$$

28 In order to get this solution, we must take the result that $f = S(1 + r)^T/(1 + \delta)^T$ and turn it around so that $S = f(1 + \delta)^T/(1 + r)^T$ to find the value of S.

Exhibit 5 (Continued)

at the start, which grows to $33{,}857.81(1.0075)^{2/12} = 33{,}900$ units when the futures expires.

Scenario (4 August)

The stock index is at S_T when the futures expires.

Outcome and Analysis

The payoff of the futures contract is

$$-339(\$100)(S_T - 1484.72) = -\$33{,}900S_T + \$50{,}332{,}008$$

As noted, dividends are reinvested and the number of units of the index grows to 33,900 shares. The overall position of the fund is

Stock worth 33,900S

Futures payoff of $-33{,}900S_T + \$50{,}332{,}008$

or an overall total of $50,332,008. This is exactly the amount we said the fund would have if it invested $49,952,173 at the risk-free rate of 4.65 percent for two months. Thus, the fund has effectively converted a stock position to cash.

EXAMPLE 5

Synthetics Inc. (SYNINC) executes a variety of synthetic strategies for pension funds. One such strategy is to enable the client to maintain a liquid balance in cash while retaining exposure to equity market movements. A similar strategy is to enable the client to maintain its position in the market but temporarily convert it to cash. A client with a $100 million equity position wants to convert it to cash for three months. An equity market futures contract is priced at $325,000, expires in three months, and is based on an underlying index with a dividend yield of 2 percent. The risk-free rate is 3.5 percent.

A Determine the number of futures contracts SYNINC should trade and the effective amount of money it has invested in risk-free bonds to achieve this objective.

B When the futures contracts expire, the equity index is at S_T. Show how this transaction results in the appropriate outcome.

Solution to A:

First note that no multiplier is quoted here. The futures price of $325,000 is equivalent to a quoted price of $325,000 and a multiplier of 1.0. The number of futures contracts is

$$N_f = -\frac{\$100{,}000{,}000(1.035)^{0.25}}{\$325{,}000} = -310.35$$

Rounding off, SYNINC should sell 310 contracts. This is equivalent to selling futures contracts on stock worth

$$\frac{310(\$325{,}000)}{(1.035)^{0.25}} = \$99{,}887{,}229$$

and is the equivalent of investing \$99,887,229 in risk-free bonds, which will grow to a value of $\$99,887,229(1.035)^{0.25} = \$100,750,000$. The number of units of stock being effectively converted to cash is (ignoring the minus sign)

$$\frac{N_f * q}{(1+\delta)^T} = \frac{310(1)}{(1.02)^{0.25}} = 308.47$$

The accumulation and reinvestment of dividends would make this figure grow to $308.47(1.02)^{0.25} = 310$ units when the futures expires.

Solution to B:

At expiration, the profit on the futures is $-310(S_T - \$325{,}000) = -310S_T + \$100{,}750{,}000$. That means SYNINC will have to pay $310S_T$ and will receive \$100,750,000 to settle the futures contract. Due to reinvestment of dividends, it will end up with the equivalent of 310 units of stock, which can be sold to cover the amount $-310S_T$. This will leave \$100,750,000, the equivalent of having invested in risk-free bonds.

You might be wondering about the relationship between the number of futures contracts given here and the number of futures contracts required to adjust the portfolio beta to zero. Here we are selling a given number of futures contracts against stock to effectively convert the stock to a risk-free asset. Does that not mean that the portfolio would then have a beta of zero? In Section 3.2, we gave a different formula to reduce the portfolio beta to zero. These formulas do not appear to be the same. Would they give the same value of N_f? In the example here, we sell the precise number of futures to completely hedge the stock portfolio. The stock portfolio, however, has to be identical to the index. It cannot have a different beta. The other formula, which reduces the beta to zero, is more general and can be used to eliminate the systematic risk on any portfolio. Note, however, that only systematic risk is eliminated. If the portfolio is not fully diversified, some risk will remain, but that risk is diversifiable, and the expected return on that portfolio would still be the risk-free rate. If we apply that formula to a portfolio that is identical to the index on which the futures is based, the two formulas are the same and the number of futures contracts to sell is the same in both cases.[29]

Finally, we should note that we could have changed the beta of the portfolio by making transactions in individual securities. To raise (lower) the beta we could sell (buy) low-beta stocks and buy (sell) high-beta stocks. Alternatively, we could do transactions in the portfolio itself and the risk-free asset. To reduce the beta to zero, for example, we could sell the entire portfolio and invest the money in the risk-free asset. To increase the beta, we could reduce any position we hold in the risk-free asset, even to the point of borrowing by issuing the risk-free asset.[30] In this reading, we illustrate how these transactions can be better executed using derivatives, which have lower transaction costs and generally greater liquidity. There is no guarantee that either approach will result in the portfolio having the exact beta the investor desired. Betas are notoriously difficult to measure. But executing the transactions in derivatives provides an attractive alternative to having to make a large number of transactions in individual securities. In light of the fact that many of these adjustments are intended

29 A key element in this statement is that the futures beta is the beta of the underlying index, multiplied by the present value interest factor using the risk-free rate. This is a complex and subtle point, however, that we simply state without going into the mathematical proof.

30 Students of capital market theory will recognize that the transactions we describe in this paragraph are those involving movements up and down the capital market line, which leads to investors finding their optimal portfolios. This kind of trading activity in turn leads to the well-known capital asset pricing model.

to be only temporary, it makes far more sense to do the transactions in derivatives than to make the transactions in the underlying securities, provided that one is willing to keep re-entering positions upon contract expirations.

ASSET ALLOCATION WITH FUTURES

4

It has been widely noted that the most important factor in the performance of an asset portfolio is the allocation of the portfolio among asset classes. In this reading, we do not develop techniques for determining the best allocation among asset classes any more than we attempt to determine what beta to set as a target for our stock portfolio or what duration to set as a target for our bond portfolio. We focus instead on how derivative strategies can be used to implement a plan based on a market outlook. As we saw previously in this reading, we can adjust the beta or duration effectively with lower cost and greater liquidity by using stock index or bond futures. In this section, we look at how to allocate a portfolio among asset classes using futures.

4.1 Adjusting the Allocation among Asset Classes

Consider the case of a $300 million portfolio that is allocated 80 percent ($240 million) to stock and 20 percent ($60 million) to bonds. The manager wants to change the allocation to 50 percent ($150 million) stock and 50 percent ($150 million) bonds. Therefore, the manager wants to reduce the allocation to stock by $90 million and increase the allocation to bonds by $90 million. The trick, however, is to use the correct number of futures contracts to set the beta and duration to the desired level. To do this, the manager should sell stock index futures contracts to reduce the beta on the $90 million of stock from its current level to zero. This transaction will effectively convert the stock to cash. She should then buy bond futures contracts to increase the duration on the cash from its current level to the desired level.

Exhibit 6 presents this example. The manager sells 516 stock index futures contracts and buys 772 bond futures contracts. Two months later, the position is worth $297,964,852. As we show, had the transactions been done by selling stocks and buying bonds, the portfolio would be worth $297,375,000, a difference of only about 0.2 percent relative to the original market value. Of course, the futures transactions can be executed in a more liquid market and with lower transaction costs.

Exhibit 6 Adjusting the Allocation between Stocks and Bonds

Scenario (15 November)

Global Asset Advisory Group (GAAG) is a pension fund management firm. One of its funds consists of $300 million allocated 80 percent to stock and 20 percent to bonds. The stock portion has a beta of 1.10 and the bond portion has a duration of 6.5. GAAG would like to temporarily adjust the asset allocation to 50 percent stock and 50 percent bonds. It will use stock index futures and bond futures to achieve this objective. The stock index futures contract has a price of $200,000 (after accounting for the multiplier) and a beta of 0.96. The bond futures contract has an implied modified duration of 7.2 and a price of $105,250. The yield beta is 1. The transaction will be put in place on 15 November, and the horizon date for termination is 10 January.

(continued)

Exhibit 6 (Continued)

Action

The market value of the stock is 0.80($300,000,000) = $240,000,000. The market value of the bonds is 0.20($300,000,000) = $60,000,000. Because it wants the portfolio to be temporarily reallocated to half stock and half bonds, GAAG needs to change the allocation to $150 million of each.

Thus, GAAG effectively needs to sell $90 million of stock by converting it to cash using stock index futures and buy $90 million of bonds by using bond futures. This would effectively convert the stock into cash and then convert that cash into bonds. Of course, this entire series of transactions will be synthetic; the actual stock and bonds in the portfolio will stay in place.

Using Equation 5, the number of stock index futures, denoted as N_{sf}, will be

$$N_{sf} = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\frac{S}{f_s}$$

where β_T is the target beta of zero, β_S is the stock beta of 1.10, β_f is the futures beta of 0.96, S is the market value of the stock involved in the transaction of $90 million, and f_s is the price of the stock index futures, $200,000. We obtain

$$N_{sf} = \left(\frac{0.00 - 1.10}{0.96}\right)\frac{\$90{,}000{,}000}{\$200{,}000} = -515.63$$

Rounding off, GAAG sells 516 contracts.

Using Equation 4, the number of bond futures, denoted as N_{bf}, will be

$$N_{bf} = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\frac{B}{f_b}$$

where $MDUR_T$ is the target modified duration of 6.5, $MDUR_B$ is the modified duration of the existing bonds, $MDUR_f$ is the implied modified duration of the futures (here 7.2), B is the market value of the bonds of $90 million, and f_b is the bond futures price of $105,250. The modified duration of the existing bonds is the modified duration of a cash position. The sale of stock index futures provides $90 million of synthetic cash that is now converted into bonds using bond futures. Because no movement of actual cash is involved in these futures market transactions, the modified duration of cash is effectively equal to zero. We obtain

$$N_{bf} = \left(\frac{6.5 - 0.0}{7.2}\right)\left(\frac{\$90{,}000{,}000}{\$105{,}250}\right) = 771.97$$

So GAAG buys 772 contracts.

Scenario (10 January)

During this period, the stock portion of the portfolio returns –3 percent and the bond portion returns 1.25 percent. The stock index futures price goes from $200,000 to $193,600, and the bond futures price increases from $105,250 to $106,691.

Exhibit 6 (Continued)

Outcome and Analysis

The profit on the stock index futures transaction is –516($193,600 – $200,000) = $3,302,400. The profit on the bond futures transaction is 772($106,691 – $105,250) = $1,112,452. The total profit from the futures transaction is, therefore, $3,302,400 + $1,112,452 = $4,414,852. The market value of the stocks and bonds will now be

Stocks: $240,000,000(1 – 0.03)	=	$232,800,000
Bonds: $60,000,000(1.0125)	=	$ 60,750,000
Total:		$293,550,000

Thus, the total portfolio value, including the futures gains, is $293,550,000 + $4,414,852 = $297,964,852. Had GAAG sold stocks and then converted the proceeds to bonds, the value would have been

Stocks: $150,000,000(1 – 0.03)	=	$145,500,000
Bonds: $150,000,000(1.0125)	=	$151,875,000
Total:		$297,375,000

This total is a slight difference of about 0.2 percent relative to the market value of the portfolio using derivatives.

Exhibit 7 shows a variation of this problem in which a portfolio management firm wants to convert a portion of a bond portfolio to cash to meet a liquidity requirement and another portion to a higher duration. On the portion it wants to convert to cash, it sells 104 futures contracts. This is the correct amount to change the duration to 0.25, the approximate duration of a short-term money market instrument. It then buys 33 futures contracts to raise the duration on the other part of the portfolio. The net is that it executes only one transaction of 71 contracts, and the end result is a portfolio worth $3,030,250 at the end of the period. Had the transactions been done by selling and buying securities, the portfolio would have been worth $3,048,000, or about the same amount. Another question we shall examine is whether this strategy actually meets the liquidity requirement.

We note in Exhibit 7 that the manager wants to convert a portion of the portfolio to cash to increase liquidity. By selling the futures contracts, the manager maintains the securities in long-term bonds but reduces the volatility of those bonds to the equivalent of that of a short-term instrument. We might, however, question whether liquidity has actually been improved. If cash is needed, the fund would have to sell the long-term bonds and buy back the futures. The latter would not present a liquidity problem, but the sale of the long-term bonds could be a problem. Reducing the duration to replicate a short-term instrument does not remove the problem that long-term instruments, which are still held, may have to be liquidated. What it does is convert the volatility of the instrument to that of a short-term instrument. This conversion in no way handles the liquidity problem. It simply means that given an interest rate change, the position will have the sensitivity of a short-term instrument.

Exhibit 7 Adjusting the Allocation between One Bond Class and Another

Scenario (15 October)

Fixed Income Money Advisors (FIMA) manages bond portfolios for wealthy individual investors. It uses various tactical strategies to alter its mix between long-and short-term bonds to adjust its portfolio to a composition appropriate for its outlook for interest rates. Currently, it would like to alter a $30 million segment of its portfolio that has a modified duration of 6.5. To increase liquidity, it would like to move $10 million into cash but adjust the duration on the remaining $20 million to 7.5. These changes will take place on 15 October and will likely be reversed on 12 December.

Action

The bond futures contract that FIMA will use is priced at $87,500 and has an implied modified duration of 6.85. To convert $10 million of bonds at a duration of 6.5 into cash requires adjusting the duration to that of a cash equivalent. A cash equivalent is a short-term instrument with a duration of less than 1.0. The equivalent instruments that FIMA would use if it did the transactions in cash would be six-month instruments. The average duration of a six-month instrument is three months or 0.25. The interest rate that drives the long-term bond market is assumed to have a yield beta of 1.0 with respect to the interest rate that drives the futures market.

FIMA could solve this problem in either of two ways. It could lower the duration on $10 million of bonds from 6.5 to 0.25. Then it could raise the duration on $20 million from 6.5 to 7.5. If FIMA converts $10 million to a duration of 0.25 and $20 million to a duration of 7.5, the overall duration would be (10/30)0.25 + (20/30)7.50 = 5.08. As an alternative, FIMA could just aim for lowering the overall duration to 5.08, but we shall illustrate the approach of adjusting the duration in two steps.

Thus, FIMA needs to lower the duration on $10 million from 6.5 to 0.25. Accordingly, the appropriate number of futures contracts is

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right) = \left(\frac{0.25 - 6.50}{6.85}\right)\left(\frac{\$10{,}000{,}000}{\$87{,}500}\right) = -104.28$$

So, FIMA should sell 104 contracts.

To increase the duration on $20 million from 6.5 to 7.5, the appropriate number of futures contracts is

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right) = \left(\frac{7.5 - 6.5}{6.85}\right)\left(\frac{\$20{,}000{,}000}{\$87{,}500}\right) = 33.37$$

Thus, FIMA should buy 33 futures contracts.

Because these transactions involve the same futures contract, the net effect is that FIMA should sell 71 contracts. Therefore, FIMA does just one transaction to sell 71 contracts.

Scenario (12 December)

During this period, interest rates rose by 2 percent and the bonds decreased in value by 13 percent (6.5 duration times 2 percent). The futures price fell to $75,250. Thus, the $30 million bond portfolio fell by $30,000,000(0.13) = $3,900,000.

Exhibit 7 (Continued)

Outcome and Analysis

The profit on the futures contracts is –71($75,250 – $87,500) = $869,750. So the overall loss is $3,900,000 – $869,750 = $3,030,250. The change in the portfolio value of 13 percent was based on an assumed yield change of 2 percent (6.5 duration times 0.02 = 0.13). A portfolio with a modified duration of 5.08 would, therefore, change by approximately 5.08(0.02) = 0.1016, or 10.16 percent. The portfolio thus would decrease by $30,000,000(0.1016) = $3,048,000.

The difference in this result and what was actually obtained is $17,750, or about 0.06 percent of the initial $30 million value of the portfolio. Some of this difference is due to rounding and some is due to the fact that bonds do not respond in the precise manner predicted by duration.

In Exhibit 8, we illustrate a similar situation involving a pension fund that would like to shift the allocation of its portfolio from large-cap stock to mid-cap stock. With futures contracts available on indexes of both the large-cap and mid-cap sectors, the fund can do this by selling futures on the large-cap index and buying futures on the mid-cap index. The results come very close to replicating what would happen if it undertook transactions in the actual stocks. The futures transactions, however, take place in a market with much greater liquidity and lower transaction costs.

Exhibit 8 Adjusting the Allocation between One Equity Class and Another

Scenario (30 April)

The pension fund of US Integrated Technology (USIT) holds $50 million of large-cap domestic equity. It would like to move $20 million from large-cap stocks to mid-cap stocks. The large-cap stocks have an average beta of 1.03. The desired beta of mid-cap stocks is 1.20. A futures contract on large-cap stocks has a price of $263,750 and a beta of 0.98. A futures contract on mid-cap stocks has a price of $216,500 and a beta of 1.14. The transaction will be initiated on 30 April and terminated on 29 May.

To distinguish the futures contracts, we use N_{Lf} and N_{Mf} as the number of large-cap and mid-cap futures contracts, f_L and f_M as the prices of large-cap and mid-cap futures contracts ($263,750 and $216,500, respectively), β_L and β_M as the betas of large-cap and mid-cap stocks (1.03 and 1.20, respectively), and β_{Lf} and β_{Mf} as the betas of the large-cap and mid-cap futures (0.98 and 1.14, respectively).

Action

USIT first wants to convert $20 million of stock to cash and then convert $20 million of cash into mid-cap stock. It can use large-cap futures to convert the beta from 1.03 to zero and then use mid-cap futures to convert the beta from 0 to 1.20.

To convert the large-cap stock to cash will require

$$N_{Lf} = \left(\frac{\beta_T - \beta_L}{\beta_{Lf}}\right)\left(\frac{S}{f_L}\right) = \left(\frac{0.0 - 1.03}{0.98}\right)\left(\frac{\$20{,}000{,}000}{\$263{,}750}\right) = -79.70$$

(continued)

Exhibit 8 (Continued)

So USIT sells 80 large-cap futures contracts. At this point, it has changed the beta to zero. Now it uses mid-cap futures to convert the beta from 0.0 to 1.20:

$$N_{Mf} = \left(\frac{\beta_M - \beta_T}{\beta_{Mf}}\right)\left(\frac{B}{f_M}\right) = \left(\frac{1.20 - 0.0}{1.14}\right)\left(\frac{\$20{,}000{,}000}{\$216{,}500}\right) = 97.24$$

So USIT buys 97 mid-cap futures contracts.

Scenario (29 May)

Large-cap stocks increase by 2.47 percent, and the large-cap futures price increases to $269,948. Mid-cap stocks increase by 2.88 percent, and the mid-cap futures price increases to $222,432. The $50 million large-cap portfolio is now worth $50,000,000(1.0247) = $51,235,000.

Outcome and Analysis

The profit on the large-cap futures contracts is –80($269,948 – $263,750) = –$495,840. The profit on the mid-cap futures contracts is 97($222,432 – $216,500) = $575,404. The total value of the fund is, therefore, $51,235,000 – $495,840 + $575,404 = $51,314,564.

Had the transactions been executed by selling $20 million of large-cap stock and buying $20 million of mid-cap stock, the value of the large-cap stock would be $30,000,000(1.0247) = $30,741,000, and the value of the mid-cap stock would be $20,000,000(1.0288) = $20,576,000, for a total value of $30,741,000 + $20,576,000 = $51,317,000.

This amount produces a difference of $2,436 compared with making the allocation synthetically, an insignificant percentage of the original portfolio value. The difference comes from the fact that stocks do not always respond in the exact manner predicted by their betas and also that the number of futures contracts is rounded off.

EXAMPLE 6

Q-Tech Advisors manages a portfolio consisting of $100 million, allocated 70 percent to stock at a beta of 1.05 and 30 percent to bonds at a modified duration of 5.5. As a tactical strategy, it would like to temporarily adjust the allocation to 60 percent stock and 40 percent bonds. Also, it would like to change the beta on the stock position from 1.05 to 1.00 and the modified duration from 5.5 to 5.0. It will use a stock index futures contract, which is priced at $280,000 and has a beta of 0.98, and a bond futures contract, which is priced at $125,000 and has an implied modified duration of 6.50.

A Determine how many stock index and bond futures contracts it should use and whether to go long or short.

B At the horizon date, the stock portfolio has fallen by 3 percent and the bonds have risen by 1 percent. The stock index futures price is $272,160, and the bond futures price is $126,500. Determine the market value of the portfolio assuming the transactions specified in Part A are done, and compare it to the market value of the portfolio had the transactions been done in the securities themselves.

Solution to A:

To reduce the allocation from 70 percent stock ($70 million) and 30 percent bonds ($30 million) to 60 percent stock ($60 million) and 40 percent bonds ($40 million), Q-Tech must synthetically sell $10 million of stock and buy $10 million of bonds. First, assume that Q-Tech will sell $10 million of stock and leave the proceeds in cash. Doing so will require

$$N_{sf} = \left(\frac{0 - 1.05}{0.98}\right)\left(\frac{\$10{,}000{,}000}{\$280{,}000}\right) = -38.27$$

futures contracts. It should sell 38 contracts, which creates synthetic cash of $10 million. To buy $10 million of bonds, Q-Tech should buy

$$N_{bf} = \left(\frac{5.50 - 0.0}{6.50}\right)\left(\frac{\$10{,}000{,}000}{\$125{,}000}\right) = 67.69$$

futures contracts, which rounds to 68. This transaction allows Q-Tech to synthetically borrow $10 million (selling a stock futures contract is equivalent to borrowing cash) and buy $10 million of bonds. Because we have created synthetic cash and a synthetic loan, these amounts offset. Thus, at this point, having sold 38 stock index futures and bought 68 bond futures, Q-Tech has effectively sold $10 million of stock and bought $10 million of bonds. It has produced a synthetically re-allocated portfolio of $60 million of stock and $40 million of bonds.

Now it needs to adjust the beta on the $60 million of stock to its target of 1.00. The number of futures contracts would, therefore, be

$$N_{sf} = \left(\frac{1.00 - 1.05}{0.98}\right)\left(\frac{\$60{,}000{,}000}{\$280{,}000}\right) = -10.93$$

So it should sell an additional 11 contracts. In total, it should sell 38 + 11 = 49 contracts.

To adjust the modified duration from 5.50 to its target of 5.00 on the $40 million of bonds, the number of futures contracts is

$$N_{bf} = \left(\frac{5 - 5.50}{6.50}\right)\left(\frac{\$40{,}000{,}000}{\$125{,}000}\right) = -24.62$$

So it should sell 25 contracts. In total, therefore, it should buy 68 – 25 = 43 contracts.

Solution to B:

The value of the stock will be $70,000,000(1 – 0.03) = $67,900,000.

The profit on the stock index futures will be –49($272,160 – $280,000) = $384,160.

The total value of the stock position is therefore $67,900,000 + $384,160 = $68,284,160.

The value of the bonds will be $30,000,000(1.01) = $30,300,000.

The profit on the bond futures will be 43($126,500 – $125,000) = $64,500.

The total value of the bond position is, therefore, $30,300,000 + $64,500 = $30,364,500.

Therefore, the overall position is worth $68,284,160 + $30,364,500 = $98,648,660.

Had the transactions been done in the securities themselves, the stock would be worth $60,000,000(1 – 0.03) = $58,200,000. The bonds would be worth $40,000,000(1.01) = $40,400,000. The overall value of the portfolio would be $58,200,000 + $40,400,000 = $98,600,000, which is a difference of only $48,660 or 0.05 percent of the original value of the portfolio.

So far, we have looked only at allocating funds among different asset classes. In the next section, we place ourselves in the position that funds are not available to invest in any asset classes, but market opportunities are attractive. Futures contracts enable an investor to place itself in the market without yet having the actual cash in place.

4.2 Pre-Investing in an Asset Class

In all the examples so far, the investor is already in the market and wants to either alter the position to a different asset allocation or get out of the market altogether. Now consider that the investor might not be in the market but wants to get into the market. The investor might not have the cash to invest at a time when opportunities are attractive. Futures contracts do not require a cash outlay but can be used to add exposure. We call this approach pre-investing.

An advisor to a mutual fund would like to pre-invest $10 million in cash that it will receive in three months. It would like to allocate this money to a position of 60 percent stock and 40 percent bonds. It can do this by taking long positions in stock index futures and bond futures. The trick is to establish the position at the appropriate beta and duration. This strategy is illustrated in Exhibit 9. We see that the result using futures is very close to what it would have been if the fund had actually had the money and invested it in stocks and bonds.

Exhibit 9 Pre-Investing in Asset Classes

Scenario (28 February)

Quantitative Mutual Funds Advisors (QMFA) uses modern analytical techniques to manage money for a number of mutual funds. QMFA is not necessarily an aggressive investor, but it does not like to be out of the market. QMFA has learned that it will receive an additional $10 million to invest. Although QMFA would like to receive the money now, the money is not available for three months. If it had the money now, QMFA would invest $6 million in stocks at an average beta of 1.08 and $4 million in bonds at a modified duration of 5.25. It believes the market outlook over the next three months is highly attractive. Therefore, QMFA would like to invest now, which it can do by trading stock and bond futures. An appropriate stock index futures contract is selling at $210,500 and has a beta of 0.97. An appropriate bond futures contract is selling for $115,750 and has an implied modified duration of 6.05. The current date is 28 February, and the money will be available on 31 May. The number of stock index futures contracts will be denoted as N_{sf}, and the number of bond futures contracts will be denoted as N_{bf}.

Action

QMFA wants to take a position in $6 million of stock index futures at a beta of 1.08. It currently has no position; hence, its beta is zero. The required number of stock index futures contracts to obtain this position is

$$N_{sf} = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right) = \left(\frac{1.08 - 0.0}{0.97}\right)\left(\frac{\$6{,}000{,}000}{\$210{,}500}\right) = 31.74$$

So QMFA buys 32 stock index futures contracts.

Exhibit 9 (Continued)

To gain exposure at a duration of 5.25 on $4 million of bonds, the number of bond futures contracts is

$$N_{bf} = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right) = \left(\frac{5.25 - 0.0}{6.05}\right)\left(\frac{\$4{,}000{,}000}{\$115{,}750}\right) = 29.99$$

Thus, QMFA buys 30 bond futures contracts.

Scenario (31 May)

During this period, the stock increased by 2.2 percent and the bonds increased by 0.75 percent. The stock index futures price increased to $214,500, and the bond futures price increased to $116,734.

Outcome and Analysis

The profit on the stock index futures contracts is 32($214,500 – $210,500) = $128,000. The profit on the bond futures contracts is 30($116,734 – $115,750) = $29,520. The total profit is, therefore, $128,000 + $29,520 = $157,520.

Had QMFA actually invested the money, the stock would have increased in value by $6,000,000(0.022) = $132,000, and the bonds would have increased in value by $4,000,000(0.0075) = $30,000, for a total increase in value of $132,000 + $30,000 = $162,000, which is relatively close to the futures gain of $157,520. The difference of $4,480 between this approach and the synthetic one is about 0.04 percent of the $10 million invested. This difference is due to the fact that stocks and bonds do not always respond in the manner predicted by their betas and durations and also that the number of futures contracts is rounded off.

In a transaction like the one just described, the fund is effectively borrowing against the cash it will receive in the future by pre-investing. Recall that

Long underlying + Short futures = Long risk-free bond

which means that

Long underlying = Long risk-free bond + Long futures

In this example, however, the investor does not have the long position in the risk-free bond. That would require cash. We can remove the long risk-free bond in the equation above by off-setting it with a loan in which we borrow the cash. Hence, adding a loan to both sides gives[31]

Long underlying + Loan = Long futures

An outright long position in futures is like a fully leveraged position in the underlying. So in this example, we have effectively borrowed against the cash we will receive in the future and invested in the underlying.

EXAMPLE 7

Total Asset Strategies (TAST) specializes in a variety of risk management strategies, one of which is to enable investors to take positions in markets in anticipation of future transactions in securities. One of its popular strategies is to have the client invest when it does not have the money but will be receiving it later. One client interested in this strategy will receive $6 million at a later date

31 The right-hand side is a long risk-free bond and a loan of the same amount, which offset each other.

but wants to proceed and take a position of $3 million in stock and $3 million in bonds. The desired stock beta is 1.0, and the desired bond duration is 6.2. A stock index futures contract is priced at $195,000 and has a beta of 0.97. A bond futures contract is priced at $110,000 and has an implied modified duration of 6.0.

A Find the number of stock and bond futures contracts TAST should trade and whether it should go long or short.

B At expiration, the stock has gone down by 5 percent, and the stock index futures price is down to $185,737.50. The bonds are up 2 percent, and the bond futures price is up to $112,090. Determine the value of the portfolio and compare it with what it would have been had the transactions been made in the actual securities.

Solution to A:

The approximate number of stock index futures is

$$\left(\frac{1.00 - 0.0}{0.97}\right)\left(\frac{\$3{,}000{,}000}{\$195{,}000}\right) = 15.86$$

So TAST should buy 16 contracts. The number of bond futures is

$$\left(\frac{6.2 - 0.0}{6.0}\right)\left(\frac{\$3{,}000{,}000}{\$110{,}000}\right) = 28.18$$

So it should buy 28 contracts.

Solution to B:

The profit on the stock index futures is 16($185,737.50 – $195,000) = –$148,200.

The profit on the bond futures is 28($112,090 – $110,000) = $58,520. The total profit is –$148,200 + $58,520 = –$89,680, a loss of $89,680. Suppose TAST had invested directly. The stock would have been worth $3,000,000(1 – 0.05) = $2,850,000, and the bonds would have been worth $3,000,000(1.02) = $3,060,000, for a total value of $2,850,000 + $3,060,000 = $5,910,000, or a loss of $90,000, which is about the same as the loss using only the futures.

When the cash is eventually received, the investor will close out the futures position and invest the cash. This transaction is equivalent to paying off this implicit loan. The investor will then be long the underlying.

We should remember that this position is certainly a speculative one. By taking a leveraged long position in the market, the investor is speculating that the market will perform well enough to cover the cost of borrowing. If this does not happen, the losses could be significant. But such is the nature of leveraged speculation with a specific horizon.

So far, all of the strategies we have examined have involved domestic transactions. We now take a look at how foreign currency derivatives can be used to handle common transactions faced in global commerce.

5 STRATEGIES AND APPLICATIONS FOR MANAGING FOREIGN CURRENCY RISK

The risk associated with changes in exchange rates between currencies directly affects many companies. Any company that engages in business with companies or customers in other countries is exposed to this risk. The volatility of exchange rates results in

considerable uncertainty for companies that sell products in other countries as well as for those companies that buy products in other countries. Companies are affected not only by the exchange rate uncertainty itself but also by its effects on their ability to plan for the future. For example, consider a company with a foreign subsidiary. This subsidiary generates sales in the foreign currency that will eventually be converted back into its domestic currency. To implement a business plan that enables the company to establish a realistic target income, the company must not only predict its foreign sales, but it must also predict the exchange rate at which it will convert its foreign cash flows into domestic cash flows. The company may be an expert on whatever product it makes or service it provides and thus be in a good position to make reasonable forecasts of sales. But predicting foreign exchange rates with much confidence is extremely difficult, even for experts in the foreign exchange business. A company engaged in some other line of work can hardly expect to be able to predict foreign exchange rates very well. Hence, many such businesses choose to manage this kind of risk by locking in the exchange rate on future cash flows with the use of derivatives. This type of exchange rate risk is called **transaction exposure**.

In addition to the risk associated with foreign cash flows, exchange rate volatility also affects a company's accounting statements. When a company combines the balance sheets of foreign subsidiaries into a consolidated balance sheet for the entire company, the numbers from the balance sheets of foreign subsidiaries must be converted into its domestic currency at an appropriate exchange rate. Hence, exchange rate risk manifests itself in this arena as well. This type of exchange rate risk is called **translation exposure**.

Finally, we should note that exchange rate uncertainty can also affect a company by making its products or services either more or less competitive with those of comparable foreign companies. This type of risk can affect any type of company, even if it does not sell its goods or services in foreign markets. For example, suppose the US dollar is exceptionally strong. This condition makes US products and services more expensive to non-US residents and will lead to a reduction in travel to the United States. Hence, the owner of a hotel in the Disney World area, even though her cash flow is entirely denominated in dollars, will suffer a loss of sales when the dollar is strong because fewer non-US residents will travel to the United States, visit Disney World, and stay in her hotel. Likewise, foreign travel will be cheaper for US citizens, and more of them will visit foreign countries instead of Disney World.[32] This type of risk is called **economic exposure**.

In this reading, we shall focus on managing the risk of transaction exposure. The management of translation exposure requires a greater focus on accounting than we can provide here. Managing economic exposure requires the forecasting of demand in light of competitive products and exchange rates, and we shall not address this risk.

The management of a single cash flow that will have to be converted from one currency to another is generally done using forward contracts. Futures contracts tend to be too standardized to meet the needs of most companies. Futures are primarily used by dealers to manage their foreign exchange portfolios.[33] Therefore, in the two examples here, we use forward contracts to manage the risk of a single foreign cash flow.

32 Even US citizens who would never travel abroad would not increase their trips to Disney World because of the more favorable exchange rate.

33 In some cases, single cash flows are managed using currency options, which we cover in the reading on risk management applications of option strategies. A series of foreign cash flows is usually managed using currency swaps, which we cover in the reading on risk management applications of swap strategies.

5.1 Managing the Risk of a Foreign Currency Receipt

When due to receive cash flows denominated in a foreign currency, companies can be viewed as being long the currency. They will convert the currency to their domestic currency and, hence, will be selling the foreign currency to obtain the domestic currency. If the domestic currency increases in value while the company is waiting to receive the cash flow, the domestic currency will be more expensive, and the company will receive fewer units of the domestic currency for the given amount of foreign currency. Thus, being long the foreign currency, the company should consider selling the currency in the forward market by going short a currency forward contract.

Exhibit 10 illustrates the case of a company that anticipates the receipt of a future cash flow denominated in euros. By selling a forward contract on the amount of euros it expects to receive, the company locks in the exchange rate at which it will convert the euros. We assume the contract calls for actual delivery of the euros, as opposed to a cash settlement, so the company simply transfers the euros to the dealer, which sends the domestic currency to the company. If the transaction were structured to be settled in cash, the company would sell the euros on the market for the exchange rate at that time, S_T, and the forward contract would be cash settled for a payment of $-(S_T - F)$, where F is the rate agreed on at the start of the forward contract—in other words, the forward exchange rate. The net effect is that the company receives F, the forward rate for the euros.

Exhibit 10 Managing the Risk of a Foreign Currency Receipt

Scenario (15 August)

H-Tech Hardware, a US company, sells its products in many countries. It recently received an order for some computer hardware from a major European government. The sale is denominated in euros and is in the amount of €50 million. H-Tech will be paid in euros; hence, it bears exchange rate risk. The current date is 15 August, and the euros will be received on 3 December.

Action

On 15 August, H-Tech decides to lock in the 3 December exchange rate by entering into a forward contract that obligates it to deliver €50 million and receive a rate of $0.877. H-Tech is effectively long the euro in its computer hardware sale, so a short position in the forward market is appropriate.

Scenario (3 December)

The exchange rate on this day is S_T, but as we shall see, this value is irrelevant for H-Tech because it is hedged.

Outcome and Analysis

The company receives its €50 million, delivers it to the dealer, and is paid $0.877 per euro for a total payment of €50,000,000($0.877) = $43,850,000. H-Tech thus pays the €50 million and receives $43.85 million, based on the rate locked in on 15 August.

5.2 Managing the Risk of a Foreign Currency Payment

In Exhibit 11, we see the opposite type of problem. A US company is obligated to purchase a foreign currency at a later date. Because an increase in the exchange rate will hurt it, the US company is effectively short the currency. Hence, to lock in the

rate now, it needs to go long the forward contract. Regardless of the exchange rate at expiration, the company purchases the designated amount of currency at the forward rate agreed to in the contract now.

Exhibit 11 Managing the Risk of a Foreign Currency Payment

Scenario (2 March)

American Manufacturing Catalyst (AMC) is a US company that occasionally makes steel and copper purchases from non-US companies to meet unexpected demand that cannot be filled through its domestic suppliers. On 2 March, AMC determines that it will need to buy a large quantity of steel from a Japanese company on 1 April. It has entered into a contract with the Japanese company to pay ¥900 million for the steel. At a current exchange rate of $0.0083 per yen, the purchase will currently cost ¥900,000,000($0.0083) = $7,470,000. AMC faces the risk of the yen strengthening.

Action

In its future steel purchase, AMC is effectively short yen, because it will need to purchase yen at a later date. Thus, a long forward contract is appropriate. AMC decides to lock in the exchange rate for 1 April by entering into a long forward contract on ¥900 million with a dealer. The forward rate is $0.008309. AMC will be obligated to purchase ¥900 million on 1 April and pay a rate of $0.008309.

Scenario (1 April)

The exchange rate for yen is S_T. As we shall see, this value is irrelevant for AMC, because it is hedged.

Outcome and Analysis

The company purchases ¥900 million from the dealer and pays $0.008309, for a total payment of ¥900,000,000($0.008309) = $7,478,100. This amount was known on 2 March. AMC gets the yen it needs and uses it to purchase the steel.

In Exhibit 10, a company agreed to accept a fixed amount of the foreign currency for the sale of its computer hardware. In Exhibit 11, a company agreed to pay a fixed amount of the foreign currency to acquire the steel. You may be wondering why in both cases the transaction was denominated in the foreign currency. In some cases, a company might be able to lock in the amount of currency in domestic units. It all depends on the relative bargaining power of the buyer and the seller and on how badly each wants to make the sale. Companies with the expertise to manage foreign exchange risk can use that expertise to offer contracts denominated in either currency to their counterparts on the other side of the transaction. For example, in the second case, suppose the Japanese company was willing to lock in the exchange rate using a forward contract with one of its derivatives dealers. Then the Japanese company could offer the US company the contract in US dollars. The ability to manage exchange rate risk and offer customers a price in either currency can be an attractive feature for a seller.

EXAMPLE 8

Royal Tech Ltd. is a UK technology company that has recently acquired a US subsidiary. The subsidiary has an underfunded pension fund, and Royal Tech has absorbed the subsidiary's employees into its own pension fund, bringing the US subsidiary's defined-benefit plan up to an adequate level of funding. Soon

Royal Tech will be making its first payments to retired employees in the United States. Royal Tech is obligated to pay about $1.5 million to these retirees. It can easily set aside in risk-free bonds the amount of pounds it will need to make the payment, but it is concerned about the foreign currency risk in making the US dollar payment. To manage this risk, Royal Tech is considering using a forward contract that has a contract rate of £0.60 per dollar.

A Determine how Royal Tech would eliminate this risk by identifying an appropriate forward transaction. Be sure to specify the notional principal and state whether to go long or short. What domestic transaction should it undertake?

B At expiration of the forward contract, the spot exchange rate is S_T. Explain what happens.

Solution to A:

Royal Tech will need to come up with $1,500,000 and is obligated to buy dollars at a later date. It is thus short dollars. To have $1,500,000 secured at the forward contract expiration, Royal Tech would need to go long a forward contract on the dollar. With the forward rate equal to £0.60, the contract will need a notional principal of £900,000. So Royal Tech must set aside funds so that it will have £900,000 available when the forward contract expires. When it delivers the £900,000, it will receive £900,000(1/£0.60) = $1,500,000, where 1/£0.60 ≈ $1.67 is the dollar-per-pound forward rate.

Solution to B:

At expiration, it will not matter what the spot exchange rate is. Royal Tech will deliver £900,000 and receive $1,500,000.

5.3 Managing the Risk of a Foreign-Market Asset Portfolio

One of the dominant themes in the world of investments in the last 20 years has been the importance of diversifying internationally. The increasing globalization of commerce has created a greater willingness on the part of investors to think beyond domestic borders and add foreign securities to a portfolio.[34] Thus, more asset managers are holding or considering holding foreign stocks and bonds. An important consideration in making such a decision is the foreign currency risk. Should a manager accept this risk, hedge the foreign market risk and the foreign currency risk, or hedge only the foreign currency risk?

It is tempting to believe that the manager should accept the foreign market risk, using it to further diversify the portfolio, and hedge the foreign currency risk. In fact, many asset managers claim to do so. A closer look, however, reveals that it is virtually impossible to actually do this.

Consider a US asset management firm that owns a portfolio currently invested in euro-denominated stock worth S_0, where S_0 is the current stock price in euros. The exchange rate is FX_0 dollars per euro. Therefore, the portfolio is currently worth $S_0(FX_0)$ in dollars. At a future time, t, the portfolio is worth S_t in euros and the exchange rate is FX_t. So the portfolio would then be worth $S_t(FX_t)$. The firm is long both the stock and the euro.

34 Ironically, the increasing globalization of commerce has increased the correlation among the securities markets of various countries. With this higher correlation, the benefits of international diversification are much smaller.

A forward contract on the euro would require the firm to deliver a certain number of euros and receive the forward rate, F. The number of euros to be delivered, however, would need to be specified in the contract. In this situation, the firm would end up delivering S_t euros. This amount is unknown at the time the forward contract is initiated. Thus, it would not be possible to know how many euros the firm would need to deliver.

Some companies manage this problem by estimating an expected future value of the portfolio. They enter into a hedge based on that expectation and adjust the hedge to accommodate any changes in expectations. Other companies hedge a minimum portfolio value. They estimate that it is unlikely the portfolio value will fall below a certain level and then sell a forward contract for a size based on this minimum value.[35] This approach leaves the companies hedged for a minimum value, but any increase in the value of the portfolio beyond the minimum would not be hedged. Therefore, any such gains could be wiped out by losses in the value of the currency.

So, with the exception of one special and complex case we discuss below, it is not possible to leave the local equity market return exposed and hedge the currency risk.[36] If the local market return is hedged, then it would be possible to hedge the currency risk. The hedge of the local market return would lock in the amount of the foreign currency that would be converted at the hedge termination date. Of course, the company can hedge the local market return and leave the currency risk unhedged. Or it can hedge neither.[37]

In Exhibit 12, we examine the two possibilities that can be executed: hedging the local market risk and hedging both the local market risk *and* the foreign currency risk. We first use futures on the foreign equity portfolio as though no currency risk existed. This transaction attempts to lock in the future value of the portfolio. This locked-in return should be close to the foreign risk-free rate. If we also choose to hedge the currency risk, we then know that the future value of the portfolio will tell us the number of units of the foreign currency that we shall have available to convert to domestic currency at the hedge termination date. Then we would know the amount of notional principal to use in a forward contract to hedge the exchange rate risk.

Exhibit 12 Managing the Risk of a Foreign-Currency-Denominated Asset Portfolio

Scenario (31 December)

AZ Asset Management is a US firm that invests money for wealthy individual investors. Concerned that it does not know how to manage foreign currency risk, so far AZ has invested only in US markets. Recently, it began learning about managing currency risk and would like to begin investing in foreign markets with a small position worth €10 million. The proposed portfolio has a beta of 1.10. AZ is considering either hedging the European equity market return and leaving the currency risk unhedged, or hedging the currency risk as well as the European equity market return. If it purchases the €10 million portfolio, it will put this hedge in place on 31 December and plans to leave the position open until 31 December of the following year.

(continued)

35 One way to assure a minimum value would be to use a put option. We shall take up this strategy in the reading on risk management applications of option strategies.

36 The foreign equity market return is often referred to as the local market return, a term we shall use henceforth.

37 In fact, some compelling arguments exist for hedging neither. The currency risk can be unrelated to the domestic market risk, thereby offering some further diversifying risk-reduction possibilities.

Exhibit 12 (Continued)

For hedging the European equity market risk, it will use a stock index futures contract on a euro-denominated stock index. This contract is priced at €120,000 and has a beta of 0.95. If it hedges the currency risk, it will use a dollar-denominated forward contract on the euro. That contract has a price of $0.815 and can have any notional principal that the parties agree on at the start. The current spot exchange rate is $0.80. The foreign risk-free rate is 4 percent, which is stated as an annually compounded rate. The domestic risk-free rate is 6 percent.

Action

Hedging the equity market risk only: To eliminate the risk on the portfolio of stock that has a beta of 1.10 would require

$$N_f = \left(\frac{0 - 1.10}{0.95}\right)\left(\frac{10{,}000{,}000}{120{,}000}\right) = -96.49$$

contracts. This amount would be rounded to 96, so AZ would sell 96 contracts.

Hedging the equity market risk and the currency risk: Again, AZ would sell 96 stock index futures contracts. It would enter into a forward contract to lock in the exchange rate on a certain amount of euros on 31 December. The question is, how many euros will it have? If the futures contract hedges the stock portfolio, it should earn the foreign risk-free rate. Thus, the portfolio should be worth €10,000,000(1.04) = €10,400,000. So, AZ expects to have €10,400,000 on the following 31 December and will convert this amount back to dollars. So the notional principal on the forward contract should be €10.4 million. Note that the starting portfolio value in dollars is €10,000,000($0.80) = $8,000,000.

Scenario (31 December of the Following Year)

During the year, the European stock market went down 4.55 percent. Given the portfolio beta of 1.10, it declines by 4.55(1.10) = 5 percent. The portfolio is now worth €10,000,000(1 – 0.05) = €9,500,000. The exchange rate fell to $0.785, and the futures price fell to €110,600.

Outcome and Analysis

If nothing is hedged: The portfolio is converted to dollars at $0.785 and is worth €9,500,000(0.785) = $7,457,500. This amount represents a loss of 6.8 percent over the initial value of $8,000,000.

If only the European stock market is hedged: The profit on the futures would be –96(€110,600 – €120,000) = €902,400. Adding this amount to the value of the portfolio gives a value of €9,500,000 + €902,400 = €10,402,400, which is an increase in value of 4.02 percent, or approximately the foreign risk-free rate, as it should be. This amount is converted to dollars to obtain €10,402,400($0.785) = $8,165,884, a gain of 2.07 percent.

If the European stock market and the currency risk are both hedged: AZ sold €10.4 million of euros in the forward market at $0.815. The contract will settle in cash and show a profit of €10,400,000($0.815 – $0.785) = $312,000. This leaves the overall portfolio value at $8,165,884 + $312,000 = $8,477,884, a gain of 5.97 percent, or approximately the domestic risk-free rate.

In this case, the foreign stock market went down *and* the foreign currency went down. Without the hedge, the loss was almost 7 percent. With the foreign stock market hedge, the loss turns into a gain of 2 percent. With the currency

Exhibit 12 (Continued)

hedge added, the loss becomes a gain of almost 6 percent. Of course, different outcomes could occur. Gains from a stronger foreign stock market and a stronger currency would be lost if the company had made these same hedges.

Note, however, that once AZ hedges the foreign market return, it can expect to earn only the foreign risk-free rate. If it hedges the foreign market return and the exchange rate, it can expect to earn only its domestic risk-free rate. Therefore, neither strategy makes much sense for the long run. In the short run, however, this strategy can be a good tactic for investors who are already in foreign markets and who wish to temporarily take a more defensive position without liquidating the portfolio and converting it to cash.

EXAMPLE 9

FCA Managers (FCAM) is a US asset management firm. Among its asset classes is a portfolio of Swiss stocks worth SF10 million, which has a beta of 1.00. The spot exchange rate is \$0.75, the Swiss interest rate is 5 percent, and the US interest rate is 6 percent. Both of these interest rates are compounded in the Libor manner: Rate × (Days/360). These rates are consistent with a six-month forward rate of \$0.7537. FCAM is considering hedging the local market return on the portfolio and possibly hedging the exchange rate risk for a six-month period. A futures contract on the Swiss market is priced at SF300,000 and has a beta of 0.90.

A What futures position should FCAM take to hedge the Swiss market return? What return could it expect?

B Assuming that it hedges the Swiss market return, how could it hedge the exchange rate risk as well, and what return could it expect?

Solution to A:

To hedge the Swiss local market return, the number of futures contracts is

$$N_f = \left(\frac{0 - 1.00}{0.90}\right)\left(\frac{\text{SF10,000,000}}{\text{SF300,000}}\right) = -37.04$$

So FCAM should sell 37 contracts. Because the portfolio is perfectly hedged, its return should be the Swiss risk-free rate of 5 percent.

Solution to B:

If hedged, the Swiss portfolio should grow to a value of SF10,000,000[1 + 0.05(180/360)] = SF10,250,000.

FCAM could hedge this amount with a forward contract with this much notional principal. If the portfolio is hedged, it will convert to a value of SF10,250,000(\$0.7537) = \$7,725,425.

In dollars, the portfolio was originally worth SF10,000,000(\$0.75) = 7,500,000. Thus, the return is $\frac{\$7{,}725{,}425}{\$7{,}500{,}000} - 1 \approx 0.03$, which is the US risk-free rate for six months.

We see that if only the foreign stock market return is hedged, the portfolio return is the foreign risk-free rate before converting to the domestic currency. If both the foreign stock market and the exchange rate risk are hedged, the return equals the domestic risk-free rate.

As a temporary and tactical strategy, hedging one or both risks can make sense. There are certainly periods when one might be particularly concerned about these risks and might wish to eliminate them. Executing this sort of strategy can be much easier than selling all of the foreign stocks and possibly converting the proceeds into domestic currency. But in the long run, a strategy of investing in foreign markets, hedging that risk, and hedging the exchange rate risk hardly makes much sense.

6 FUTURES OR FORWARDS?

As we have seen, numerous opportunities and strategies exist for managing risk using futures and forwards. We have largely ignored the issue of which instrument—futures or forwards—is better. Some types of hedges are almost always executed using futures, and some are almost always executed using forwards. Why the preference for one over the other? First, let us recall the primary differences between the two:

- Futures contracts are standardized, with all terms except for the price set by the futures exchange. Forward contracts are customized. The two parties set the terms according to their needs.
- Futures contracts are guaranteed by the clearinghouse against default. Forward contracts subject each party to the possibility of default by the other party.
- Futures contracts require margin deposits and the daily settlement of gains and losses. Forward contracts pay off the full value of the contract at expiration. Some participants in forward contracts agree prior to expiration to use margin deposits and occasional settlements to reduce the default risk.
- Futures contracts are regulated by federal authorities. Forward contracts are essentially unregulated.
- Futures contracts are conducted in a public arena, the futures exchange, and are reported to the exchanges and the regulatory authority. Forward contracts are conducted privately, and individual transactions are not generally reported to the public or regulators.

Risks that are associated with very specific dates, such as when interest rates are reset on a loan, usually require forward contracts. Thus, we used an FRA to lock in the rate on a loan. That rate is set on a specific day. A futures contract has specific expirations that may not correspond to the day on which the rate is reset. Although it is possible to use sophisticated models and software to compensate for this problem, typical borrowers do not usually possess the expertise to do so. It is much easier for them to use an FRA.

Oddly enough, however, the risk of most bond portfolios is managed using Treasury bond futures. Those portfolios have horizon dates for which the company is attempting to lock in values. But usually rates are not being reset on that date, and the hedge does not need to be perfect. Often there is flexibility with respect to the horizon date. Treasury bond futures work reasonably well for these investors. Likewise, the risk of equity portfolios tends to be managed with stock index futures. Even though the offsetting of risks is not precise, that is not a necessity. Equity and debt portfolio managers usually need only satisfactory protection against market declines. Nonetheless, in some cases equity and debt portfolio managers use over-the-counter instruments such as forward contracts. In fact, sometimes a portfolio manager will ask

a derivatives dealer to write a forward contract on a specific portfolio. This approach is more costly than using futures and provides a better hedge, but, as noted, a perfect hedge is usually not needed. In practice, portfolio managers have traded off the costs of customized hedges with the costs of using standardized futures contracts and have found the latter to be preferable.[38]

Forward contracts are the preferred vehicle for the risk management of foreign currency. This preference partly reflects the deep liquidity in the forward market, which has been around longer than the futures market. Moreover, much of this trading is undertaken by corporations managing the risk of either the issuance of a bond or the inflows and outcomes of specific currency transactions, in which case the precision provided by customized transactions is preferred.

Nevertheless, one might wonder why certain contracts do not die out. Recall that most corporations do not use the Eurodollar futures market to hedge their floating-rate loans. Yet the Eurodollar futures contract is one of the most active of all futures contracts in the world. Where does this volume come from? It is from the dealers in swaps, options, and FRAs. When they enter into transactions with end users in which the underlying rate is Libor, they must manage the risk they have assumed, and they must do so very quickly. They cannot afford to leave their positions exposed for long. It is rarely possible for them to simply pick up the phone and find another customer to take the opposite side of the transaction. A corporate client with the exact opposite needs at the exact same time as some other end user would be rare. Therefore, dealers need to execute offsetting transactions very quickly. There is no better place to do this than in the Eurodollar futures markets, with its extremely deep liquidity. These dealer companies have sophisticated analysts and software and are able to manage the risk caused by such problems as the futures contract expiring on one day and the payoffs on the FRAs being set on another day. Thus, these risks can be more effectively measured and managed by dealers than by end users.

As we have emphasized, futures contracts require margin deposits and the daily settling of gains and losses. This process causes some administrative problems because money must be deposited into a futures account and cash flows must be managed on a daily basis. When futures brokers call for more money to cover losses, companies using futures contracts must send cash or very liquid securities. Although the brokers may be generating value on the other side of a hedge transaction, that value may not produce actual cash.[39] On the other hand, forward transactions, while not necessarily requiring margin deposits, generate concerns over whether the counterparty will be able to pay at expiration. Of course, those concerns lead some counterparties to require margins and periodic settlements.

Although forward contracts are essentially unregulated while futures contracts are heavily regulated, this factor is not usually a major consideration in deciding which type of contract to use. In some cases, however, regulation prevents use of a specific contract. For example, a country might prohibit foreign futures exchanges from offering their products in its markets. There would probably be no such prohibition on forward contracts.[40] In some cases, regulation prevents or delays usage of certain futures products, making it possible for innovative companies that can create forward

38 Portfolio managers do use swaps on occasion, as we cover in the reading on risk management applications of swap strategies.

39 Consider, for example, a company that sells futures contracts to hedge the value of a bond portfolio. Suppose interest rates fall, the bond portfolio rises, and the futures price also rises. Losses will be incurred on the futures contracts and additional margin deposits will be required. The bond portfolio has increased in value, but it may not be practical to liquidate the portfolio to generate the necessary cash.

40 In some less developed but highly regulated countries, private financial transactions such as forward contracts can be prohibited.

products to offer them ahead of the comparable products of futures exchanges. The futures exchanges claim this is unfair by making it more difficult for them to compete with forward markets in providing risk management products.

We also noted that futures contracts are public transactions, whereas forward contracts are private transactions. This privacy characteristic can cause a company to prefer a forward transaction if it does not want others, such as traders on the futures exchange, to know its views.

7 FINAL COMMENTS

A few points are worth repeating. Because they can be somewhat unstable, betas and durations are difficult to measure, even under the best of circumstances. Even when no derivatives transactions are undertaken, the values believed to be the betas and durations may not truly turn out to reflect the sensitivities of stocks and bonds to the underlying sources of risk. Therefore, if derivatives transactions do not work out to provide the exact hedging results expected, users should not necessarily blame derivatives. If, however, speculative long (short) positions are added to an otherwise long position, risk should increase (decrease), although the exact amount of the increase (decrease) cannot be known for sure in advance.[41] Derivatives should not be maligned for their speculative use when there are valuable hedging uses.

We have mentioned that transaction costs are a major consideration in the use of derivatives, and this is clearly the case with futures and forwards. By some reports, transactions costs for stock index derivatives are approximately 95 percent lower than for stock indexes.[42] Indeed, one of the major reasons that derivatives exist is that they provide a means of trading at lower transaction costs. To survive as risk management products, derivatives need to be much less expensive than the value of the underlying instruments. There are almost no situations in which transacting in the underlying securities would be preferable to using derivatives on a transaction-cost basis, when taking a position for a specified short horizon.

Transacting in futures and forwards also has a major advantage of being less disruptive to the portfolio and its managers. For example, the asset classes of many portfolios are managed by different persons or firms. If the manager of the overall portfolio wants to change the risk of certain asset classes or alter the allocations between asset classes, he can do so using derivatives. Instead of telling one manager that she must sell securities and another manager that he must buy securities, the portfolio manager can use derivatives to reduce the allocation to one class and increase the allocation to the other. The asset class managers need not even know that the overall asset allocation has been changed. They can concentrate on doing the best they can within their respective areas of responsibility.

In the matter of liquidity, however, futures and forwards do not always offer the advantages often attributed to them. They require less capital to trade than the underlying securities, but they are not immune to liquidity problems. Nowhere is this concern more evident than in using a futures contract that expires a long time from

41 We use the expression "should increase (decrease)" to reflect the fact that some other factors could cause perverse results. We previously mentioned call features and credit risk of such assets as corporate and municipal bonds that could result in a bond price not moving in the same direction as a move in the general level of bond prices. A poorly diversified stock portfolio could move opposite to the market, thereby suggesting a negative beta that is really only diversifiable risk. We assume that these situations are rare or that their likelihood and consequences have been properly assessed by risk managers.

42 These statements are based on trading all individual stocks that make up an index. Trading through exchange-traded funds would reduce some of these stock trading costs.

the present. The greatest liquidity in the futures markets is in the shortest expirations. Although there may be futures contracts available with long-term expirations, their liquidity is much lower. Many forward markets are very liquid, but others may not be. High liquidity should not automatically be assumed of all derivatives, although in general, derivatives are more liquid than the underlying securities.

Many organizations are not permitted to use futures or forwards. Futures and forwards are fully leveraged positions, because they essentially require no equity. Some companies might have a policy against fully leveraged positions but might permit options, which are not fully leveraged. Loss potential is much greater on purchased or sold futures or forwards, whereas losses are capped on purchased options. Some organizations, however, permit futures and forwards but prohibit options. Other organizations might prohibit credit-risky instruments, such as forwards and over-the-counter options, but permit credit-risk-free instruments, such as futures and exchange-listed options. These restrictions, although sometimes misguided, are realistic constraints that must be considered when deciding how to manage risk.

In conclusion, futures and forward contracts are both alike and different. On some occasions, one is preferred over the other. Both types of contracts have their niches. The most important point they have in common is that they have zero value at the start and offer linear payoffs, meaning that no one "invests" any money in either type of contract at the start, but the cost is paid for by the willingness to give up gains and incur losses resulting from movements in the underlying. Options, which require a cash investment at the start, allow a party to capture favorable movements in the underlying while avoiding unfavorable movements. This type of payoff is nonlinear. In some cases, options will be preferred to other types of derivatives.

SUMMARY

OPTIONAL SEGMENT

- A borrower can lock in the rate that will be set at a future date on a single-payment loan by entering into a long position in an FRA. The FRA obligates the borrower to make a fixed interest payment and receive a floating interest payment, thereby protecting the borrower if the loan rate is higher than the fixed rate in the FRA but also eliminating gains if the loan rate is lower than the fixed rate in the FRA.
- The duration of a bond futures contract is determined as the duration of the bond underlying the futures contract as of the futures expiration, based on the yield of the bond underlying the futures contract. The modified duration is obtained by dividing the duration by 1 plus the yield. The duration of a futures contract is implied by these factors and is called the implied (modified) duration.
- The implied yield of a futures contract is the yield implied by the futures price on the bond underlying the futures contract as of the futures expiration.
- The yield beta is the sensitivity of the yield on a bond portfolio relative to the implied yield on the futures contract.
- The number of bond futures contracts required to change the duration of a bond portfolio is based on the ratio of the market value of the bonds to the futures price multiplied by the difference between the target or desired modified duration and the actual modified duration, divided by the implied modified duration of the futures.

END OPTIONAL SEGMENT

- The actual adjusted duration of a bond portfolio may not equal the desired duration for a number of reasons, including that the yield beta may be inaccurate or unstable or the bonds could contain call features or default risk. In addition, duration is a measure of instantaneous risk and may not accurately capture the risk over a long horizon without frequent portfolio adjustments.
- The number of equity futures contracts required to change the beta of an equity portfolio is based on the ratio of the market value of the stock to the futures price times the difference between the target or desired beta and the actual beta, divided by the beta of the futures.
- A long position in stock is equivalent to a long position in futures and a long position in a risk-free bond; therefore, it is possible to synthetically create a long position in stock by buying futures on stock and a risk-free bond. This process is called equitizing cash and can be used to create a synthetic stock index fund.
- A long position in cash is equivalent to a long position in stock and a short position in stock futures. Therefore, it is possible to synthetically create a long position in cash by buying stock and selling futures.
- The allocation of a portfolio between equity and debt can be adjusted using stock index and bond futures. Buy futures to increase the allocation to an asset class, and sell futures to decrease the allocation to an asset class.
- The allocation of a bond portfolio between cash and high-duration bonds can be adjusted by using bond futures. Sell futures to increase the allocation to cash, and buy futures to increase the allocation to long-term bonds.
- The allocation of an equity portfolio among different equity sectors can be adjusted by using stock index futures. Sell futures on an index representing one sector to decrease the allocation to that sector, and buy futures on an index representing another sector to increase the allocation to that sector.
- A portfolio manager can buy bond or stock index futures to take a position in an asset class without having cash to actually invest in the asset class. This type of strategy is sometimes used in anticipation of the receipt of a sum of cash at a later date, which will then be invested in the asset class and the futures position will be closed.
- Transaction exposure is the risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale. Translation exposure is the risk associated with the conversion of foreign financial statements into domestic currency. Economic exposure is the risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.
- The risk of a future foreign currency receipt can be eliminated by selling a forward contract on the currency. This transaction locks in the rate at which the foreign currency will be converted to the domestic currency.
- The risk of a future foreign currency payment can be eliminated by buying a forward contract on the currency. This transaction locks in the rate at which the domestic currency will be converted to the foreign currency.
- It is not possible to invest in a foreign equity market and precisely hedge the currency risk only. To hedge the currency risk, one must know the exact amount of foreign currency that will be available at a future date. Without locking in the equity return, it is not possible to know how much foreign currency will be available.
- It is possible to hedge the foreign equity market return and accept the exchange rate risk or hedge the foreign equity market return *and* hedge the exchange rate risk. By hedging the equity market return, one would know the proper amount

of currency that would be available at a later date and could use a futures or forward contract to hedge the currency risk. The equity return, however, would equal the risk-free rate.

- Forward contracts are usually preferred over futures contracts when the risk is related to an event on a specific date, such as an interest rate reset. Forward contracts on foreign currency are usually preferred over futures contracts, primarily because of the liquidity of the market. Futures contracts require margins and daily settlements but are guaranteed against credit losses and may be preferred when credit concerns are an issue. Either contract may be preferred or required if there are restrictions on the use of the other. Dealers use both instruments in managing their risk, occasionally preferring one instrument and sometimes preferring the other. Forward contracts are preferred if privacy is important.
- Futures and forwards, as well as virtually all derivatives, have an advantage over transactions in the actual instruments by virtue of their significantly lower transaction costs. They also allow a portfolio manager to make changes in the risk of certain asset classes or the allocation among asset classes without disturbing the asset class or classes themselves. This feature allows the asset class managers to concentrate on their respective asset classes without being concerned about buying and selling to execute risk-altering changes or asset allocation changes.
- Although futures and forwards tend to be more liquid than their underlying assets, they are not always highly liquid. Therefore, it cannot always be assumed that futures and forwards can solve liquidity problems.

PRACTICE PROBLEMS

1 An investment management firm wishes to increase the beta for one of its portfolios under management from 0.95 to 1.20 for a three-month period. The portfolio has a market value of $175,000,000. The investment firm plans to use a futures contract priced at $105,790 in order to adjust the portfolio beta. The futures contract has a beta of 0.98.

A Calculate the number of futures contracts that should be bought or sold to achieve an increase in the portfolio beta.

B At the end of three months, the overall equity market is up 5.5 percent. The stock portfolio under management is up 5.1 percent. The futures contract is priced at $111,500. Calculate the value of the overall position and the effective beta of the portfolio.

2 Consider an asset manager who wishes to create a fund with exposure to the Russell 2000 stock index. The initial amount to be invested is $300,000,000. The fund will be constructed using the Russell 2000 Index futures contract, priced at 498.30 with a $500 multiplier. The contract expires in three months. The underlying index has a dividend yield of 0.75 percent, and the risk-free rate is 2.35 percent per year.

A Indicate how the money manager would go about constructing this synthetic index using futures.

B Assume that at expiration, the Russell 2000 is at 594.65. Show how the synthetic position produces the same result as investment in the actual stock index.

3 An investment management firm has a client who would like to temporarily reduce his exposure to equities by converting a $25 million equity position to cash for a period of four months. The client would like this reduction to take place without liquidating his equity position. The investment management firm plans to create a synthetic cash position using an equity futures contract. This futures contract is priced at 1170.10, has a multiplier of $250, and expires in four months. The dividend yield on the underlying index is 1.25 percent, and the risk-free rate is 2.75 percent.

A Calculate the number of futures contracts required to create synthetic cash.

B Determine the effective amount of money committed to this risk-free transaction and the effective number of units of the stock index that are converted to cash.

C Assume that the stock index is at 1031 when the futures contract expires. Show how this strategy is equivalent to investing the risk-free asset, cash.

4 Consider a portfolio with a 65 percent allocation to stocks and 35 percent to bonds. The portfolio has a market value of $200 million. The beta of the stock position is 1.15, and the modified duration of the bond position is 6.75. The portfolio manager wishes to increase the stock allocation to 85 percent and reduce the bond allocation to 15 percent for a period of six months. In addition to altering asset allocations, the manager would also like to increase the beta on the stock position to 1.20 and increase the modified duration of the bonds to 8.25. A stock index futures contract that expires in six months is priced at

Practice Problems and Solutions 1–6 taken from *Analysis of Derivatives for the Chartered Financial Analyst® Program,* by Don M. Chance, CFA. © 2003 CFA Institute. All rights reserved. All other problems and solutions © 2017 CFA Institute. All rights reserved.

$157,500 and has a beta of 0.95. A bond futures contract that expires in six months is priced at $109,000 and has an implied modified duration of 5.25. The stock futures contract has a multiplier of one.

A Show how the portfolio manager can achieve his goals by using stock index and bond futures. Indicate the number of contracts and whether the manager should go long or short.

B After six months, the stock portfolio is up 5 percent and bonds are up 1.35 percent. The stock futures price is $164,005 and the bond futures price is $110,145. Compare the market value of the portfolio in which the allocation is adjusted using futures to the market value of the portfolio in which the allocation is adjusted by directly trading stocks and bonds.

5 A pension fund manager expects to receive a cash inflow of $50,000,000 in three months and wants to use futures contracts to take a $17,500,000 synthetic position in stocks and $32,500,000 in bonds today. The stock would have a beta of 1.15 and the bonds a modified duration of 7.65. A stock index futures contract with a beta of 0.93 is priced at $175,210. A bond futures contract with a modified duration of 5.65 is priced at $95,750.

A Calculate the number of stock and bond futures contracts the fund manager would have to trade in order to synthetically take the desired position in stocks and bonds today. Indicate whether the futures positions are long or short.

B When the futures contracts expire in three months, stocks have declined by 5.4 percent and bonds have declined by 3.06 percent. Stock index futures are priced at $167,559, and bond futures are priced at $93,586. Show that profits on the futures positions are essentially the same as the change in the value of stocks and bonds during the three-month period.

6 **A** Consider a US company, GateCorp, that exports products to the United Kingdom. GateCorp has just closed a sale worth £200,000,000. The amount will be received in two months. Because it will be paid in pounds, the US company bears the exchange risk. In order to hedge this risk, GateCorp intends to use a forward contract that is priced at $1.4272 per pound. Indicate how the company would go about constructing the hedge. Explain what happens when the forward contract expires in two months.

B ABCorp is a US-based company that frequently imports raw materials from Australia. It has just entered into a contract to purchase A$175,000,000 worth of raw wool, to be paid in one month. ABCorp fears that the Australian dollar will strengthen, thereby raising the US dollar cost. A forward contract is available and is priced at $0.5249 per Australian dollar. Indicate how ABCorp would go about constructing a hedge. Explain what happens when the forward contract expires in one month.

The following information relates to Questions 7–14

Victor Kayent, a portfolio manager for Terracin Investment Partners (TIP), manages the Terracin Fund. Selected information about the Terracin Fund is presented in Exhibit 1.

Exhibit 1 Asset Allocation and Risk Metrics for the Terracin Fund as of 15 January

Asset Class	Market Value	Portfolio Weight	Beta	Modified Duration
US equities*	$350 million	70%	1.10	n/a
US fixed income	$100 million	20%	n/a	5.00
Cash	$50 million	10%	0.00	0.00
Total	$500 million	100%	n/a	n/a

* This portfolio is meant to track the performance of US large-cap stocks, not to exactly replicate the performance of the S&P 500 Index.

On 15 January, Kayent receives a forecast from the firm's consultant predicting a US equity market decline over the next three months. Based on this forecast and those generated internally by the firm, Kayent plans to temporarily reduce equity exposure in the fund through the use of S&P 500 and Treasury bond futures contracts. The fund currently has no position in futures. Kayent considers the following three strategies.

Strategy 1: Lower the beta on the US equities portion of the fund to 0.80 for a period of three months.

Strategy 2: Create a synthetic cash position by temporarily converting the US equity exposure in the fund into cash for a period of three months.

Strategy 3: Reduce the US equity allocation in the fund to 50% and increase the US fixed-income allocation to 40% for a period of three months.

Selected data on the relevant S&P 500 futures contracts and Treasury bond futures contracts, as well as other market data, are presented in Exhibit 2.

Exhibit 2 Futures and Market Data as of 15 January

S&P 500 futures		Treasury bond futures	
Quoted futures price	2157	Quoted futures price	$105,200
Multiplier	$250	Duration	6.20
Beta	0.90	Yield beta	0.95
Maturity of futures	3 months	Maturity of futures	3 months

Other US market data	
Risk-free rate	0.50%
S&P 500 dividend yield	3.00%

Kayent chooses Strategy 1 to temporarily reduce equity exposure. On 15 April, three months after contract initiation, the futures position is closed based on the quoted futures price in Exhibit 3. Kayent calculates the effective beta of the fund over the past three months to assess the effectiveness of the strategy.

Exhibit 3 Selected Fund and Market Data as of 15 April

S&P 500 futures		Treasury bond futures	
Quoted futures price	2053	Quoted futures price	$104,500
Multiplier	$250	Duration	5.90
Beta	1.05	Yield beta	1.15
Maturity of futures	3 months	Maturity of futures	3 months

Return over last 3 months	
S&P 500	–5.00%
Equity holdings of the Terracin Fund (excluding gains/losses on futures position)	–5.80%

Looking ahead to the next three months, Kayent turns bullish on the US equity markets after reviewing updated market forecasts provided by the firm's consultant. Kayent now wants to gain additional equity exposure and considers the following strategy involving the creation of synthetic stock.

Strategy 4: Equitize $50 million in cash for a three-month period ending 15 July.

Kayent is next told by Helen Tideran, CFO of TIP, that TIP will receive $10 million in cash from a new client on 15 July. The new client currently has no equity or fixed-income exposure and would like to invest in the market as of 15 April. TIP will manage this $10 million in a separate account. To meet the client's request, Kayent elects to pre-invest $7 million in equities with an average beta of 1.50 and pre-invest $3 million in bonds with a modified duration of 7.50 using the futures contracts presented in Exhibit 3.

Tideran also tells Kayent that TIP is acquiring an asset management firm in the United Kingdom for £10 million with the payment due in six months. Tideran tells Kayent:

> We expect the US dollar to depreciate relative to the British pound over the next six months; therefore, we should sell pounds forward to hedge the currency risk.

7 Based on Exhibits 1 and 2, how many futures contracts does Kayent need to sell to execute Strategy 1?

A 175

B 195

C 216

8 Based on Exhibits 1 and 2, how many futures contracts does Kayent need to sell to execute Strategy 2?

A 650

B 654

C 793

9 Based on Exhibits 1 and 2, the number of futures contracts Kayent should sell to adjust the equity allocation in Strategy 3 is:

A 62.

B 204.

C 227.

10 Based on Exhibits 1 and 2, the number of futures contracts Kayent should buy to adjust the fixed-income allocation in Strategy 3 is:

A 690.

B 728.

C 767.

11 Based on Exhibit 3, the effective beta of the equity portion of the fund is *closest* to:

A 0.84.

B 1.19.

C 1.48.

12 The implementation of Strategy 4 requires Kayent to buy:

A stock and short equity futures.

B stock and short risk-free bonds.

C risk-free bonds and buy equity futures.

13 Based on Exhibit 3, to satisfy the new client's pre-investing request, Kayent should buy:

A 18 stock index futures and 36 bond futures.

B 18 stock index futures and 38 bond futures.

C 19 stock index futures and 42 bond futures.

14 Given Tideran's expectation about the British pound over the next six months, Tideran's statement to Kayent is:

A correct.

B incorrect, because TIP should buy pounds forward.

C incorrect, because TIP should not hedge given their expectation for the British pound.

SOLUTIONS

1 A The number of futures contracts that must be bought is

$$N_f = \left(\frac{1.2 - 0.95}{0.98}\right)\left(\frac{\$175{,}000{,}000}{\$105{,}790}\right) = 421.99$$

Rounded off, this is 422 contracts.

B The value of the stock portfolio is \$175,000,000(1 + 0.051) = \$183,925,000.

The profit on the long futures position is 422(\$111,500 – \$105,790) = \$2,409,620.

The overall value of the position (stock plus long futures) is \$183,925,000 + \$2,409,620 = \$186,334,620.

The overall rate of return is $\left(\frac{\$186{,}334{,}620}{\$175{,}000{,}000}\right) - 1 = 0.0648$.

The effective beta is 0.0648/0.055 = 1.18, which is approximately equal to the target beta of 1.2.

2 A The number of futures contracts that must be bought is

$$N_f = \frac{\$300{,}000{,}000(1.0235)^{0.25}}{\$500(498.30)} = 1{,}211.11$$

Rounded off, this is 1,211 contracts long.

Now invest the following amount in risk-free bonds, which pay 2.35 percent interest:

$$\frac{1{,}211(\$500)(498.30)}{(1.0235)^{0.25}} = \$299{,}973{,}626$$

This amount will grow to $\$299{,}973{,}626(1.0235)^{0.25} = \$301{,}720{,}650$. The number of synthetic units of stock is

$$\frac{1211(500)}{(1.0075)^{0.25}} = 604{,}369.98$$

which would grow to $604{,}369.98(1.0075)^{0.25} = 605{,}500$ with the reinvestment of dividends.

B At expiration in three months, the payoff on the futures is 1,211(\$500)(594.65 – 498.30) = 605,500(594.65) – \$301,720,650. In order to settle the futures contract, the money manager will owe \$301,720,650. This amount can be paid off with the proceeds from the investment in risk-free bonds, leaving the money manager with 605,500 units of the stock index, each worth 594.65. This transaction achieves the desired exposure to the stock index.

3 A In order to create a synthetic cash position, the number of futures contracts to be sold is

$$N_f = \frac{\$25{,}000{,}000(1.0275)^{4/12}}{\$250(1170.10)} = 86.24$$

Rounded off, this is 86 contracts short.

B The effective amount of stock committed to this transaction is actually

$$\frac{86(\$250)(1170.10)}{(1.0275)^{4/12}} = \$24{,}930{,}682$$

This amount invested at the risk-free rate should grow to $\$24{,}930{,}682(1.0275)^{4/12} = \$25{,}157{,}150$, resulting in the following number of shares:

$$\frac{86(\$250)}{(1.0125)^{4/12}} = 21{,}411.16$$

With reinvestment of dividends, this number would grow to $21{,}411.16(1.0125)^{4/12} = 21{,}500$ shares. The short position in futures is equivalent to selling $24,930,682 of stock.

C In four months when the futures contract expires, the stock index is at 1031. The payoff of the futures contract is $-86(\$250)(1031 - 1170.10) = -\$21{,}500(1031) + \$25{,}157{,}150 = \$2{,}990{,}650$.

Netting the futures payoff against the stock position produces $25,157,150, equivalent to investing $24,930,682 at 2.75 percent for four months. The short futures position has thus effectively converted equity to cash.

4 A The current allocation is as follows: stocks, 0.65(200,000,000) = $130,000,000; bonds, 0.35($200,000,000) = $70,000,000. The new allocation desired is as follows: stocks, 0.85($200,000,000) = $170,000,000; bonds, 0.15($200,000,000) = $30,000,000. So, to achieve the new allocation, the manager must buy stock futures on $170,000,000 – $130,000,000 = $40,000,000. An equivalent amount of bond futures must be sold.

To synthetically sell $40 million in bonds and convert into cash, the manager must sell futures:

$$N_{bf} = \left(\frac{0.0 - 6.75}{5.25}\right)\left(\frac{\$40{,}000{,}000}{\$109{,}000}\right) = -471.82$$

He should sell 472 contracts and create synthetic cash.

To synthetically buy $40 million of stock with synthetic cash, the manager must buy futures:

$$N_{sf} = \left(\frac{1.15 - 0}{0.95}\right)\left(\frac{\$40{,}000{,}000}{\$157{,}500}\right) = 307.44$$

He should buy 307 contracts. Now the manager effectively has $170 million (85 percent) in stocks and $30 million (15 percent) in bonds.

The next step is to increase the beta on the $170 million in stock to 1.20 by purchasing futures. The number of futures contracts would, therefore, be

$$N_{sf} = \left(\frac{1.20 - 1.15}{0.95}\right)\left(\frac{\$170{,}000{,}000}{\$157{,}500}\right) = 56.81$$

An additional 57 stock futures contracts should be purchased. In total, 307 + 57 = 364 contracts are bought.

To increase the modified duration from 6.75 to 8.25 on the $30 million of bonds, the number of futures contracts is

$$N_{bf} = \left(\frac{8.25 - 6.75}{5.25}\right)\left(\frac{\$30{,}000{,}000}{\$109{,}000}\right) = 78.64$$

An additional 79 bond futures contracts should be purchased. In total, 472 – 79 = 393 contracts are sold.

B The value of the stock will be $130,000,000(1 + 0.05) = $136,500,000. The profit on the stock index futures will be 364($164,005 – $157,500) = $2,367,820.

The value of the bonds will be $70,000,000(1 + 0.0135) = $70,945,000. The profit on the bond futures will be –393($110,145 – $109,000) = –$449,985.

The total value of the position, therefore, is $136,500,000 + $2,367,820 + $70,945,000 – $449,985 = $209,362,835.

If the reallocation were carried out by trading bonds and stocks: The stock would be worth $170,000,000(1 + 0.05) = $178,500,000. The bonds would be worth $30,000,000(1 + 0.0135) = $30,405,000. The overall value of the portfolio would be $178,500,000 + $30,405,000 = $208,905,000.

The difference between the two approaches is $457,835, only 0.229 percent of the original value of the portfolio.

5 A In order to gain effective exposure to stock and bonds today, the manager must use futures to synthetically buy $17,500,000 of stock and $32,500,000 of bonds.

To synthetically buy $17,500,000 in stock, the manager must buy futures:

$$N_{sf} = \left(\frac{1.15 - 0}{0.93}\right)\left(\frac{\$17{,}500{,}000}{\$175{,}210}\right) = 123.51$$

He should buy 124 contracts.

To synthetically buy $32,500,000 of bonds, the manager must buy futures:

$$N_{bf} = \left(\frac{7.65 - 0}{5.65}\right)\left(\frac{\$32{,}500{,}000}{\$95{,}750}\right) = 459.57$$

He should buy 460 contracts.

Now the manager effectively has invested $17,500,000 in stock and $32,500,000 in bonds.

B The profit on the stock index futures will be 124($167,559 – $175,210) = –$948,724.

The profit on the bond futures will be 460($93,586 – $95,750) = –$995,440.

The total profit with futures = –$948,724 – $995,440 = –$1,944,164.

If bonds and stocks were purchased today, in three months:

The change in value of stock would be $17,500,000(–0.054) = –$945,000.

The change in value of bonds would be $32,500,000(–0.0306) = –$994,500.

The overall change in value of the portfolio would be –$945,000 – $994,500 = –$1,939,500.

The difference between the two approaches is $4,664, only 0.009 percent of the total expected cash inflow.

6 A GateCorp will receive £200,000,000 in two months. To hedge the risk that the pound may weaken during this period, the firm should enter into a forward contract to deliver pounds and receive dollars two months from now at a price fixed now. Because it is effectively long the pound, GateCorp will take a short position on the pound in the forward market. GateCorp will thus enter into a two-month short forward contract to deliver £200,000,000 at a rate of $1.4272 per pound.

When the forward contract expires in two months, irrespective of the spot exchange rate, GateCorp will deliver £200,000,000 and receive ($1.4272/£1)(£200,000,000) = $285,440,000.

B ABCorp will have to pay A$175,000,000 in one month. To hedge the risk that the Australian dollar may strengthen against the US dollar during this period, it should enter into a forward contract to purchase Australian dollars one month from now at a price fixed today. Because it is effectively short the Australian dollar, ABCorp takes a long position in the forward market. ABCorp thus enters into a one-month long forward contract to purchase A$175,000,000 at a rate of US$0.5249 per Australian dollar.

When the forward contract expires in one month, irrespective of the spot exchange rate, ABCorp will pay ($0.5249/A$)(A$175,000,000) = $91,857,500 to purchase A$175,000,000. This amount is used to purchase the raw material needed.

7 C is correct. The number of S&P 500 futures contracts needed to be sold to execute Strategy 1 is calculated as follows.

$$N_f = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right)$$

Given the fund's equity allocation of $350 million,

$$N_f = \left(\frac{0.80 - 1.10}{0.90}\right)\left(\frac{\$350{,}000{,}000}{2157 \times \$250}\right)$$

$$= -216.35 \text{ (}-216\text{ rounded)}$$

Because the calculated answer is negative, 216 contracts should be sold.

8 C is correct. The number of S&P 500 futures contracts needed to be sold to execute Strategy 2 is calculated as follows.

$$N_f = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right)$$

Given the fund's equity allocation of $350 million and setting the target beta equal to 0,

$$N_f = \left(\frac{0.00 - 1.10}{0.90}\right)\left(\frac{\$350{,}000{,}000}{2157 \times \$250}\right)$$

$$= -793.28 \text{ (}-793\text{ rounded)}$$

Because the calculated answer is negative, 793 contracts should be sold.

9 C is correct. The reduction in the stock allocation in the fund from 70% ($350 million) to 50% ($250 million) is done by converting (selling) $100 million in stocks to cash (beta of zero) using stock index futures. The number of S&P 500 futures contracts needed to be sold to reduce the equity exposure to 50% is calculated as follows.

$$N_f = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right)$$

$$N_f = \left(\frac{0.00 - 1.10}{0.90}\right)\left(\frac{\$100{,}000{,}000}{2157 \times \$250}\right)$$

$$= -226.65 \text{ (}-227\text{ rounded)}$$

10 B is correct. The increase in the bond allocation in the fund from 20% ($100 million) to 40% ($200 million) is done by converting $100 million in stocks to cash using stock index futures and then converting the $100 million in cash to bonds with a modified duration of 5.00 using bond futures.

Setting the target modified duration to 5.00, the number of bond futures to buy is calculated as:

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)\beta_y$$

$$N_f = \left(\frac{5.00 - 0.00}{6.20}\right)\left(\frac{\$100{,}000{,}000}{\$105{,}200}\right) \times 0.95$$

$$= 728.26 \text{ (728 rounded)}$$

11 A is correct. To execute Strategy 1, 216 contracts would have been sold three months ago on 15 January, calculated as follows.

$$N_f = \left(\frac{0.80 - 1.10}{0.90}\right)\left(\frac{\$350{,}000{,}000}{2157 \times \$250}\right)$$

$$= -216.35 \text{ (}-216\text{ rounded)}$$

The effective beta for the equity portion of the fund over the last three months is calculated as the value of the stock portfolio = $350,000,000(1 – 0.058) = $329,700,000.

The profit on the short futures position = –216 × (2053 – 2157) × $250 = $5,616,000.

So, the overall value of the portfolio = $329,700,000 + $5,616,000 = $335,316,000.

Therefore, the rate of return = ($335,316,000/$350,000,000) – 1 = –0.042.

Because the market (S&P 500) declined by 5% and the overall loss was 4.2%, the effective beta of the portfolio = –0.042/–0.05 = 0.84.

12 C is correct. Equitizing cash (Strategy 4) is the combination of buying (long) risk-free bonds and buying (long) equity futures:

Long risk-free bond + Long futures = Long stock.

13 C is correct. Kayent wants to pre-invest $7 million in stock index futures with a beta of 1.50. Setting the target beta to 1.50, the number of stock index futures to buy is calculated as follows.

$$N_f = \left(\frac{\beta_T - \beta_S}{\beta_f}\right)\left(\frac{S}{f}\right)$$

$$N_f = \left(\frac{1.50 - 0.00}{1.05}\right)\left(\frac{\$7{,}000{,}000}{2053 \times \$250}\right)$$

$$= 19.48 \text{ (19 rounded)}$$

Kayent also wants to pre-invest $3 million in bond futures contracts with a target modified duration of 7.50. Setting the target modified duration to 7.50, the number of bond futures to buy is calculated as follows.

$$N_f = \left(\frac{MDUR_T - MDUR_B}{MDUR_f}\right)\left(\frac{B}{f}\right)\beta_y$$

$$N_f = \left(\frac{7.50 - 0.00}{5.90}\right)\left(\frac{\$3{,}000{,}000}{\$104{,}500}\right) \times 1.15$$

$$= 41.97 \text{ (42 rounded)}$$

A is incorrect because 18 incorrectly uses the yield beta of 1.15 for the stock index futures beta of 1.05 and 36 incorrectly omits the yield beta in the equation. The number of stock index futures is calculated as follows.

$$N_f = \left(\frac{1.50 - 0.00}{1.15}\right)\left(\frac{\$7{,}000{,}000}{2053 \times \$250}\right)$$

$$= 17.79 \text{ (18 rounded)}$$

The number of bond futures needed is

$$N_f = \left(\frac{7.50 - 0.00}{5.90}\right)\left(\frac{\$3{,}000{,}000}{\$104{,}500}\right)$$

$$= 36.49 \text{ (36 rounded)}$$

14 B is correct. TIP is obligated to pay £10 million in six months. If the pound appreciates (dollar depreciates) against the dollar (pound) during this period, the dollar cost of the payable will increase (decrease). To hedge against this risk, TIP should buy a pound forward contract. Under the forward contract, TIP will purchase pounds six months from now at an exchange rate locked in today. So, the dollar cost of the payable is set today regardless of where the spot exchange rate is in six months (expiration).

READING

29

Risk Management Applications of Option Strategies

by Don M. Chance, PhD, CFA

Don M. Chance, PhD, CFA, is at Louisiana State University (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** compare the use of covered calls and protective puts to manage risk exposure to individual securities;
☐	**b.** calculate and interpret the value at expiration, profit, maximum profit, maximum loss, breakeven underlying price at expiration, and general shape of the graph for the following option strategies: bull spread, bear spread, butterfly spread, collar, straddle, box spread;
☐	**c.** calculate the effective annual rate for a given interest rate outcome when a borrower (lender) manages the risk of an anticipated loan using an interest rate call (put) option;
☐	**d.** calculate the payoffs for a series of interest rate outcomes when a floating rate loan is combined with 1) an interest rate cap, 2) an interest rate floor, or 3) an interest rate collar;
☐	**e.** explain why and how a dealer delta hedges an option position, why delta changes, and how the dealer adjusts to maintain the delta hedge;
☐	**f.** interpret the gamma of a delta-hedged portfolio and explain how gamma changes as in-the-money and out-of-the-money options move toward expiration.

INTRODUCTION

1

In the reading on risk management applications of forward and futures strategies, we examined strategies that employ forward and futures contracts. Recall that forward and futures contracts have linear payoffs and do not require an initial outlay. Options, on the other hand, have nonlinear payoffs and require the payment of cash up front.

Analysis of Derivatives for the Chartered Financial Analyst® Program, by Don M. Chance, CFA. © 2003 CFA Institute. All rights reserved.

By having nonlinear payoffs, options permit their users to benefit from movements in the underlying in one direction and to not be harmed by movements in the other direction. In many respects, they offer the best of all worlds, a chance to profit if expectations are realized with minimal harm if expectations turn out to be wrong. The price for this opportunity is the cash outlay required to establish the position. From the standpoint of the holder of the short position, options can lead to extremely large losses. Hence, sellers of options must be well compensated in the form of an adequate up-front premium and must skillfully manage the risk they assume.

In this reading we examine the most widely used option strategies. The reading is divided into three parts. In the first part, we look at option strategies that are typically used in equity investing, which include standard strategies involving single options and strategies that combine options with the underlying. In the second part, we look at the specific strategies that are commonly used in managing interest rate risk. In the third part, we examine option strategies that are used primarily by dealers and sophisticated traders to manage the risk of option positions.

Let us begin by reviewing the necessary notation. First recall that time 0 is the time at which the strategy is initiated and time T is the time the option expires, stated as a fraction of a year. Accordingly, the amount of time until expiration is simply $T - 0 = T$, which is (Days to expiration)/365. The other symbols are

c_0, c_T = price of the call option at time 0 and time T
p_0, p_T = price of the put option at time 0 and time T[1]
X = exercise price
S_0, S_T = price of the underlying at time 0 and time T
V_0, V_T = value of the position at time 0 and time T
Π = profit from the transaction: $V_T - V_0$
r = risk-free rate

Some additional notation will be introduced when necessary.

Note that we are going to measure the profit from an option transaction, which is simply the final value of the transaction minus the initial value of the transaction. Profit does not take into account the time value of money or the risk. Although a focus on profit is not completely satisfactory from a theoretical point of view, it is nonetheless instructive, simple, and a common approach to examining options. Our primary objective here is to obtain a general picture of the manner in which option strategies perform. With that in mind, discussing profit offers probably the best trade-off in terms of gaining the necessary knowledge with a minimum of complexity.

In this reading, we assume that the option user has a view regarding potential movements of the underlying. In most cases that view is a prediction of the direction of the underlying, but in some cases it is a prediction of the volatility of the underlying. In all cases, we assume this view is specified over a horizon that corresponds to the option's life or that the option expiration can be tailored to the horizon date. Hence, for the most part, these options should be considered customized, over-the-counter options.[2] Every interest rate option is a customized option.

Because the option expiration corresponds to the horizon date for which a particular view is held, there is no reason to use American options. Accordingly, all options in this reading are European options. Moreover, we shall not consider terminating the strategy early. Putting an option in place and closing the position prior to expiration is certainly a legitimate strategy. It could reflect the arrival of new information over

1 Lower case indicates European options, and upper case indicates American options. In this reading, all options are European.
2 If the options discussed were exchange-listed options, it would not significantly alter the material in this reading.

the holding period, but it requires an understanding of more complex issues, such as valuation of the option and the rate at which the option loses its time value. Thus, we shall examine the outcome of a particular strategy over a range of possible values of the underlying only on the expiration day.

Section 2 of this reading focuses on option strategies that relate to equity investments. Section 3 concentrates on strategies using interest rate options. In Section 4, we focus on managing an option portfolio.

OPTION STRATEGIES FOR EQUITY PORTFOLIOS

2

OPTIONAL SEGMENT

Many typical illustrations of option strategies use individual stocks, but we shall use options on a stock index, the NASDAQ 100, referred to simply as the NASDAQ. We shall assume that in addition to buying and selling options on the NASDAQ, we can also buy the index, either through construction of the portfolio itself, through an index mutual fund, or an exchange-traded fund.[3] We shall simply refer to this instrument as a stock. We are given the following numerical data:

S_0 = 2000, value of the NASDAQ 100 when the strategy is initiated

T = 0.0833, the time to expiration (one month = 1/12)

The options available will be the following:[4]

Exercise Price	Call Price	Put Price
1950	108.43	56.01
2000	81.75	79.25
2050	59.98	107.39

Let us start by examining an initial strategy that is the simplest of all: to buy or sell short the underlying. Panel A of Exhibit 1 illustrates the profit from the transaction of buying a share of stock. We see the obvious result that if you buy the stock and it goes up, you make a profit; if it goes down, you incur a loss. Panel B shows the case of selling short the stock. Recall that this strategy involves borrowing the shares from a broker, selling them at the current price, and then buying them back at a later date. In this case, if you sell short the stock and it goes down, you make a profit. Conversely, if it goes up, you incur a loss. Now we shall move on to strategies involving options, but we shall use the stock strategies again when we combine options with stock.

3 Exchange-traded shares on the NASDAQ 100 are called NASDAQ 100 Trust Shares and QQQs, for their ticker symbol. They are commonly referred to as Qubes, trade on the AMEX, and are the most active exchange-traded fund and often the most actively traded of all securities. Options on the NASDAQ 100 are among the most actively traded as well.

4 These values were obtained using the Black–Scholes–Merton model. By using this model, we know we are working with reasonable values that do not permit arbitrage opportunities.

Exhibit 1 Simple Stock Strategies

A. Buy Stock

B. Sell Short Stock

In this section we examine option strategies in the context of their use in equity portfolios. Although these strategies are perfectly applicable for fixed-income portfolios, corporate borrowing scenarios, or even commodity risk management situations, they are generally more easily explained and understood in the context of investing in equities or equity indexes.

To analyze an equity option strategy, we first assume that we establish the position at the current price. We then determine the value of the option at expiration for a specific value of the index at expiration. We calculate the profit as the value at expiration minus the current price. We then generate a graph to illustrate the value at

expiration and profit for a range of index values at expiration. Although the underlying is a stock index, we shall just refer to it as the underlying to keep things as general as possible. We begin by examining the most fundamental option transactions, long and short positions in calls and puts.

2.1 Standard Long and Short Positions

2.1.1 *Calls*

Consider the purchase of a call option at the price c_0. The value at expiration, c_T, is $c_T = \max(0, S_T - X)$. Broken down into parts,

$$c_T = 0 \quad \text{if } S_T \leq X$$
$$c_T = S_T - X \quad \text{if } S_T > X$$

The profit is obtained by subtracting the option premium, which is paid to purchase the option, from the option value at expiration, $\Pi = c_T - c_0$. Broken down into parts,

$$\Pi = -c_0 \quad \text{if } S_T \leq X$$
$$\Pi = S_T - X - c_0 \quad \text{if } S_T > X$$

Now consider this example. We buy the call with the exercise price of 2000 for 81.75. Consider values of the index at expiration of 1900 and 2100.
For $S_T = 1900$,

$$c_T = \max(0, 1900 - 2000) = 0$$
$$\Pi = 0 - 81.75 = -81.75$$

For $S_T = 2100$,

$$c_T = \max(0, 2100 - 2000) = 100$$
$$\Pi = 100 - 81.75 = 18.25$$

Exhibit 2 illustrates the value at expiration and profit when S_T, the underlying price at expiration, ranges from 1600 to 2400. We see that buying a call results in a limited loss of the premium, 81.75. For an index value at expiration greater than the exercise price of 2000, the value and profit move up one-for-one with the index value, and there is no upper limit.

Exhibit 2 Buy Call

It is important to identify the breakeven index value at expiration. Recall that the formula for the profit is $\Pi = \max(0,S_T - X) - c_0$. We would like to know the value of S_T for which $\Pi = 0$. We shall call that value S_T^*. It would be nice to be able to solve $\Pi = \max(0,S_T^* - X) - c_0 = 0$ for S_T^*, but that is not directly possible. Instead, we observe that there are two ranges of outcomes, one in which $\Pi = S_T^* - X - c_0$ for $S_T^* > X$, the case of the option expiring in-the-money, and the other in which $\Pi = -c_0$ for $S_T \leq X$, the case of the option expiring out-of-the-money. It is obvious from the equation and by observing Exhibit 2 that in the latter case, there is no possibility of breaking even. In the former case, we see that we can solve for S_T^*. Setting $\Pi = S_T^* - X - c_0 = 0$, we obtain $S_T^* = X + c_0$.

Thus, the breakeven is the exercise price plus the option premium. This result should be intuitive: The value of the underlying at expiration must exceed the exercise price by the amount of the premium to recover the cost of the premium. In this problem, the breakeven is $S_T^* = 2000 + 81.75 = 2081.75$. Observe in Exhibit 2 that the profit line crosses the axis at this value.

In summarizing the strategy, we have the following results for the option buyer:

$c_T = \max(0,S_T - X)$

Value at expiration = c_T

Profit: $\Pi = c_T - c_0$

Maximum profit = ∞

Maximum loss = c_0

Breakeven: $S_T^* = X + c_0$

Call options entice naive speculators, but it is important to consider the *likely* gains and losses more than the *potential* gains and losses. For example, in this case, the underlying must go up by about 4.1 percent in one month to cover the cost of the call. This increase equates to an annual rate of almost 50 percent and is an unreasonable expectation by almost any standard. If the underlying does not move at all, the loss is 100 percent of the premium.

For the seller of the call, the results are just the opposite. The sum of the positions of the seller and buyer is zero. Hence, we can take the value and profit results for the buyer and change the signs. The results for the maximum profit and maximum loss are changed accordingly, and the breakeven is the same. Hence, for the option seller,

$c_T = \max(0, S_T - X)$

Value at expiration = $-c_T$

Profit: $\Pi = -c_T + c_0$

Maximum profit = c_0

Maximum loss = ∞

Breakeven: $S_T^* = X + c_0$

Exhibit 3 shows the results for the seller of the call. Note that the value and profit have a fixed maximum. The worst case is an infinite loss. Just as there is no upper limit to the buyer's potential gain, there is no upper limit to how much the seller can lose.

Exhibit 3 Sell Call

Call options are purchased by investors who are bullish. We now turn to put options, which are purchased by investors who are bearish.

EXAMPLE 1

Consider a call option selling for $7 in which the exercise price is $100 and the price of the underlying is $98.

A Determine the value at expiration and the profit for a buyer under the following outcomes:

i. The price of the underlying at expiration is $102.

ii. The price of the underlying at expiration is $94.

B Determine the value at expiration and the profit for a seller under the following outcomes:

i. The price of the underlying at expiration is \$91.

ii. The price of the underlying at expiration is \$101.

C Determine the following:

i. the maximum profit to the buyer (maximum loss to the seller).

ii. the maximum loss to the buyer (maximum profit to the seller).

D Determine the breakeven price of the underlying at expiration.

Solutions:

A Call buyer

i. Value at expiration $= c_T = \max(0, S_T - X)$

$= \max(0, 102 - 100) = 2$

$\Pi = c_T - c_0 = 2 - 7 = -5$

ii. Value at expiration $= c_T = \max(0, S_T - X)$

$= \max(0, 94 - 100) = 0$

$\Pi = c_T - c_0 = 0 - 7 = -7$

B Call seller

i. Value at expiration $= -c_T = -\max(0, S_T - X)$

$= -\max(0, 91 - 100) = 0$

$\Pi = -c_T + c_0 = -0 + 7 = 7$

ii. Value at expiration $= -c_T = -\max(0, S_T - X)$

$= -\max(0, 101 - 100) = -1$

$\Pi = -c_T + c_0 = -1 + 7 = 6$

C Maximum and minimum

i. Maximum profit to buyer (loss to seller) = ∞

ii. Maximum loss to buyer (profit to seller) = $c_0 = 7$

D $S_T^* = X + c_0 = 100 + 7 = 107$

2.1.2 *Puts*

The value of a put at expiration is $p_T = \max(0, X - S_T)$. Broken down into parts,

$$p_T = X - S_T \quad \text{if } S_T < X$$
$$p_T = 0 \quad \text{if } S_T \geq X$$

The profit is obtained by subtracting the premium on the put from the value at expiration:

$$\Pi = p_T - p_0$$

Broken down into parts,

$$\Pi = X - S_T - p_0 \quad \text{if } S_T < X$$
$$\Pi = -p_0 \quad \text{if } S_T \geq X$$

For our example and outcomes of S_T = 1900 and 2100, the results are as follows:

$S_T = 1900$:
$P_T = \max(0,2000 - 1900) = 100$
$\Pi = 100 - 79.25 = 20.75$
$S_T = 2100$:
$P_T = \max(0,2000 - 2100) = 0$
$\Pi = 0 - 79.25 = -79.25$

These results are shown in Exhibit 4. We see that the put has a maximum value and profit and a limited loss, the latter of which is the premium. The maximum value is obtained when the underlying goes to zero.[5] In that case, $p_T = X$. So the maximum profit is $X - p_0$. Here that will be 2000 – 79.25 = 1920.75.

Exhibit 4 Buy Put

The breakeven is found by breaking up the profit equation into its parts, $\Pi = X - S_T - p_0$ for $S_T < X$ and $\Pi = -p_0$ for $S_T \geq X$. In the latter case, there is no possibility of breaking even. It refers to the range over which the entire premium is lost. In the former case, we denote the breakeven index value as S_T^*, set the equation to zero, and solve for S_T^* to obtain $S_T^* = X - p_0$. In our example, the breakeven is S_T^* = 2000 – 79.25 = 1920.75.

In summary, for the strategy of buying a put we have

$p_T = \max(0,X - S_T)$

Value at expiration = p_T

Profit: $\Pi = p_T - p_0$

Maximum profit = $X - p_0$

Maximum loss = p_0

5 The maximum value and profit are not visible on the graph because we do not show S_T all the way down to zero.

Breakeven: $S_T^* = X - p_0$

Now consider the *likely* outcomes for the holder of the put. In this case, the underlying must move down by almost 4 percent in one month to cover the premium. One would hardly ever expect the underlying to move down at an annual rate of almost 50 percent. Moreover, if the underlying does not move downward at all (a likely outcome given the positive expected return on most assets), the loss is 100 percent of the premium.

For the sale of a put, we simply change the sign on the value at expiration and profit. The maximum profit for the buyer becomes the maximum loss for the seller and the maximum loss for the buyer becomes the maximum profit for the seller. The breakeven for the seller is the same as for the buyer. So, for the seller,

$p_T = \max(0, X - S_T)$

Value at expiration = $-p_T$

Profit: $\Pi = -p_T + p_0$

Maximum profit = p_0

Maximum loss = $X - p_0$

Breakeven: $S_T^* = X - p_0$

Exhibit 5 graphs the value at expiration and the profit for this transaction.

Exhibit 5 Sell Put

EXAMPLE 2

Consider a put option selling for $4 in which the exercise price is $60 and the price of the underlying is $62.

A Determine the value at expiration and the profit for a buyer under the following outcomes:

i. The price of the underlying at expiration is $62.

ii. The price of the underlying at expiration is \$55.

B Determine the value at expiration and the profit for a seller under the following outcomes:

i. The price of the underlying at expiration is \$51.

ii. The price of the underlying at expiration is \$68.

C Determine the following:

i. the maximum profit to the buyer (maximum loss to the seller).

ii. the maximum loss to the buyer (maximum profit to the seller).

D Determine the breakeven price of the underlying at expiration.

Solutions:

A Put buyer

i. Value at expiration $= p_T = \max(0, X - S_T)$

$= \max(0, 60 - 62) = 0$

$\Pi = p_T - p_0 = 0 - 4 = -4$

ii. Value at expiration $= p_T = \max(0, X - S_T)$

$= \max(0, 60 - 55) = 5$

$\Pi = p_T - p_0 = 5 - 4 = 1$

B Put seller

i. Value at expiration $= -p_T = -\max(0, X - S_T)$

$= -\max(0, 60 - 51) = -9$

$\Pi = -p_T + p_0 = -9 + 4 = -5$

ii. Value at expiration $= -p_T = -\max(0, X - S_T)$

$= -\max(0, 60 - 68) = 0$

$\Pi = -p_T + p_0 = 0 + 4 = 4$

C Maximum and minimum

i. Maximum profit to buyer (loss to seller) $= X - p_0 = 60 - 4 = 56$

ii. Maximum loss to buyer (profit to seller) $= p_0 = 4$

D $S_T^* = X - p_0 = 60 - 4 = 56$

It may be surprising to find that we have now covered all of the information we need to examine all of the other option strategies. We need to learn only a few basic facts. We must know the formula for the value at expiration of a call and a put. Then we need to know how to calculate the profit for the purchase of a call and a put, but that calculation is simple: the value at expiration minus the initial value. If we know these results, we can calculate the value at expiration of the option and the profit for any value of the underlying at expiration. If we can do that, we can graph the results for a range of possible values of the underlying at expiration. Because graphing can take a long time, however, it is probably helpful to learn the basic shapes of the value and profit graphs for calls and puts. Knowing the profit equation and the shapes of the graphs, it is easy to determine the maximum profit and maximum loss. The breakeven can be determined by setting the profit equation to zero for the case in which the profit equation contains S_T. Once we have these results for the long call and put, it is an easy matter to turn them around and obtain the results for the short

END OPTIONAL SEGMENT

call and put. Therefore, little if any memorization is required. From there, we can go on to strategies that combine an option with another option and combine options with the underlying.

2.2 Risk Management Strategies with Options and the Underlying

In this section, we examine two of the most widely used option strategies, particularly for holders of the underlying. One way to reduce exposure without selling the underlying is to sell a call on the underlying; the other way is to buy a put.

2.2.1 *Covered Calls*

A **covered call** is a relatively conservative strategy, but it is also one of the most misunderstood strategies. A covered call is a position in which you own the underlying and sell a call. The value of the position at expiration is easily found as the value of the underlying plus the value of the short call:

$$V_T = S_T - \max(0, S_T - X)$$

Therefore,

$$\begin{aligned} V_T &= S_T && \text{if } S_T \le X \\ V_T &= S_T - (S_T - X) = X && \text{if } S_T > X \end{aligned}$$

We obtain the profit for the covered call by computing the change in the value of the position, $V_T - V_0$. First recognize that V_0, the value of the position at the start of the contract, is the initial value of the underlying minus the call premium. We are long the underlying and short the call, so we must subtract the call premium that was received from the sale of the call. The initial investment in the position is what we pay for the underlying less what we receive for the call. Hence, $V_0 = S_0 - c_0$. The profit is thus

$$\begin{aligned} \Pi &= S_T - \max(0, S_T - X) - (S_0 - c_0) \\ &= S_T - S_0 - \max(0, S_T - X) + c_0 \end{aligned}$$

With the equation written in this manner, we see that the profit for the covered call is simply the profit from buying the underlying, $S_T - S_0$, plus the profit from selling the call, $-\max(0, S_T - X) + c_0$. Breaking it down into ranges,

$$\begin{aligned} \Pi &= S_T - S_0 + c_0 && \text{if } S_T \le X \\ \Pi &= S_T - S_0 - (S_T - X) + c_0 = X - S_0 + c_0 && \text{if } S_T > X \end{aligned}$$

In our example, $S_0 = 2000$. In this section we shall use a call option with the exercise price of 2050. Thus $X = 2050$, and the premium, c_0, is 59.98. Let us now examine two outcomes: $S_T = 2100$ and $S_T = 1900$. The value at expiration when $S_T = 2100$ is $V_T = 2100 - (2100 - 2050) = 2050$, and when $S_T = 1900$, the value of the position is $V_T = 1900$.

In the first case, we hold the underlying worth 2100 but are short a call worth 50. Thus, the net value is 2050. In the second case, we hold the underlying worth 1900 and the option expires out-of-the-money.

In the first case, $S_T = 2100$, the profit is $\Pi = 2050 - 2000 + 59.98 = 109.98$. In the second case, $S_T = 1900$, the profit is $\Pi = 1900 - 2000 + 59.98 = -40.02$. These results are graphed for a range of values of S_T in Exhibit 6. Note that for all values of ST greater than 2050, the value and profit are maximized. Thus, 2050 is the maximum value and 109.98 is the maximum profit.[6]

As evident in Exhibit 6 and the profit equations, the maximum loss would occur when S_T is zero. Hence, the profit would be $S_T - S_0 + c_0$. The profit is $-S_0 + c_0$ when $S_T = 0$. This means that the maximum loss is $S_0 - c_0$. In this example, $-S_0 + c_0$ is $-2000 + 59.98 = -1940.02$. Intuitively, this would mean that you purchased the underlying for 2000 and sold the call for 59.98. The underlying value went to zero, resulting in a loss of 2000, but the call expired with no value, so the gain from the option is the option premium. The total loss is 1940.02.

Exhibit 6 Covered Call (Buy Underlying, Sell Call)

The breakeven underlying price is found by examining the profit equations and focusing on the equation that contains S_T. In equation form, $\Pi = S_T - S_0 + c_0$ when $S_T \leq X$. We let S_T^* denote the breakeven value of S_T, set the equation to zero, and solve for S_T^* to obtain $S_T^* = S_0 - c_0$. The breakeven and the maximum loss are identical. In this example, the breakeven is $S_T^* = 2000 - 59.98 = 1940.02$, which is seen in Exhibit 6.

To summarize the covered call, we have the following:

Value at expiration: $V_T = S_T - \max(0, S_T - X)$

Profit: $\Pi = V_T - S_0 + c_0$

Maximum profit $= X - S_0 + c_0$

Maximum loss $= S_0 - c_0$

Breakeven: $S_T^* = S_0 - c_0$

6 Note in Exhibit 6 that there is large gap between the value at expiration and profit, especially compared with the graphs of buying and selling calls and puts. This difference occurs because a covered call is mostly a position in the underlying asset. The initial value of the asset, S_0, accounts for most of the difference in the two lines. Note also that because of the put–call parity relationship, a covered call looks very similar to a short put.

Because of the importance and widespread use of covered calls, it is worthwhile to discuss this strategy briefly to dispel some misunderstandings. First of all, some investors who do not believe in using options fail to see that selling a call on a position in the underlying reduces the risk of that position. Options do not automatically increase risk. The option part of this strategy alone, viewed in isolation, seems an extremely risky strategy. We noted in Section 2.1.1 that selling a call without owning the stock exposes the investor to unlimited loss potential. But selling a covered call—adding a short call to a long position in a stock—reduces the overall risk. Thus, any investor who holds a stock cannot say he is too conservative to use options.

Following on that theme, however, one should also view selling a covered call as a strategy that reduces not only the risk but also the expected return compared with simply holding the underlying. Hence, one should not expect to make a lot of money writing calls on the underlying. It should be apparent that in fact the covered call writer could miss out on significant gains in a strong bull market. The compensation for this willingness to give up potential upside gains, however, is that in a bear market the losses on the underlying will be cushioned by the option premium.

It may be disconcerting to some investors to look at the profit profile of a covered call. The immediate response is to think that no one in their right mind would invest in a strategy that has significant downside risk but a limited upside. Just owning the underlying has significant downside risk, but at least there is an upside. But it is important to note that the visual depiction of the strategy, as in Exhibit 6, does not tell the whole story. It says nothing about the likelihood of certain outcomes occurring.

For example, consider the covered call example we looked at here. The underlying starts off at 2000. The maximum profit occurs when the option expires with the underlying at 2050 or above, an increase of 2.5 percent over the life of the option. We noted that this option has a one-month life. Thus, the underlying would have to increase at an approximate annual rate of at least 2.5%(12) = 30% for the covered call writer to forgo all of the upside gain. There are not many stocks, indexes, or other assets in which an investor would expect the equivalent of an annual move of at least 30 percent. Such movements obviously do occur from time to time, but they are not common. Thus, covered call writers do not often give up large gains.

But suppose the underlying did move to 2050 or higher. As we previously showed, the value of the position would be 2050. Because the initial value of the position is 2000 – 59.98 = 1940.02, the rate of return would be 5.7 percent for one month. Hence, the maximum return is still outstanding by almost anyone's standards.[7]

Many investors believe that the initial value of a covered call should not include the value of the underlying if the underlying had been previously purchased. Suppose, for example, that this asset, currently worth 2000, had been bought several months ago at 1900. It is tempting to ignore the current value of the underlying; there is no current outlay. This view, however, misses the notion of opportunity cost. If an investor currently holding an asset chooses to write a call on it, she has made a conscious decision not to sell the asset. Hence, the current value of the asset should be viewed as an opportunity cost that is just as real as the cost to an investor buying the underlying at this time.

Sellers of covered calls must make a decision about the chosen exercise price. For example, one could sell the call with an exercise price of 1950 for 108.43, or sell the call with exercise price of 2000 for 81.75, or sell the call with exercise price of 2050 for 59.98. The higher the exercise price, the less one receives for the call but the more room for gain on the upside. There is no clear-cut solution to deciding which call is best; the choice depends on the risk preferences of the investor.

7 Of course, we are not saying that the performance reflects a positive alpha. We are saying only that the upside performance given up reflects improbably high returns, and therefore the limits on the upside potential are not too restrictive.

Finally, we should note that anecdotal evidence suggests that writers of call options make small amounts of money, but make it often. The reason for this phenomenon is generally thought to be that buyers of calls tend to be overly optimistic, but that argument is fallacious. The real reason is that the expected profits come from rare but large payoffs. For example, consider the call with exercise price of 2000 and a premium of 81.75. As we learned in Section 2.1, the breakeven underlying price is 2081.75—a gain of about 4.1 percent in a one-month period, which would be an exceptional return for almost any asset. These prices were obtained using the Black–Scholes–Merton model, so they are fair prices. Yet the required underlying price movement to profit on the call is exceptional. Obviously someone buys calls, and naturally, someone must be on the other side of the transaction. Sellers of calls tend to be holders of the underlying or other calls, which reduces the enormous risk they would assume if they sold calls without any other position.[8] Hence, it is reasonable to expect that sellers of calls would make money often, because large underlying price movements occur only rarely. Following this line of reasoning, however, it would appear that sellers of calls can consistently take advantage of buyers of calls. That cannot possibly be the case. What happens is that buyers of calls make money less often than sellers, but when they do make money, the leverage inherent in call options amplifies their returns. Therefore, when call writers lose money, they tend to lose big, but most call writers own the underlying or are long other calls to offset the risk.

EXAMPLE 3

Consider a bond selling for \$98 per \$100 face value. A call option selling for \$8 has an exercise price of \$105. Answer the following questions about a covered call.

A Determine the value of the position at expiration and the profit under the following outcomes:

- **i.** The price of the bond at expiration is \$110.
- **ii.** The price of the bond at expiration is \$88.

B Determine the following:

- **i.** The maximum profit.
- **ii.** The maximum loss.

C Determine the breakeven bond price at expiration.

Solutions:

A **i.**
$$V_T = S_T - \max(0, S_T - X) = 110 - \max(0, 110 - 105)$$
$$= 110 - 110 + 105 = 105$$
$$\Pi = V_T - V_0 = 105 - (S_0 - c_0) = 105 - (98 - 8) = 15$$

ii.
$$V_T = S_T - \max(0, S_T - X) = 88 - \max(0, 88 - 105)$$
$$= 88 - 0 = 88$$
$$\Pi = V_T - V_0 = 88 - (S_0 - c_0) = 88 - (98 - 8) = -2$$

B **i.** Maximum profit $= X - S_0 + c_0 = 105 - 98 + 8 = 15$

ii. Maximum loss $= S_0 - c_0 = 98 - 8 = 90$

C $S_T^* = S_0 - c_0 = 98 - 8 = 90$

8 Sellers of calls who hold other calls are engaged in transactions called spreads. We discuss several types of spreads in Section 2.3.

Covered calls represent one widely used way to protect a position in the underlying. Another popular means of providing protection is to buy a put.

2.2.2 *Protective Puts*

Because selling a call provides some protection to the holder of the underlying against a fall in the price of the underlying, buying a put should also provide protection. A put, after all, is designed to pay off when the price of the underlying moves down. In some ways, buying a put to add to a long stock position is much better than selling a call. As we shall see here, it provides downside protection while retaining the upside potential, but it does so at the expense of requiring the payment of cash up front. In contrast, a covered call generates cash up front but removes some of the upside potential.

Holding an asset and a put on the asset is a strategy known as a **protective put**. The value at expiration and the profit of this strategy are found by combining the value and profit of the two strategies of buying the asset and buying the put. The value is $V_T = S_T + \max(0, X - S_T)$. Thus, the results can be expressed as

$$\begin{aligned} V_T &= S_T + (X - S_T) = X \quad \text{if } S_T \le X \\ V_T &= S_T \qquad\qquad\qquad\quad \text{if } S_T > X \end{aligned}$$

When the underlying price at expiration exceeds the exercise price, the put expires with no value. The position is then worth only the value of the underlying. When the underlying price at expiration is less than the exercise price, the put expires in-the-money and is worth $X - S_T$, while the underlying is worth S_T. The combined value of the two instruments is X. When the underlying is worth less than the exercise price at expiration, the put can be used to sell the underlying for the exercise price.

The initial value of the position is the initial price of the underlying, S_0, plus the premium on the put, p_0. Hence, the profit is $\Pi = S_T + \max(0, X - S_T) - (S_0 + p_0)$. The profit can be broken down as follows:

$$\begin{aligned} \Pi &= X - (S_0 + p_0) \quad \text{if } S_T \le X \\ \Pi &= S_T - (S_0 + p_0) \quad \text{if } S_T > X \end{aligned}$$

In this example, we are going to use the put with an exercise price of 1950. Its premium is 56.01. Recalling that the initial price of the underlying is 2000, the value at expiration and profit for the case of $S_T = 2100$ are

$$\begin{aligned} V_T &= 2100 \\ \Pi &= 2100 - (2000 + 56.01) = 43.99 \end{aligned}$$

For the case of $S_T = 1900$, the value at expiration and profit are

$$\begin{aligned} V_T &= 1950 \\ \Pi &= 1950 - (2000 + 56.01) = -106.01 \end{aligned}$$

The results for a range of outcomes are shown in Exhibit 7. Note how the protective put provides a limit on the downside with no limit on the upside.[9] Therefore, we can say that the upper limit is infinite. The lower limit is a loss of 106.01. In the worst possible case, we can sell the underlying for the exercise price, but the up-front cost of the underlying and put are 2056.01, for a maximum loss of 106.01.

9 Note that the graph for a protective put looks like the graph for a call. This result is due to put–call parity.

Exhibit 7 Protective Put (Buy Underlying, Buy Put)

Now let us find the breakeven price of the underlying at expiration. Note that the two profit equations are $\Pi = S_T - (S_0 + p_0)$ if $S_T > X$ and $\Pi = X - (S_0 + p_0)$ if $S_T \leq X$. In the latter case, there is no value of the underlying that will allow us to break even. In the former case, $S_T > X$, we change the notation on S_T to S_T^* to denote the breakeven value, set this expression equal to zero, and solve for S_T^*:

$$S_T^* = S_0 + p_0$$

To break even, the underlying must be at least as high as the amount expended up front to establish the position. In this problem, this amount is 2000 + 56.01 = 2056.01.

To summarize the protective put, we have the following:

Value at expiration: $V_T = S_T + \max(0, X - S_T)$

Profit: $\Pi = V_T - S_0 - p_0$

Maximum profit = ∞

Maximum loss = $S_0 + p_0 - X$

Breakeven: $S_T^* = S_0 + p_0$

A protective put can appear to be a great transaction with no drawbacks. It provides downside protection with upside potential, but let us take a closer look. First recall that this is a one-month transaction and keep in mind that the option has been priced by the Black–Scholes–Merton model and is, therefore, a fair price. The maximum loss of 106.01 is a loss of 106.01/2056.01 = 5.2%. The breakeven of 2056.01 requires an upward move of 2.8 percent, which is an annual rate of about 34 percent. From this angle, the protective put strategy does not look quite as good, but in fact, these figures simply confirm that protection against downside loss is expensive. When the protective put is fairly priced, the protection buyer must give up considerable upside potential that may not be particularly evident from just looking at a graph.

The purchase of a protective put also presents the buyer with some choices. In this example, the buyer bought the put with exercise price of 1950 for 56.01. Had he bought the put with exercise price of 2000, he would have paid 79.25. The put with exercise price of 2050 would have cost 107.39. The higher the price for which the investor wants to be able to sell the underlying, the more expensive the put will be.

The protective put is often viewed as a classic example of insurance. The investor holds a risky asset and wants protection against a loss in value. He then buys insurance in the form of the put, paying a premium to the seller of the insurance, the put writer. The exercise price of the put is like the insurance deductible because the magnitude of the exercise price reflects the risk assumed by the party holding the underlying. The higher the exercise price, the less risk assumed by the holder of the underlying and the more risk assumed by the put seller. The lower the exercise price, the more risk assumed by the holder of the underlying and the less risk assumed by the put seller. In insurance, the higher the deductible, the more risk assumed by the insured party and the less risk assumed by the insurer. Thus, a higher exercise price is analogous to a lower insurance deductible.

Like traditional insurance, this form of insurance provides coverage for a period of time. At the end of the period of time, the insurance expires and either pays off or not. The buyer of the insurance may or may not choose to renew the insurance by buying another put.

EXAMPLE 4

Consider a currency selling for \$0.875. A put option selling for \$0.075 has an exercise price of \$0.90. Answer the following questions about a protective put.

A Determine the value at expiration and the profit under the following outcomes:

i. The price of the currency at expiration is \$0.96.

ii. The price of the currency at expiration is \$0.75.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

C Determine the breakeven price of the currency at expiration.

Solutions:

A **i.** $V_T = S_T + \max(0, X_T - S_T) = 0.96 + \max(0, 0.90 - 0.96) = 0.96$

$\Pi = V_T - V_0 = 0.96 - (S_0 + p_0) = 0.96 - (0.875 + 0.075)$

$= 0.01$

ii. $V_T = S_T + \max(0, X - S_T) = 0.75 + \max(0, 0.90 - 0.75) = 0.90$

$\Pi = V_T - V_0 = 0.90 - (S_0 + p_0) = 0.90 - (0.875 + 0.075)$

$= -0.05$

B **i.** Maximum profit = ∞

ii. Maximum loss = $S_0 + p_0 - X = 0.875 + 0.075 - 0.90 = 0.05$

C $S_T^* = S_0 + p_0 = 0.875 + 0.075 = 0.95$

Finally, we note that a protective put can be modified in a number of ways. One in particular is to sell a call to generate premium income to pay for the purchase of the put. This strategy is known as a collar. We shall cover collars in detail in Section 2.4.1 when we look at combining puts and calls. For now, however, let us proceed with strategies that combine calls with calls and puts with puts. These strategies are called spreads.

2.3 Money Spreads

A spread is a strategy in which you buy one option and sell another option that is identical to the first in all respects except either exercise price or time to expiration. If the options differ by time to expiration, the spread is called a time spread. Time spreads are strategies designed to exploit differences in perceptions of volatility of the underlying. They are among the more specialized strategies, and we do not cover them here. Our focus is on money spreads, which are spreads in which the two options differ only by exercise price. The investor buys an option with a given expiration and exercise price and sells an option with the same expiration but a different exercise price. Of course, the options are on the same underlying asset. The term *spread* is used here because the payoff is based on the difference, or spread, between option exercise prices.

2.3.1 *Bull Spreads*

A **bull spread** is designed to make money when the market goes up. In this strategy we combine a long position in a call with one exercise price and a short position in a call with a higher exercise price. Let us use X_1 as the lower of the two exercise prices and X_2 as the higher. The European call prices would normally be denoted as $c(X_1)$ and $c(X_2)$, but we shall simplify this notation somewhat in this reading by using the symbols c_1 and c_2, respectively. The value of a call at expiration is $c_T = \max(0,S_T - X)$. So, the value of the spread at expiration is

$$V_T = \max(0,S_T - X_1) - \max(0,S_T - X_2)$$

Therefore,

$$\begin{aligned} V_T &= 0 - 0 = 0 && \text{if } S_T \le X_1 \\ V_T &= S_T - X_1 - 0 = S_T - X_1 && \text{if } X_1 < S_T < X_2 \\ V_T &= S_T - X_1 - (S_T - X_2) = X_2 - X_1 && \text{if } S_T \ge X_2 \end{aligned}$$

The profit is obtained by subtracting the initial outlay for the spread from the above value of the spread at expiration. To determine the initial outlay, recall that a call option with a lower exercise price will be more expensive than a call option with a higher exercise price. Because we are buying the call with the lower exercise price and selling the call with the higher exercise price, the call we buy will cost more than the call we sell. Hence, the spread will require a net outlay of funds. This net outlay is the initial value of the position of $V_0 = c_1 - c_2$, which we call the net premium. The profit is $V_T - V_0$. Therefore,

$$\Pi = \max(0,S_T - X_1) - \max(0,S_T - X_2) - (c_1 - c_2)$$

In this manner, we see that the profit is the profit from the long call, $\max(0,S_T - X_1) - c_1$, plus the profit from the short call, $-\max(0,S_T - X_2) + c_2$. Broken down into ranges, the profit is

$$\begin{aligned} \Pi &= -c_1 + c_2 && \text{if } S_T \le X_1 \\ \Pi &= S_T - X_1 - c_1 + c_2 && \text{if } X_1 < S_T < X_2 \\ \Pi &= X_2 - X_1 - c_1 + c_2 && \text{if } S_T \ge X_2 \end{aligned}$$

If S_T is below X_1, the strategy will lose a limited amount of money. The profit on the upside, if S_T is at least X_2, is also limited. When both options expire out-of-the-money, the investor loses the net premium, $c_1 - c_2$.

In this example, we use exercise prices of 1950 and 2050. Thus $X_1 = 1950$, $c_1 = 108.43$, $X_2 = 2050$, and $c_2 = 59.98$. Let us examine the outcomes in which the asset price at expiration is 2100, 2000, and 1900. In one outcome, the underlying is above

the upper exercise price at expiration, and in one, the underlying is below the lower exercise price at expiration. Let us also examine one case between the exercise prices with S_T equal to 2000.

When $S_T = 2100$, the value at expiration is $V_T = 2050 - 1950 = 100$

When $S_T = 2000$, the value at expiration is $V_T = 2000 - 1950 = 50$

When $S_T = 1900$, the value at expiration is $V_T = 0$

To calculate the profit, we simply subtract the initial value for the call with exercise price X_1 and add the initial value for the call with exercise price X_2.

When $S_T = 2100$, the profit is $\Pi = 100 - 108.43 + 59.98 = 51.55$

When $S_T = 2000$, the profit is $\Pi = 50 - 108.43 + 59.98 = 1.55$

When $S_T = 1900$, the profit is $\Pi = -108.43 + 59.98 = -48.45$

When S_T is greater than 2100, we would obtain the same outcome as when S_T equals 2100. When S_T is less than 1900, we would obtain the same outcome as when S_T equals 1900.

Exhibit 8 depicts these results graphically. Note how the bull spread provides a limited gain as well as a limited loss. Of course, just purchasing a call provides a limited loss. But when selling the call in addition to buying the call, the investor gives up the upside in order to reduce the downside. In the bull spread, the investor sells gains from the call beyond the higher exercise price. Thus, a bull spread has some similarities to the covered call. With a covered call, the long position in the underlying "covers" the short position in the call. In a bull spread, the long position in the call with the lower exercise price "covers" the short position in the call with the higher exercise price. For both strategies, the short call can be viewed as giving up the gains beyond its exercise price. The upside gain can also be viewed as paying a premium of $c_1 - c_2$ to buy the underlying for X_1 and sell it for X_2. Accordingly, the maximum gain is $X_2 - X_1 - c_1 + c_2 = 2050 - 1950 - 108.43 + 59.98 = 51.55$, as computed above. This amount represents a maximum return of about 106 percent.[10] The maximum loss is the net premium, 48.45, which is a 100 percent loss.

10 This calculation is based on the fact that the initial value of the position is 108.43 – 59.98 = 48.45 and the maximum value is 100, which is a gain of 106.4 percent.

Exhibit 8 Bull Spread (Buy Call with Exercise Price X_1, Sell Call with Exercise Price X_2)

As can be seen from the graph and the profit equations, there is a breakeven asset price at expiration that falls between the two exercise prices. We let S_T^* be the breakeven asset price at expiration and set the profit for the case of $X_1 < S_T < X_2$ to zero:

$$S_T^* = X_1 + c_1 - c_2$$

To achieve a profit of zero or more, the asset price at expiration must exceed the lower exercise price by at least the net premium paid for the options. The long option must expire in-the-money by enough to cover the net premium. In our example,

$$S_T^* = 1950 + 108.43 - 59.98 = 1{,}998.45$$

What this result means is that the underlying must not move down by more than 0.08 percent.

To summarize the bull spread, we have

Value at expiration: $V_T = \max(0, S_T - X_1) - \max(0, S_T - X_2)$

Profit: $\Pi = V_T - c_1 + c_2$

Maximum profit = $X_2 - X_1 - c_1 + c_2$

Maximum loss = $c_1 - c_2$

Breakeven: $S_T^* = X_1 + c_1 - c_2$

EXAMPLE 5

Consider two call options on a stock selling for $72. One call has an exercise price of $65 and is selling for $9. The other call has an exercise price of $75 and is selling for $4. Both calls expire at the same time. Answer the following questions about a bull spread:

A Determine the value at expiration and the profit under the following outcomes:

i. The price of the stock at expiration is $78.

ii. The price of the stock at expiration is \$69.

iii. The price of the stock at expiration is \$62.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

C Determine the breakeven stock price at expiration.

Solutions:

A **i.**
$$V_T = \max(0,S_T - X_1) - \max(0,S_T - X_2)$$
$$= \max(0,78 - 65) - \max(0,78 - 75) = 13 - 3 = 10$$
$$\Pi = V_T - V_0 = V_T - (c_1 - c_2) = 10 - (9 - 4) = 5$$

ii.
$$V_T = \max(0,S_T - X_1) - \max(0,S_T - X_2)$$
$$= \max(0,69 - 65) - \max(0,69 - 75) = 4 - 0 = 4$$
$$\Pi = V_T - V_0 = V_T - (c_1 - c_2) = 4 - (9 - 4) = -1$$

iii.
$$V_T = \max(0,S_T - X_1) - \max(0,S_T - X_2)$$
$$= \max(0,62 - 65) - \max(0,62 - 75) = 0 - 0 = 0$$
$$\Pi = V_T - V_0 = 0 - (c_1 - c_2) = 0 - (9 - 4) = -5$$

B **i.** Maximum profit $= X_2 - X_1 - (c_1 - c_2) = 75 - 65 - (9 - 4) = 5$

ii. Maximum loss $= c_1 - c_2 = 9 - 4 = 5$

C $S_T^* = X_1 + c_1 - c_2 = 65 + 9 - 4 = 70$

Bull spreads are used by investors who think the underlying price is going up. There are also bear spreads, which are used by investors who think the underlying price is going down.

2.3.2 *Bear Spreads*

If one uses the opposite strategy, selling a call with the lower exercise price and buying a call with the higher exercise price, the opposite results occur. The graph is completely reversed: The gain is on the downside and the loss is on the upside. This strategy is called a **bear spread**. The more intuitive way of executing a bear spread, however, is to use puts. Specifically, we would buy the put with the higher exercise price and sell the put with the lower exercise price.

The value of this position at expiration would be $V_T = \max(0,X_2 - S_T) - \max(0,X_1 - S_T)$. Broken down into ranges, we have the following relations:

$$V_T = X_2 - S_T - (X_1 - S_T) = X_2 - X_1 \quad \text{if } S_T \le X_1$$
$$V_T = X_2 - S_T - 0 = X_2 - S_T \quad \text{if } X_1 < S_T < X_2$$
$$V_T = 0 - 0 = 0 \quad \text{if } S_T \ge X_2$$

To obtain the profit, we subtract the initial outlay. Because we are buying the put with the higher exercise price and selling the put with the lower exercise price, the put we are buying is more expensive than the put we are selling. The initial value of the bear spread is $V_0 = p_2 - p_1$. The profit is, therefore, $V_T - V_0$, which is

$$\Pi = \max(0,X_2 - S_T) - \max(0,X_1 - S_T) - p_2 + p_1$$

We see that the profit is the profit from the long put, $\max(0,X_2 - S_T) - p_2$, plus the profit from the short put, $-\max(0,X_1 - S_T) + p_1$. Broken down into ranges, the profit is

$$\Pi = X_2 - X_1 - p_2 + p_1 \quad \text{if } S_T \le X_1$$
$$\Pi = X_2 - S_T - p_2 + p_1 \quad \text{if } X_1 < S_T < X_2$$
$$\Pi = -p_2 + p_1 \quad \text{if } S_T \ge X_2$$

In contrast to the profit in a bull spread, the bear spread profit occurs on the downside; the maximum profit occurs when $S_T \le X_1$. This profit reflects the purchase of the underlying at X_1, which occurs when the short put is exercised, and the sale of the underlying at X_2, which occurs when the long put is exercised. The worst outcome occurs when $S_T > X_2$, in which case both puts expire out-of-the-money and the net premium is lost.

In the example, we again use options with exercise prices of 1950 and 2050. Their premiums are $p_1 = 56.01$ and $p_2 = 107.39$. We examine the three outcomes we did with the bull spread: S_T is 1900, 2000, or 2100.

When $S_T = 1900$, the value at expiration is $V_T = 2050 - 1950 = 100$

When $S_T = 2000$, the value at expiration is $V_T = 2050 - 2000 = 50$

When $S_T = 2100$, the value at expiration is $V_T = 0$

The profit is obtained by taking the value at expiration, subtracting the premium of the put with the higher exercise price, and adding the premium of the put with the lower exercise price:

When $S_T = 1900$, the profit is $\Pi = 100 - 107.39 + 56.01 = 48.62$

When $S_T = 2000$, the profit is $\Pi = 50 - 107.39 + 56.01 = -1.38$

When $S_T = 2100$, the profit is $\Pi = -107.39 + 56.01 = -51.38$

When S_T is less than 1900, the outcome is the same as when S_T equals 1900. When S_T is greater than 2100, the outcome is the same as when S_T equals 2100.

The results are graphed in Exhibit 9. Note how this strategy is similar to a bull spread but with opposite outcomes. The gains are on the downside underlying moves and the losses are on the upside underlying. The maximum profit occurs when both puts expire in-the-money. You end up using the short put to buy the asset and the long put to sell the asset. The maximum profit is $X_2 - X_1 - p_2 + p_1$, which in this example is 100 – 107.39 + 56.01 = 48.62, a return of 94 percent.[11] The maximum loss of $p_2 - p_1$ occurs when both puts expire out-of-the-money, and in this case is 107.39 – 56.01 = 51.38, a loss of 100 percent.

11 The net premium is 107.39 – 56.01 = 51.38, so the maximum value of 100 is a return of about 94 percent.

Exhibit 9 Bear Spread (Buy Put with Exercise Price X_2, Sell Put with Exercise Price X_1)

The breakeven asset price occurs between the two exercise prices. Let S_T^* be the breakeven asset price at expiration, set the profit equation for the middle case to zero, and solve for S_T^* to obtain $S_T^* = X_2 - p_2 + p_1$. In this case, the breakeven is $S_T^* = 2050 - 107.39 + 56.01 = 1{,}998.62$. The underlying need move down only as little as 0.07 percent to make a profit.

To summarize the bear spread, we have

Value at expiration: $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

Profit: $\Pi = V_T - p_2 + p_1$

Maximum profit = $X_2 - X_1 - p_2 + p_1$

Maximum loss = $p_2 - p_1$

Breakeven: $S_T^* = X_2 - p_2 + p_1$

EXAMPLE 6

Consider two put options on a bond selling for $92 per $100 par. One put has an exercise price of $85 and is selling for $3. The other put has an exercise price of $95 and is selling for $11. Both puts expire at the same time. Answer the following questions about a bear spread:

A Determine the value at expiration and the profit under the following outcomes:

- **i.** The price of the bond at expiration is $98.
- **ii.** The price of the bond at expiration is $91.
- **iii.** The price of the bond at expiration is $82.

B Determine the following:

- **i.** the maximum profit.
- **ii.** the maximum loss.

C Determine the breakeven bond price at expiration.

Solutions:

A **i.** $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 95 - 98) - \max(0, 85 - 98) = 0 - 0 = 0$

$\Pi = V_T - V_0 = V_T - (p_2 - p_1) = 0 - (11 - 3) = -8$

ii. $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 95 - 91) - \max(0, 85 - 91) = 4 - 0 = 4$

$\Pi = V_T - V_0 = V_T - (p_2 - p_1) = 4 - (11 - 3) = -4$

iii. $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 95 - 82) - \max(0, 85 - 82) = 13 - 3 = 10$

$\Pi = V_T - V_0 = 10 - (p_2 - p_1) = 10 - (11 - 3) = 2$

B **i.** Maximum profit $= X_2 - X_1 - (p_2 - p_1) = 95 - 85 - (11 - 3) = 2$

ii. Maximum loss $= p_2 - p_1 = 11 - 3 = 8$

C $S_T^* = X_2 - p_2 + p_1 = 95 - 11 + 3 = 87$

The bear spread with calls involves selling the call with the lower exercise price and buying the one with the higher exercise price. Because the call with the lower exercise price will be more expensive, there will be a cash inflow at initiation of the position and hence a profit if the calls expire worthless.

Bull and bear spreads are but two types of spread strategies. We now take a look at another strategy, which combines bull and bear spreads.

2.3.3 *Butterfly Spreads*

In both the bull and bear spread, we used options with two different exercise prices. There is no limit to how many different options one can use in a strategy. As an example, the **butterfly spread** combines a bull and bear spread. Consider three different exercise prices, X_1, X_2, and X_3. Suppose we first construct a bull spread, buying the call with exercise price of X_1 and selling the call with exercise price of X_2. Recall that we could construct a bear spread using calls instead of puts. In that case, we would buy the call with the higher exercise price and sell the call with the lower exercise price. This bear spread is identical to the sale of a bull spread.

Suppose we sell a bull spread by buying the call with exercise price X_3 and selling the call with exercise price X_2. We have now combined a long bull spread and a short bull spread (or a bear spread). We own the calls with exercise price X_1 and X_3 and have sold two calls with exercise price X_2. Combining these results, we obtain a value at expiration of

$$V_T = \max(0, S_T - X_1) - 2\max(0, S_T - X_2) + \max(0, S_T - X_3)$$

This can be broken down into ranges of

$$\begin{aligned}
V_T &= 0 - 2(0) + 0 = 0 && \text{if } S_T \le X_1 \\
V_T &= S_T - X_1 - 2(0) + 0 = S_T - X_1 && \text{if } X_1 < S_T < X_2 \\
V_T &= S_T - X_1 - 2(S_T - X_2) + 0 = -S_T + 2X_2 - X_1 && \text{if } X_2 \le S_T < X_3 \\
V_T &= S_T - X_1 - 2(S_T - X_2) + S_T - X_3 = 2X_2 - X_1 - X_3 && \text{if } S_T \ge X_3
\end{aligned}$$

If the exercise prices are equally spaced, $2X_2 - X_1 - X_3$ would equal zero.[12] In virtually all cases in practice, the exercise prices are indeed equally spaced, and we shall make that assumption. Therefore,

$$V_T = 2X_2 - X_1 - X_3 = 0 \quad \text{if } S_T \geq X_3$$

To obtain the profit, we must subtract the initial value of the position, which is $V_0 = c_1 - 2c_2 + c_3$. Is this value positive or negative? It turns out that it will always be positive. The bull spread we buy is more expensive than the bull spread we sell, because the lower exercise price on the bull spread we buy (X_1) is lower than the lower exercise price on the bull spread we sell (X_2). Because the underlying is more likely to move higher than X_1 than to move higher than X_2, the bull spread we buy is more expensive than the bull spread we sell.

The profit is thus $V_T - V_0$, which is

$$\Pi = \max(0,S_T - X_1) - 2\max(0,S_T - X_2) + \max(0,S_T - X_3) - c_1 + 2c_2 - c_3$$

Broken down into ranges,

$$\begin{aligned}
\Pi &= -c_1 + 2c_2 - c_3 && \text{if } S_T \leq X_1 \\
\Pi &= S_T - X_1 - c_1 + 2c_2 - c_3 && \text{if } X_1 < S_T < X_2 \\
\Pi &= -S_T + 2X_2 - X_1 - c_1 + 2c_2 - c_3 && \text{if } X_2 \leq S_T < X_3 \\
\Pi &= -c_1 + 2c_2 - c_3 && \text{if } S_T \geq X_3
\end{aligned}$$

Note that in the lowest and highest ranges, the profit is negative; a loss. It is not immediately obvious what happens in the middle two ranges. Let us look at our example. In this example, we buy the calls with exercise prices of 1950 and 2050 and sell two calls with exercise price of 2000. So, $X_1 = 1950$, $X_2 = 2000$, and $X_3 = 2050$. Their premiums are $c_1 = 108.43$, $c_2 = 81.75$, and $c_3 = 59.98$. Let us examine the outcomes in which $S_T = 1900$, 1975, 2025, and 2100. These outcomes fit into each of the four relevant ranges.

When $S_T = 1900$, the value at expiration is $V_T = 0 - 2(0) + 0 = 0$

When $S_T = 1975$, the value at expiration is $V_T = 1975 - 1950 = 25$

When $S_T = 2025$, the value at expiration is V_T

$= -2025 + 2(2000) - 1950 = 25$

When $S_T = 2100$, the value at expiration is $V_T = 0$

Now, turning to the profit,

When $S_T = 1900$, the profit will be Π

$= 0 - 108.43 + 2(81.75) - 59.98 = -4.91$

When $S_T = 1975$, the profit will be Π

$= 25 - 108.43 + 2(81.75) - 59.98 = 20.09$

When $S_T = 2025$, the profit will be Π

$= 25 - 108.43 + 2(81.75) - 59.98 = 20.09$

When $S_T = 2100$, the profit will be Π

$= 0 - 108.43 + 2(81.75) - 59.98 = -4.91$

Exhibit 10 depicts these results graphically. Note that the strategy is based on the expectation that the volatility of the underlying will be relatively low. The expectation must be that the underlying will trade near the middle exercise price. The maximum loss of 4.91 occurs if the underlying ends up below the lower strike, 1950, or above the

12 For example, suppose the exercise prices are equally spaced with $X_1 = 30$, $X_2 = 40$, and $X_3 = 50$. Then $2X_2 - X_3 - X_1 = 2(40) - 50 - 30 = 0$.

upper strike, 2050. The maximum profit occurs if the underlying ends up precisely at the middle exercise price. This maximum profit is found by examining either of the middle two ranges with S_T set equal to X_2:

$$\begin{aligned}\Pi(\text{maximum}) &= S_T - X_1 - c_1 + 2c_2 - c_3 \\ &= X_2 - X_1 - c_1 + 2c_2 - c_3 \qquad \text{if } S_T = X_2 \\ \Pi(\text{maximum}) &= -S_T + 2X_2 - X_1 - c_1 + 2c_2 - c_3 \\ &= X_2 - X_1 - c_1 + 2c_2 - c_3 \qquad \text{if } S_T = X_2\end{aligned}$$

In this case, the maximum profit is Π (maximum) = 2000 – 1950 – 108.43 + 2(81.75) – 59.98 = 45.09, which is a return of 918 percent.[13]

Exhibit 10 Butterfly Spread (Buy Calls with Exercise Price X_1 and X_3, Sell Two Calls with Exercise Price X_2)

There are two breakeven prices, and they lie within the two middle profit ranges. We find them as follows:

For $X_1 < S_T < X_2$:

$$\Pi = S_T^* - X_1 - c_1 + 2c_2 - c_3 = 0$$

$$S_T^* = X_1 + c_1 - 2c_2 + c_3$$

For $X_2 \leq S_T < X_3$:

$$\Pi = -S_T^* + 2X_2 - X_1 - c_1 + 2c_2 - c_3 = 0$$

$$S_T^* = 2X_2 - X_1 - c_1 + 2c_2 - c_3$$

13 This return is based on a maximum value of 2000 – 1950 = 50 versus the initial value of 4.91, a return of 918 percent.

In this example, therefore, the breakeven prices are

$$S_T^* = X_1 + c_1 - 2c_2 + c_3$$
$$= 1950 + 108.43 - 2(81.75) + 59.98 = 1954.91$$
$$S_T^* = 2X_2 - X_1 - c_1 + 2c_2 - c_3$$
$$= 2(2000) - 1950 - 108.43 + 2(81.75) - 59.98 = 2045.09$$

These movements represent a range of roughly ±2.3 percent from the starting value of 2000. Therefore, if the underlying stays within this range, the strategy will be profitable.

In summary, for the butterfly spread

Value at expiration: $V_T = \max(0,S_T - X_1) - 2\max(0,S_T - X_2) + \max(0,S_T - X_3)$

Profit: $\Pi = V_T - c_1 + 2c_2 - c_3$

Maximum profit = $X_2 - X_1 - c_1 + 2c_2 - c_3$

Maximum loss = $c_1 - 2c_2 + c_3$

Breakeven: $S_T^* = X_1 + c_1 - 2c_2 + c_3$ and $S_T^* = 2X_2 - X_1 - c_1 + 2c_2 - c_3$

As we noted, a butterfly spread is a strategy based on the expectation of low volatility in the underlying. Of course, for a butterfly spread to be an appropriate strategy, the user must believe that the underlying will be less volatile than the market expects. If the investor buys into the strategy and the market is more volatile than expected, the strategy is likely to result in a loss. If the investor expects the market to be more volatile than he believes the market expects, the appropriate strategy could be to sell the butterfly spread. Doing so would involve selling the calls with exercise prices of X_1 and X_3 and buying two calls with exercise prices of X_2.[14]

Alternatively, a butterfly spread can be executed using puts. Note that the initial value of the spread using calls is $V_0 = c_1 - 2c_2 + c_3$. Recall that from put–call parity, $c = p + S - X/(1 + r)^T$. If we use the appropriate subscripts and substitute $p_i + S - X_i/(1 + r)^T$ for c_i where i = 1, 2, and 3, we obtain $V_0 = p_1 - 2p_2 + p_3$. The positive signs on p_1 and p_3 and the negative sign on $2p_2$ mean that we could buy the puts with exercise prices X_1 and X_3 and sell two puts with exercise price of X_2 to obtain the same result. We would, in effect, be buying a bear spread with puts consisting of buying the put with exercise price of X_3 and selling the put with exercise price of X_2, and also selling a bear spread by selling the put with exercise price of X_2 and buying the put with exercise price of X_1. If the options are priced correctly, it does not really matter whether we use puts or calls.[15]

EXAMPLE 7

Consider three put options on a currency that is currently selling for \$1.45. The exercise prices are \$1.30, \$1.40, and \$1.50. The put prices are \$0.08, \$0.125, and \$0.18, respectively. The puts all expire at the same time. Answer the following questions about a butterfly spread.

A Determine the value at expiration and the profit under the following outcomes:

i. The price of the currency at expiration is \$1.26.

ii. The price of the currency at expiration is \$1.35.

iii. The price of the currency at expiration is \$1.47.

14 A short butterfly spread is sometimes called a **sandwich spread**.

15 If puts were underpriced, it would be better to buy the butterfly spread using puts. If calls were underpriced, it would be better to buy the butterfly spread using calls. Of course, other strategies could also be used to take advantage of any mispricing.

iv. The price of the currency at expiration is $1.59.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

C Determine the breakeven currency price at expiration.

Solutions:

A **i.**

$$\begin{aligned} V_T &= \max(0,X_1 - S_T) - 2\max(0,X_2 - S_T) + \max(0,X_3 - S_T) \\ &= \max(0,1.30 - 1.26) - 2\max(0,1.40 - 1.26) + \max(0,1.50 - 1.26) \\ &= 0.04 - 2(0.14) + 0.24 = 0.0 \\ \Pi &= V_T - V_0 = V_T - (p_1 - 2p_2 + p_3) = 0.0 - [0.08 - 2(0.125) + 0.18] \\ &= -0.01 \end{aligned}$$

ii.

$$\begin{aligned} V_T &= \max(0,X_1 - S_T) - 2\max(0,X_2 - S_T) + \max(0,X_3 - S_T) \\ &= \max(0,1.30 - 1.35) - 2\max(0,1.40 - 1.35) + \max(0,1.50 - 1.35) \\ &= 0.0 - 2(0.05) + 0.15 = 0.05 \\ \Pi &= V_T - V_0 = V_T - (p_1 - 2p_2 + p_3) \\ &= 0.05 - [0.08 - 2(0.125) + 0.18] = 0.04 \end{aligned}$$

iii.

$$\begin{aligned} V_T &= \max(0,X_1 - S_T) - 2\max(0,X_2 - S_T) + \max(0,X_3 - S_T) \\ &= \max(0,1.30 - 1.47) - 2\max(0,1.40 - 1.47) + \max(0,1.50 - 1.47) \\ &= 0.0 - 2(0) + 0.03 = 0.03 \\ \Pi &= V_T - V_0 = V_T - (p_1 - 2p_2 + p_3) \\ &= 0.03 - [0.08 - 2(0.125) + 0.18] = 0.02 \end{aligned}$$

iv.

$$\begin{aligned} V_T &= \max(0,X_1 - S_T) - 2\max(0,X_2 - S_T) + \max(0,X_3 - S_T) \\ &= \max(0,1.30 - 1.59) - 2\max(0,1.40 - 1.59) + \max(0,1.50 - 1.59) \\ &= 0.0 - 2(0) + 0.0 = 0.0 \\ \Pi &= V_T - V_0 = V_T - (p_1 - 2p_2 + p_3) \\ &= 0.0 - [0.08 - 2(0.125) + 0.18] = -0.01 \end{aligned}$$

B **i.**

$$\begin{aligned} \text{Maximum profit} &= X_3 - X_2 - (p_1 - 2p_2 + p_3) \\ &= 1.50 - 1.40 - [0.08 - 2(0.125) + 0.18] = 0.09 \end{aligned}$$

ii.

$$\begin{aligned} \text{Maximum loss} &= p_1 - 2p_2 + p_3 \\ &= 0.08 - 2(0.125) + 0.18 = 0.01 \end{aligned}$$

C

$$S_T{}^* = X_1 + p_1 - 2p_2 + p_3 = 1.30 + 0.08 - 2(0.125) + 0.18 = 1.31$$

$$\begin{aligned} S_T{}^* &= 2X_2 - X_1 - p_1 + 2p_2 - p_3 = 2(1.40) - 1.30 - 0.08 \\ &\quad + 2(0.125) - 0.18 = 1.49 \end{aligned}$$

So far, we have restricted ourselves to the use of either calls or puts, but not both. We now look at strategies that involve positions in calls *and* puts.

2.4 Combinations of Calls and Puts

2.4.1 *Collars*

Recall that in Section 2.2 we examined the protective put. In that strategy, the holder of the underlying asset buys a put to provide protection against downside loss. Purchasing the put requires the payment of the put premium. One way to get around paying the put premium is to sell another option with a premium equal to the put premium, which can be done by selling a call with an exercise price above the current price of the underlying.

Although it is not necessary that the call premium offset the put premium, and the call premium can even be more than the put premium, the typical collar has the call and put premiums offset. When this offsetting occurs, no net premium is required up front. In effect, the holder of the asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. This strategy is called a **collar**. When the premiums offset, it is sometimes called a **zero-cost collar**. This term is a little misleading, however, as it suggests that there is no "cost" to this transaction. The cost takes the form of forgoing upside gains. The term "zero-cost" refers only to the fact that no cash is paid up front.

A collar is a modified version of a protective put and a covered call and requires different exercise prices for each. Let the put exercise price be X_1 and the call exercise price be X_2. With X_1 given, it is important to see that X_2 is not arbitrary. If we want the call premium to offset the put premium, the exercise price on the call must be set such that the price of the call equals the price of the put. We thus can select any exercise price of the put. Then the call exercise price is selected by determining which exercise price will produce a call premium equal to the put premium. Although the put can have any exercise price, typically the put exercise price is lower than the current value of the underlying. The call exercise price then must be above the current value of the underlying.[16]

So let X_1 be set. The put with this exercise price has a premium of p_1. We now need to set X_2 such that the premium on the call, c_2, equals the premium on the put, p_1. To do so, we need to use an option valuation model, such as Black–Scholes–Merton, to find the exercise price of the call that will make $c_2 = p_1$. Recall that the Black–Scholes–Merton formula is

$$c = S_0 N(d_1) - Xe^{-r^c T} N(d_2)$$

where

$$d_1 = \frac{\ln(S_0/X) + \left(r^c + \sigma^2/2\right)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

and where r^c is the continuously compounded risk-free rate and $N(d_1)$ and $N(d_2)$ are normal probabilities associated with the values d_1 and d_2. Ideally we would turn the equation around and solve for X in terms of c, but the equation is too complex to be able to isolate X on one side. So, we must solve for X by trial and error. We substitute in values of X until the option price equals c, where c is the call premium that we want to equal the put premium.

16 It can be proven in general that the call exercise price would have to be above the current value of the underlying. Intuitively, it can be shown through put–call parity that if the call and put exercise prices were equal to the current value of the underlying, the call would be worth more than the put. If we lower the put exercise price below the price of the underlying, the put price would decrease. Then the gap between the call and put prices would widen further. We would then need to raise the call exercise price above the current price of the underlying to make its premium come down.

Consider the Nasdaq example. Suppose we use the put with exercise price of 1950. Its premium is 56.01. So now we need a call with a premium of 56.01. The call with exercise price of 2000 is worth 81.75. So to get a lower call premium, we need a call with an exercise price higher than 2000. By trial and error, we insert higher and higher exercise prices until the call premium falls to 56.01, which occurs at an exercise price of about 2060.[17] So now we have it. We buy the put with an exercise price of 1950 for 56.01 and sell the call with exercise price of 2060 for 56.01. This transaction requires no cash up front.

The value of the position at expiration is the sum of the value of the underlying asset, the value of the put, and the value of the short call:

$$V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$$

Broken down into ranges, we have

$$\begin{aligned} V_T &= S_T + X_1 - S_T - 0 = X_1 && \text{if } S_T \le X_1 \\ V_T &= S_T + 0 - 0 = S_T && \text{if } X_1 < S_T < X_2 \\ V_T &= S_T + 0 - (S_T - X_2) = X_2 && \text{if } S_T \ge X_2 \end{aligned}$$

The initial value of the position is simply the value of the underlying asset, S_0. The profit is $V_T - V_0$:

$$\Pi = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2) - S_0$$

Broken down into ranges, we have

$$\begin{aligned} \Pi &= X_1 - S_0 && \text{if } S_T \le X_1 \\ \Pi &= S_T - S_0 && \text{if } X_1 < S_T < X_2 \\ \Pi &= X_2 - S_0 && \text{if } S_T \ge X_2 \end{aligned}$$

Using our example where $X_1 = 1950$, $p_1 = 56.01$, $X_2 = 2060$, $c_2 = 56.01$, and $S_0 = 2000$, we obtain the following values at expiration:

If $S_T = 1900$, $V_T = 1950$

If $S_T = 2000$, $V_T = 2000$

If $S_T = 2100$, $V_T = 2060$

The profit for $S_T = 1900$ is $\Pi = 1950 - 2000 = -50$.

If $S_T = 2000$, $\Pi = 2000 - 2000 = 0$

If $S_T = 2100$, $\Pi = 2060 - 2000 = 60$

A graph of this strategy is shown in Exhibit 11. Note that the lines are flat over the range of S_T up to the put exercise price of 1950 and in the range beyond the call exercise price of 2060. Below 1950, the put provides protection against loss. Above 2060, the short call forces a relinquishment of the gains, which are earned by the buyer of the call. In between these ranges, neither the put nor the call has value. The profit is strictly determined by the underlying and moves directly with the value of the underlying. The maximum profit is $X_2 - S_0$, which here is 2060 – 2000 = 60, a return of 3 percent. The maximum loss is $S_0 - X_1$, which here is 2000 – 1950 = 50, a loss of 2.5 percent. Keep in mind that these options have lives of one month, so those numbers represent one-month returns. The breakeven is simply the original underlying price of 2000.

In summary, for the collar

17 The other necessary information to obtain the exercise price of the call is that the volatility is 0.35, the risk-free rate is 0.02, and the dividend yield is 0.005. The actual call price at a stock price of 2060 is 56.18. At 2061, the call price is 55.82. Thus, the correct exercise price lies between 2060 and 2061; we simply round to 2060.

Value at expiration: $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$
Profit: $\Pi = V_T - S_0$
Maximum profit = $X_2 - S_0$
Maximum loss = $S_0 - X_1$
Breakeven: $S_T^* = S_0$

Exhibit 11 Zero-Cost Collar (Buy Put with Exercise Price X_1, Sell Call with Exercise Price X_2, Put and Call Premiums Offset)

Collars are also known as range forwards and risk reversals.[18] Asset managers often use them to guard against losses without having to pay cash up front for the protection. Clearly, however, they are virtually the same as bull spreads. The latter has a cap on the gain and a floor on the loss but does not involve actually holding the underlying. In Section 3 we shall encounter this strategy again in the form of an interest rate collar, which protects floating-rate borrowers against high interest rates.

EXAMPLE 8

The holder of a stock worth $42 is considering placing a collar on it. A put with an exercise price of $40 costs $5.32. A call with the same premium would require an exercise price of $50.59.

A Determine the value at expiration and the profit under the following outcomes:

i. The price of the stock at expiration is $55.

ii. The price of the stock at expiration is $48.

18 It is not clear why a collar is sometimes called a risk reversal. It is clear, however, why a collar is sometimes called a range forward. Like a forward contract, it requires no initial outlay other than for the underlying. Unlike a forward contract, which has a strictly linear payoff profile, the collar payoff breaks at the two exercise prices, thus creating a range.

iii. The price of the stock at expiration is \$35.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

C Determine the breakeven stock price at expiration.

Solutions:

A i. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 55 + \max(0, 40 - 55) - \max(0, 55 - 50.59)$

$= 55 + 0 - (55 - 50.59) = 50.59$

$\Pi = V_T - S_0 = 50.59 - 42 = 8.59$

ii. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 48 + \max(0, 40 - 48) - \max(0, 48 - 50.59)$

$= 48 + 0 - 0 = 48$

$\Pi = V_T - S_0 = 48 - 42 = 6$

iii. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 35 + \max(0, 40 - 35) - \max(0, 35 - 50.59)$

$= 35 + 5 - 0 = 40$

$\Pi = V_T - S_0 = 40 - 42 = -2$

B i. Maximum profit $= X_2 - S_0 = 50.59 - 42 = 8.59$

ii. Maximum loss $= S_0 - X_1 = 42 - 40 = 2$

C $S_T^* = S_0 = 42$

Collars are one of the many directional strategies, meaning that they perform based on the direction of the movement in the underlying. Of course, butterfly spreads perform based on the volatility of the underlying. Another strategy in which performance is based on the volatility of the underlying is the straddle.

2.4.2 *Straddle*

To justify the purchase of a call, an investor must be bullish. To justify the purchase of a put, an investor must be bearish. What should an investor do if he believes the market will be volatile but does not feel particularly strongly about the direction? We discussed earlier that a short butterfly spread is one strategy. It benefits from extreme movements, but its gains are limited. There are other, more complex strategies, such as time spreads, that can benefit from high volatility; however, one simple strategy, the **straddle**, also benefits from high volatility.

Suppose the investor buys both a call and a put with the same exercise price on the same underlying with the same expiration. This strategy enables the investor to profit from upside or downside moves. Its cost, however, can be quite heavy. In fact, a straddle is a wager on a large movement in the underlying.

The value of a straddle at expiration is the value of the call and the value of the put: $V_T = \max(0, S_T - X) + \max(0, X - S_T)$. Broken down into ranges,

$$V_T = X - S_T \text{ if } S_T < X$$
$$V_T = S_T - X \text{ if } S_T \geq X$$

The initial value of the straddle is simply $V_0 = c_0 + p_0$. The profit is $V_T - V_0$ or $\Pi = \max(0,S_T - X) + \max(0,X - S_T) - c_0 - p_0$. Broken down into ranges,

$$\Pi = X - S_T - c_0 - p_0 \text{ if } S_T < X$$
$$\Pi = S_T - X - c_0 - p_0 \text{ if } S_T \geq X$$

In our example, let X = 2000. Then $c_0 = 81.75$ and $p_0 = 79.25$.

If $S_T = 2100$, the value of the position at expiration is

$V_T = 2100 - 2000 = 100$

If $S_T = 1900$, the value of the position at expiration is

$V_T = 2000 - 1900 = 100$

If $S_T = 2100$, the profit is $\Pi = 100 - 81.75 - 79.25 = -61$

If $S_T = 1900$, the profit is $\Pi = 100 - 81.75 - 79.25 = -61$

Note the symmetry, whereby a move of 100 in either direction results in a change in value of 61. The put and call payoffs are obviously symmetric. It is also apparent that these outcomes are below breakeven.

Observe the results in Exhibit 12. Note that the value and profit are V-shaped, thereby benefiting from large moves in the underlying in either direction. Like the call option the straddle contains, the gain on the upside is unlimited. Like the put, the downside gain is not unlimited, but it is quite large. The underlying can go down no further than zero. Hence, on the downside the maximum profit is $X - c_0 - p_0$, which in this case is 2000 – 81.75 – 79.25 = 1839. The maximum loss occurs if the underlying ends up precisely at the exercise price. In that case, neither the call nor the put expires with value and the premiums are lost on both. Therefore, the maximum loss is $c_0 + p_0$, which is 81.75 + 79.25 = 161.

Exhibit 12 Straddle (Buy Call and Put with Exercise Price X)

There are two breakevens. Using S_T^* to denote the breakevens, we set each profit equation to zero and solve for S_T^*:

If $S_T \geq X$,

$$\Pi = S_T^* - X - c_0 - p_0 = 0$$
$$S_T^* = X + c_0 + p_0$$

If ST < X,

$$\Pi = X - S_T^* - c_0 - p_0 = 0$$
$$S_T^* = X - c_0 - p_0$$

The breakevens thus equal the exercise price plus or minus the premiums. So in this case, the breakevens are 2000 ± 161 = 2161 and 1839. A move of 161 is a percentage move of 8.1 percent over a one-month period. Hence, in this example, the purchase of a straddle is a bet that the underlying will move at nearly a 100 percent annual rate over a one-month period, quite a risky bet. An investor would make such a bet only when he felt that the underlying would be exceptionally volatile. An obvious time to use a straddle would be around major events such as earnings announcements. But because earnings announcements are known and anticipated events, the greater uncertainty surrounding them should already be reflected in the options' prices. Recall that the greater the volatility, the higher the prices of both puts and calls. Therefore, using a straddle in anticipation of an event that everyone knows is coming is not necessarily a good idea. Only when the investor believes the market will be more volatile than everyone else believes would a straddle be advised.

In summary, for a straddle

Value at expiration: $V_T = \max(0,S_T - X) + \max(0,X - S_T)$

Profit: $\Pi = V_T - (c_0 + p_0)$

Maximum profit = ∞

Maximum loss = $c_0 + p_0$

Breakeven: $S_T^* = X \pm (c_0 + p_0)$

As we have noted, a straddle would tend to be used by an investor who is expecting the market to be volatile but does not have strong feelings one way or the other on the direction. An investor who leans one way or the other might consider adding a call or a put to the straddle. Adding a call to a straddle is a strategy called a **strap**, and adding a put to a straddle is called a **strip**. It is even more difficult to make a gain from these strategies than it is for a straddle, but if the hoped-for move does occur, the gains are leveraged. Another variation of the straddle is a **strangle**, in which the put and call have different exercise prices. This strategy creates a graph similar to a straddle but with a flat section instead of a point on the bottom.

EXAMPLE 9

Consider a stock worth $49. A call with an exercise price of $50 costs $6.25 and a put with an exercise price of $50 costs $5.875. An investor buys a straddle.

A Determine the value at expiration and the profit under the following outcomes:

- **i.** The price of the stock at expiration is $61.
- **ii.** The price of the stock at expiration is $37.

B Determine the following:

- **i.** the maximum profit.
- **ii.** the maximum loss.

C Determine the breakeven stock price at expiration.

Solutions:

A **i.** $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 61 - 50) + \max(0, 50 - 61) = 11 - 0 = 11$

$\Pi = V_T - (c_0 + p_0) = 11 - (6.25 + 5.875) = -1.125$

ii. $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 37 - 50) + \max(0, 50 - 37) = 0 + 13 = 13$

$\Pi = V_T - S_0 = 13 - (6.25 + 5.875) = 0.875$

B **i.** Maximum profit = ∞

ii. Maximum loss = $c_0 + p_0 = 6.25 + 5.875 = 12.125$

C $S_T^* = X \pm (c_0 + p_0) = 50 \pm (6.25 + 5.875) = 62.125, 37.875$

Now we turn to a strategy that combines more than one call and more than one put. It should not be surprising that we shall recognize this strategy as just a combination of something we have already learned.

2.4.3 *Box Spreads*

We can exploit an arbitrage opportunity with a neutral position many alternative ways: using put–call parity, using the binomial model, or using the Black–Scholes–Merton model. Exploiting put–call parity requires a position in the underlying. Using the binomial or Black–Scholes–Merton model requires that the model holds in the market. In addition, both models require a position in the underlying and an estimate of the volatility.

A **box spread** can also be used to exploit an arbitrage opportunity but it requires that neither the binomial nor Black–Scholes–Merton model holds, it needs no estimate of the volatility, and all of the transactions can be executed within the options market, making implementation of the strategy simpler, faster, and with lower transaction costs.

In basic terms, a box spread is a combination of a bull spread and a bear spread. Suppose we buy the call with exercise price X_1 and sell the call with exercise price X_2. This set of transactions is a bull spread. Then we buy the put with exercise price X_2 and sell the put with exercise price X_1. This is a bear spread. Intuitively, it should sound like a combination of a bull spread and a bear spread would leave the investor with a fairly neutral position, and indeed, that is the case.

The value of the box spread at expiration is

$$V_T = \max(0, S_T - X_1) - \max(0, S_T - X_2) + \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$$

Broken down into ranges, we have

$$V_T = 0 - 0 + X_2 - S_T - (X_1 - S_T) = X_2 - X_1 \quad \text{if } S_T \le X_1$$
$$V_T = S_T - X_1 - 0 + X_2 - S_T - 0 = X_2 - X_1 \quad \text{if } X_1 < S_T < X_2$$
$$V_T = S_T - X_1 - (S_T - X_2) + 0 - 0 = X_2 - X_1 \quad \text{if } S_T \ge X_2$$

These outcomes are all the same. In each case, two of the four options expire in-the-money, and the other two expire out-of-the-money. In each case, the holder of the box spread ends up buying the underlying with one option, using either the long call at X_1 or the short put at X_1, and selling the underlying with another option, using either the long put at X_2 or the short call at X_2. The box spread thus results in buying the underlying at X_1 and selling it at X_2. This outcome is known at the start.

The initial value of the transaction is the value of the long call, short call, long put, and short put, $V_0 = c_1 - c_2 + p_2 - p_1$. The profit is, therefore, $\Pi = X_2 - X_1 - c_1 + c_2 - p_2 + p_1$.

In contrast to all of the other strategies, the outcome is simple. In all cases, we end up with the same result. Using the options with exercise prices of 1950 and 2050, which have premiums of $c_1 = 108.43$, $c_2 = 59.98$, $p_1 = 56.01$, and $p_2 = 107.39$, the value at expiration is always 2050 – 1950 = 100 and the profit is always $\Pi = 100 - 108.43 + 59.98 - 107.39 + 56.01 = 0.17$. This value may seem remarkably low. We shall see why momentarily.

The initial value of the box spread is $c_1 - c_2 + p_2 - p_1$. The payoff at expiration is $X_2 - X_1$. Because the transaction is risk free, the present value of the payoff, discounted using the risk-free rate, should equal the initial outlay. Hence, we should have

$$(X_2 - X_1)/(1 + r)^T = c_1 - c_2 + p_2 - p_1$$

If the present value of the payoff exceeds the initial value, the box spread is underpriced and should be purchased.

In this example, the initial outlay is $V_0 = 108.43 - 59.98 + 107.39 - 56.01 = 99.83$. To obtain the present value of the payoff, we need an interest rate and time to expiration. The prices of these options were obtained using a time to expiration of one month and a risk-free rate of 2.02 percent. The present value of the payoff is

$$(X_2 - X_1)/(1 + r)^r = (2050 - 1950)/(1.0202)^{1/12} = 99.83$$

In other words, this box spread is correctly priced. This result should not be surprising, because we noted that we used the Black–Scholes–Merton model to price these options. The model should not allow arbitrage opportunities of any form.

Recall that the profit from this transaction is 0.17, a very low value. This profit reflects the fact that the box spread is purchased at 99.83 and matures to a value of 100, a profit of 0.17, which is a return of the risk-free rate for one month.[19] The reason the profit seems so low is that it is just the risk-free rate.

Let us assume that one of the long options, say the put with exercise price of 2050, is underpriced. Let its premium be 105 instead of 107.39. Then the net premium would be 108.43 – 59.98 + 105 – 56.01 = 97.44. Again, the present value of the payoff is 99.83. Hence, the box spread would generate a gain in value clearly in excess of the risk-free rate. If some combination of the options was such that the net premium is more than the present value of the payoff, then the box spread would be overpriced. Then we should sell the X_1 call and X_2 put and buy the X_2 call and X_1 put. Doing so would generate an outlay at expiration with a present value less than the initial value.

So to summarize the box spread, we say that

Value at expiration: $V_T = X_2 - X_1$

Profit: $\Pi = X_2 - X_1 - (c_1 - c_2 + p_2 - p_1)$

Maximum profit = (same as profit)

Maximum loss = (no loss is possible, given fair option prices)

Breakeven: no breakeven; the transaction always earns the risk-free rate, given fair option prices

19 That is, $99.83(1.0202)^{1/12} \approx 100$. Hence, the profit of 0.17 is about 2.02 percent, for one month.

EXAMPLE 10

Consider a box spread consisting of options with exercise prices of 75 and 85. The call prices are 16.02 and 12.28 for exercise prices of 75 and 85, respectively. The put prices are 9.72 and 15.18 for exercise prices of 75 and 85, respectively. The options expire in six months and the discrete risk-free rate is 5.13 percent.

A Determine the value of the box spread and the profit for any value of the underlying at expiration.

B Show that this box spread is priced such that an attractive opportunity is available.

Solutions:

A The box spread always has a value at expiration of $X_2 - X_1 = 85 - 75 = 10$

$$\Pi = V_T - (c_1 - c_2 + p_2 - p_1)$$
$$= 10 - (16.02 - 12.28 + 15.18 - 9.72) = 0.80$$

B The box spread should be worth $(X_2 - X_1)/(1 + r)^T$, or

$$(85 - 75)/(1.0513)^{0.5} = 9.75$$

The cost of the box spread is 16.02 – 12.28 + 15.18 – 9.72 = 9.20. The box spread is thus underpriced. At least one of the long options is priced too low or at least one of the short options is priced too high; we cannot tell which. Nonetheless, we can execute this box spread, buying the call with exercise price $X_1 = 75$ and put with exercise price $X_2 = 85$ and selling the call with exercise price $X_2 = 85$ and put with exercise price $X_1 = 75$. This would cost 9.20. The present value of the payoff is 9.75. Therefore, the box spread would generate an immediate increase in value of 0.55.

We have now completed our discussion of equity option strategies. Although the strategies are applicable, with minor changes, to fixed-income securities, we shall not explore that area here. We shall, however, look at interest rate option strategies, which require some significant differences in presentation and understanding compared with equity option strategies.

3 INTEREST RATE OPTION STRATEGIES

Consider a group of options in which the underlying is an interest rate and the exercise price is expressed in terms of a rate. Recall that this group of options consists of calls, which pay off if the option expires with the underlying interest rate above the exercise rate, and puts, which pay off if the option expires with the underlying interest rate below the exercise rate. Interest rate call and put options are usually purchased to protect against changes in interest rates. For dollar-based interest rate derivatives, the underlying is usually Libor but is always a specific rate, such as the rate on a 90- or 180-day underlying instrument. An interest rate option is based on a specific notional principal, which determines the payoff when the option is exercised. Traditionally, the payoff does not occur immediately upon exercise but is delayed by a period corresponding to the life of the underlying instrument from which the interest rate is taken, an issue we review below.

The payoff of an interest rate call option is

$$(\text{Notional principal})\ \max(0, \text{Underlying rate at expiration} - \text{Exercise rate})\left(\frac{\text{Days in underlying rate}}{360}\right)$$

where "days in underlying" refers to the maturity of the instrument from which the underlying rate is taken. In some cases, "days in underlying" may be the exact day count during a period. For example, if an interest rate option is used to hedge the interest paid over an m-day period, then "days in underlying" would be m. Even though Libor of 30, 60, 90, 180 days, etc., whichever is closest to m, might be used as the underlying rate, the actual day count would be m, the exact number of days. In such cases, the payment date is usually set at 30, 60, 90, 180, etc. days after the option expiration date. So, for example, 180-day Libor might be used as the underlying rate, and "days in underlying" could be 180 or perhaps 182, 183, etc. The most important point, however, is that the rate is determined on one day, the option expiration, and payment is made m days later. This practice is standard in floating-rate loans and thus is used with interest rate options, which are designed to manage the risk of floating-rate loans.

Likewise, the payoff of an interest rate put is

$$(\text{Notional principal})\ \max(0, \text{Exercise rate} - \text{Underlying rate at expiration})\left(\frac{\text{Days in underlying rate}}{360}\right)$$

Now let us take a look at some applications of interest rate options.

3.1 Using Interest Rate Calls with Borrowing

Let us examine an application of an interest rate call to establish a maximum interest rate for a loan to be taken out in the future. In brief, a company can buy an interest rate call that pays off from increases in the underlying interest rate beyond a chosen level. The call payoff then compensates for the higher interest rate the company has to pay on the loan.

Consider the case of a company called Global Computer Technology (GCT), which occasionally takes out short-term loans in US dollars with the rate tied to Libor. Anticipating that it will take out a loan at a later date, GCT recognizes the potential for an interest rate increase by that time. In this example, today is 14 April, and GCT expects to borrow $40 million on 20 August at Libor plus 200 basis points. The loan will involve the receipt of the money on 20 August with full repayment of principal and interest 180 days later on 16 February. GCT would like protection against higher interest rates, so it purchases an interest rate call on 180-day Libor to expire on 20 August. GCT chooses an exercise rate of 5 percent. This option gives it the right to receive an interest payment of the difference between the 20 August Libor and 5 percent. If GCT exercises the option on 20 August, the payment will occur 180 days later on 16 February when the loan is paid off. The cost of the call is $100,000, which is paid on 14 April. Libor on 14 April is 5.5 percent.

The transaction is designed such that if Libor is above 5 percent on 20 August, GCT will benefit and be protected against increases in interest rates. To determine how the transaction works, we need to know the effective rate on the loan. Note that the sequence of events is as follows:

14 April	→	20 August	→	16 February
GCT buys call		Call expires; loan starts		Loan repaid and call payoff made

So cash is paid for the call on 14 April. Cash proceeds from the loan are received on 20 August. On 16 February, the loan is repaid and the call payoff (if any) is made.

To evaluate the effectiveness of the overall transaction, we need to determine how the call affects the loan. Therefore, we need to incorporate the payment of the call premium on 14 April into the cash flow on the loan. So, it would be appropriate to compound the call premium from 14 April to 20 August. In effect, we need to know what the call, purchased on 14 April, effectively costs on 20 August. We compound its premium for the 128 days from 14 April to 20 August at the rate at which GCT would have to borrow on 14 April. This rate would be Libor on 14 April plus 200 basis points, or 7.5 percent. The call premium thus effectively costs

$$\$100{,}000\left[1 + 0.075\left(\frac{128}{360}\right)\right] = \$102{,}667$$

on 20 August.[20] On that date, GCT takes out the loan, thereby receiving $40 million. We should, however, reduce this amount by $102,667, because GCT effectively receives less money because it must buy the call. So, the loan proceeds are effectively $40,000,000 – $102,667 = $39,897,333.

Next we must calculate the amount of interest paid on the loan and the amount of any call payoff. Let us assume that Libor on 20 August is 8 percent. In that case, the loan rate will be 10 percent. The interest on the loan will be

$$\$40{,}000{,}000(0.10)\left(\frac{180}{360}\right) = \$2{,}000{,}000$$

This amount, plus $40 million principal, is repaid on 16 February. With Libor assumed to be 8 percent on 20 August, the option payoff is

$$\$40{,}000{,}000\max(0, 0.08 - 0.05)\left(\frac{180}{360}\right) = \$40{,}000{,}000(0.03)\left(\frac{180}{360}\right) = \$600{,}000$$

This amount is paid on 16 February. The effective interest paid on 16 February is thus $2,000,000 – $600,000 = $1,400,000. So, GCT effectively receives $39,897,333 on 20 August and pays back $40,000,000 plus $1,400,000 or $41,400,000 on 16 February. The effective annual rate is

$$\left(\frac{\$41{,}400{,}000}{\$39{,}897{,}333}\right)^{365/180} - 1 = 0.0779$$

Exhibit 13 presents a complete description of the transaction and the results for a range of possible Libors on 20 August. Exhibit 14 illustrates the effective loan rate compared with Libor on 20 August. We see that the strategy places an effective ceiling on the rate on the loan of about 7.79 percent while enabling GCT to benefit from decreases in Libor. Of course, a part of this maximum rate is the 200 basis point spread over Libor that GCT must pay.[21] In effect, the company's maximum rate without the spread is 5.79 percent. This reflects the exercise rate of 5 percent plus the effect of the option premium.

20 The interpretation of this calculation is that GCT's cost of funds is 7.5 percent, making the option premium effectively $102,667 by the time the loan is taken out.

21 It should be noted that the effective annual rate is actually more than 200 basis points. For example, if someone borrows $100 at 2 percent for 180 days, the amount repaid would be $100[1 + 0.02(180/360)] = $101. The effective annual rate would be $(\$101/\$100)^{365/180} - 1 = 0.0204$.

Exhibit 13 Outcomes for an Anticipated Loan Protected with an Interest Rate Call

Scenario (14 April)

Global Computer Technology (GCT) is a US corporation that occasionally undertakes short-term borrowings in US dollars with the rate tied to Libor. To facilitate its cash flow planning, it buys an interest rate call to put a ceiling on the rate it pays while enabling it to benefit if rates fall. A call gives GCT the right to receive the difference between Libor on the expiration date and the exercise rate it chooses when it purchases the option. The payoff of the call is determined on the expiration date, but the payment is not received until a certain number of days later, corresponding to the maturity of the underlying Libor. This feature matches the timing of the interest payment on the loan.

Action

GCT determines that it will borrow $40 million at Libor plus 200 basis points on 20 August. The loan will be repaid with a single payment of principal and interest 180 days later on 16 February.

To protect against increases in Libor between 14 April and 20 August, GCT buys a call option on Libor with an exercise rate of 5 percent to expire on 20 August with the underlying being 180-day Libor. The call premium is $100,000. We summarize the information as follows:

Loan amount	$40,000,000
Underlying	180-day Libor
Spread	200 basis points over Libor
Current Libor	5.5 percent
Expiration	20 August (128 days later)
Exercise rate	5 percent
Call premium	$100,000

Scenario (20 August)

Libor on 20 August is 8 percent.

Outcome and Analysis

For any Libor, the call payoff at expiration is given below and will be received 180 days later:

$$\$40{,}000{,}000\max(0, \text{Libor} - 0.05)\left(\frac{180}{360}\right)$$

For Libor of 8 percent, the payoff is

$$\$40{,}000{,}000\max(0, 0.08 - 0.05)\left(\frac{180}{360}\right) = \$600{,}000$$

The premium compounded from 14 April to 20 August at the original Libor of 5.5 percent plus 200 basis points is

$$\$100{,}000\left[1 + (0.055 + 0.02)\left(\frac{128}{360}\right)\right] = \$102{,}667$$

(continued)

Exhibit 13 (Continued)

So the call costs $100,000 on 14 April, which is equivalent to $102,667 on 20 August. The effective loan proceeds are $40,000,000 – $102,667 = $39,897,333. The loan interest is

$$\$40{,}000{,}000(\text{Libor on 20 August} + 200 \text{ Basis points})\left(\frac{180}{360}\right)$$

For Libor of 8 percent, the loan interest is

$$\$40{,}000{,}000(0.08 + 0.02)\left(\frac{180}{360}\right) = \$2{,}000{,}000$$

The call payoff was given above. The loan interest minus the call payoff is the effective interest. The effective rate on the loan is

$$\left(\frac{\$40{,}000{,}000 \text{ plus Effective interest}}{\$39{,}897{,}333}\right)^{365/180}$$

$$-1 = \left(\frac{\$40{,}000{,}000 + \$2{,}000{,}000 - \$600{,}000}{\$39{,}897{,}333}\right)^{365/180} - 1 = 0.0779$$

or 7.79 percent.

The results are shown below for a range of Libors on 20 August.

Libor on 20 August	Loan Rate	Loan Interest Paid on 16 February	Call Payoff	Effective Interest	Effective Loan Rate
0.010	0.030	$600,000	$0	$600,000	0.0360
0.015	0.035	700,000	0	700,000	0.0412
0.020	0.040	800,000	0	800,000	0.0464
0.025	0.045	900,000	0	900,000	0.0516
0.030	0.050	1,000,000	0	1,000,000	0.0568
0.035	0.055	1,100,000	0	1,100,000	0.0621
0.040	0.060	1,200,000	0	1,200,000	0.0673
0.045	0.065	1,300,000	0	1,300,000	0.0726
0.050	0.070	1,400,000	0	1,400,000	0.0779
0.055	0.075	1,500,000	100,000	1,400,000	0.0779
0.060	0.080	1,600,000	200,000	1,400,000	0.0779
0.065	0.085	1,700,000	300,000	1,400,000	0.0779
0.070	0.090	1,800,000	400,000	1,400,000	0.0779
0.075	0.095	1,900,000	500,000	1,400,000	0.0779
0.080	0.100	2,000,000	600,000	1,400,000	0.0779
0.085	0.105	2,100,000	700,000	1,400,000	0.0779
0.090	0.110	2,200,000	800,000	1,400,000	0.0779

Exhibit 14 The Effective Rate on an Anticipated Future Loan Protected with an Interest Rate Call Option

EXAMPLE 11

On 10 January, ResTex Ltd. determines that it will need to borrow $5 million on 15 February at 90-day Libor plus 300 basis points. The loan will be an add-on interest loan in which ResTex will receive $5 million and pay it back plus interest on 16 May. To manage the risk associated with the interest rate on 15 February, ResTex buys an interest rate call that expires on 15 February and pays off on 16 May. The exercise rate is 5 percent, and the option premium is $10,000. The current 90-day Libor is 5.25 percent. Assume that this rate, plus 300 basis points, is the rate it would borrow at for any period of up to 90 days if the loan were taken out today. Interest is computed on the exact number of days divided by 360.

Determine the effective annual rate on the loan for each of the following outcomes:

1. 90-day Libor on 15 February is 6 percent.
2. 90-day Libor on 15 February is 4 percent.

Solutions:

First we need to compound the premium from 10 January to 15 February, which is 36 days. This calculation tells us the effective cost of the call as of the time the loan is taken out:

$$\$10{,}000\left[1 + (0.0525 + 0.03)\left(\frac{36}{360}\right)\right] = \$10{,}083$$

The loan proceeds will therefore be $5,000,000 – $10,083 = $4,989,917.

Solution to 1:

Libor is 6 percent. The loan rate will be 9 percent.

The interest on the loan will be $5,000,000(0.06 + 0.03) (90/360) = $112,500.

The option payoff will be \$5,000,000 max(0,0.06 – 0.05) (90/360) = \$12,500.
Therefore, the effective interest will be \$112,500 – \$12,500 = \$100,000.
The effective rate on the loan will be

$$\left(\frac{\$5{,}000{,}000 + \$100{,}000}{\$4{,}989{,}917}\right)^{365/90} - 1 = 0.0925$$

Of course, a little more than 300 basis points of this amount is the spread.

Solution to 2:

Libor is 4 percent. The loan rate will be 7 percent.
The interest on the loan will be \$5,000,000(0.04 + 0.03) (90/360) = \$87,500.
The option payoff will be \$5,000,000 max(0,0.04 – 0.05) (90/360) = \$0.00.
The effective interest will, therefore, be \$87,500.
The effective rate on the loan will be

$$\left(\frac{\$5{,}000{,}000 + \$87{,}500}{\$4{,}989{,}917}\right)^{365/90} - 1 = 0.0817$$

Of course, a little more than 300 basis points of this amount is the spread.

Whereas interest rate call options are appropriate for borrowers, lenders also face the risk of interest rates changing. As you may have guessed, they make use of interest rate puts.

3.2 Using Interest Rate Puts with Lending

Now consider an application of an interest rate put to establish a minimum interest rate for a commitment to give a loan in the future. A lender can buy a put that pays off if the interest rate falls below a chosen level. The put payoff then compensates the bank for the lower interest rate on the loan.

For example, consider Arbitrage Bank Inc. (ABInc) which makes loan commitments to corporations. It stands ready to make a loan at Libor at a future date. To protect itself against decreases in interest rates between the time of the commitment and the time the loan is taken out, it buys interest rate puts. These options pay off if Libor is below the exercise rate at expiration. If Libor is above the exercise rate at expiration, the option expires unexercised and the lender benefits from the higher rate on the loan.

In this example, ABInc makes a commitment on 15 March to lend \$50 million at 90-day Libor plus 2.5 percent on 1 May, which is 47 days later. Current Libor is 7.25 percent. It buys a put with an exercise rate of 7 percent for \$62,500. Assume that the opportunity cost of lending in the Libor market is Libor plus a spread of 2.5 percent. Therefore, the effective cost of the premium compounded to the option's expiration is[22]

$$\$62{,}500\left[1 + (0.0725 + 0.025)\left(\frac{47}{360}\right)\right] = \$63{,}296$$

When it lends \$50 million on 1 May, it effectively has an outlay of \$50,000,000 + \$63,296 = \$50,063,296. The loan rate is set on 1 May and the interest, paid 90 days later on 30 July, is

$$\$50{,}000{,}000\left[\text{Libor on 1 May plus 250 Basis points}\left(\frac{90}{360}\right)\right]$$

22 The interpretation of this calculation is that the bank could have otherwise made a loan of \$62,500, which would have paid back \$63,296 on 1 May.

The put payoff is

$$\$50{,}000{,}000\max(0, 0.07 - \text{Libor on 1 May})\left(\frac{90}{360}\right)$$

The loan interest plus the put payoff make up the effective interest. The effective rate on the loan is

$$\left(\frac{\text{Principal plus Effective interest}}{\$50{,}063{,}296}\right)^{365/90} - 1$$

Suppose Libor on 1 May is 6 percent. In that case, the loan rate will be 8.5 percent, and the interest on the loan will be

$$\$50{,}000{,}000\left[(0.06 + 0.025)\left(\frac{90}{360}\right)\right] = \$1{,}062{,}500$$

The put payoff is

$$\$50{,}000{,}000\max(0, 0.07 - 0.06)\left(\frac{90}{360}\right) = \$125{,}000$$

This amount is paid on 30 July. The put cost of $62,500 on 15 March is equivalent to paying $63,296 on 1 May. Thus, on 1 May the bank effectively commits $50,000,000 + $63,296 = $50,063,296. The effective interest it receives is the loan interest of $1,062,500 plus the put payoff of $125,000, or $1,187,500. The effective annual rate is

$$\left(\frac{\$50{,}000{,}000 + \$1{,}187{,}500}{\$50{,}063{,}296}\right)^{365/90} - 1 = 0.0942$$

Exhibit 15 presents the results for a range of possible Libors at expiration, and Exhibit 16 graphs the effective loan rate against Libor on 1 May. Note how there is a minimum effective loan rate of 9.42 percent. Of this rate, 250 basis points is automatically built in as the loan spread.[23] The remaining amount reflects the exercise rate on the put of 7 percent minus the cost of the put premium.

Exhibit 15 Outcomes for an Anticipated Loan Protected with an Interest Rate Put

Scenario (15 March)

Arbitrage Bank Inc. (ABInc) is a US bank that makes loan commitments to corporations. When ABInc makes these commitments, it recognizes the risk that Libor will fall by the date the loan is taken out. ABInc protects itself against interest rate decreases by purchasing interest rate puts, which give it the right to receive the difference between the exercise rate it chooses and Libor at expiration. Libor is currently 7.25 percent.

Action

ABInc commits to lending $50 million to a company at 90-day Libor plus 250 basis points. The loan will be a single-payment loan, meaning that it will be made on 1 May and the principal and interest will be repaid 90 days later on 30 July.

(continued)

23 As in the case of the borrower, the spread is effectively more than 250 basis points when the effective annual rate is determined. For this 90-day loan, this effectively amounts to 256 basis points.

Exhibit 15 (Continued)

To protect against decreases in Libor between 15 March and 1 May, ABInc buys a put option with an exercise rate of 7 percent to expire on 1 May with the underlying being 90-day Libor. The put premium is $62,500. We summarize the information as follows:

Loan amount	$50,000,000
Underlying	90-day Libor
Spread	250 basis points over Libor
Current Libor	7.25 percent
Expiration	1 May
Exercise rate	7 percent
Put premium	$62,500

Scenario (1 May)

Libor is now 6 percent.

Outcome and Analysis

For any Libor, the payoff at expiration is given below and will be received 90 days later:

$$\$50{,}000{,}000\max(0, 0.07 - \text{Libor})\left(\frac{90}{360}\right)$$

For Libor of 6 percent, the payoff is

$$\$50{,}000{,}000\max(0, 0.07 - 0.060)\left(\frac{90}{360}\right) = \$125{,}000$$

The premium compounded from 15 March to 1 May at current Libor plus 250 basis points is

$$\$62{,}500\left[1 + (0.0725 + 0.025)\left(\frac{47}{360}\right)\right] = \$63{,}296$$

So the put costs $62,500 on 15 March, which is equivalent to $63,296 on 1 May. The effective amount loaned is $50,000,000 + $63,296 = $50,063,296. For any Libor, the loan interest is

$$\$50{,}000{,}000\left[\text{Libor on 1 May plus 250 Basis points}\left(\frac{90}{360}\right)\right]$$

With Libor at 6 percent, the interest is

$$\$50{,}000{,}000\left[(0.06 + 0.025)\left(\frac{90}{360}\right)\right] = \$1{,}062{,}500$$

The loan interest plus the put payoff is the effective interest on the loan. The effective rate on the loan is

$$\left(\frac{\text{Principal plus Effective interest}}{\$50{,}063{,}296}\right)^{365/90} - 1$$

$$= \left(\frac{\$50{,}000{,}000 + \$1{,}062{,}500 + \$125{,}000}{\$50{,}063{,}296}\right)^{365/90} - 1 = 0.0942$$

or 9.42 percent. The results that follow are for a range of Libors on 1 May.

Exhibit 15 (Continued)

Libor on 1 May	Loan Rate	Loan Interest Paid on 30 July	Put Payoff	Effective Interest	Effective Loan Rate
0.030	0.055	$687,500	$500,000	$1,187,500	0.0942
0.035	0.060	750,000	437,500	1,187,500	0.0942
0.040	0.065	812,500	375,000	1,187,500	0.0942
0.045	0.070	875,000	312,500	1,187,500	0.0942
0.050	0.075	937,500	250,000	1,187,500	0.0942
0.055	0.080	1,000,000	187,500	1,187,500	0.0942
0.060	0.085	1,062,500	125,000	1,187,500	0.0942
0.065	0.090	1,125,000	62,500	1,187,500	0.0942
0.070	0.095	1,187,500	0	1,187,500	0.0942
0.075	0.100	1,250,000	0	1,250,000	0.0997
0.080	0.105	1,312,500	0	1,312,500	0.1051
0.085	0.110	1,375,000	0	1,375,000	0.1106
0.090	0.115	1,437,500	0	1,437,500	0.1161
0.095	0.120	1,500,000	0	1,500,000	0.1216
0.100	0.125	1,562,500	0	1,562,500	0.1271
0.105	0.130	1,625,000	0	1,625,000	0.1327
0.110	0.135	1,687,500	0	1,687,500	0.1382

Exhibit 16 The Effective Rate on an Anticipated Loan with an Interest Rate Put Option

EXAMPLE 12

State Bank and Trust (SBT) is a lender in the floating-rate instrument market, but it has been hurt by recent interest rate decreases. SBT often makes loan commitments for its customers and then accepts the rate in effect on the day the loan is taken out. SBT has avoided floating-rate financing in the past. It takes out a certain amount of fixed-rate financing in advance to cover its loan commitments. One particularly large upcoming loan has it worried. This is a $100 million loan to be made in 65 days at 180-day Libor plus 100 basis points. The loan will be paid back 182 days after being taken out, and interest will be based on an exact day count and 360 days in a year. Current Libor is 7.125 percent, which is the rate it could borrow at now for any period less than 180 days. SBT considers the purchase of an interest rate put to protect it against an interest rate decrease over the next 65 days. The put will have an exercise price of 7 percent and a premium of $475,000.

Determine the effective annual rate on the loan for the following outcomes:

1. 180-day Libor at the option expiration is 9 percent.
2. 180-day Libor at the option expiration is 5 percent.

Solutions:

First we need to compound the premium for 65 days. This calculation tells us the effective cost of the put as of the time the loan is made:

$$\$475{,}000\left[1 + (0.07125 + 0.01)\left(\frac{65}{360}\right)\right] = \$481{,}968$$

The outlay will effectively be $100,000,000 + $481,968 = $100,481,968.

Solution to 1:

Libor is 9 percent. The loan rate will be 10 percent.

The interest on the loan will be $100,000,000 (0.09 + 0.01)(182/360) = $5,055,556.

The option payoff will be $100,000,000 max (0,0.07 – 0.09)(182/360) = $0.0.

Because there is no option payoff, the effective interest will be $5,055,556. The effective rate on the loan will be

$$\left(\frac{\$100{,}000{,}000 + \$5{,}055{,}556}{\$100{,}481{,}968}\right)^{365/182} - 1 = 0.0934$$

Of course, a little more than 100 basis points of this amount is the spread.

Solution to 2:

Libor is 5 percent. The loan will be 6 percent. The interest on the loan will be $100,000,000 (0.05 + 0.01) (182/360) = $3,033,333.

The option payoff will be $100,000,000 max(0,0.07 – 0.05) (182/360) = $1,011,111.

The effective interest will, therefore, be $3,033,333 + $1,011,111 = $4,044,444.

The effective rate on the loan will be

$$\left(\frac{\$100{,}000{,}000 + \$4{,}044{,}444}{\$100{,}481{,}968}\right)^{365/182} - 1 = 0.0724$$

Of course, a little more than 100 basis points of this amount is the spread.

Interest rate calls and puts can be combined into packages of multiple options, which are widely used to manage the risk of floating-rate loans.

3.3 Using an Interest Rate Cap with a Floating-Rate Loan

Many corporate loans are floating-rate loans. They require periodic interest payments in which the rate is reset on a regularly scheduled basis. Because there is more than one interest payment, there is effectively more than one distinct risk. If a borrower wanted to use an interest rate call to place a ceiling on the effective borrowing rate, it would require more than one call. In effect, it would require a distinct call option expiring on each interest rate reset date. A combination of interest rate call options designed to align with the rates on a loan is called a **cap**. The component options are called **caplets**. Each caplet is distinct in having its own expiration date, but typically the exercise rate on each caplet is the same.

To illustrate the use of a cap, consider a company called Measure Technology (MesTech), which borrows in the floating-rate loan market. It usually takes out a loan for several years at a spread over Libor, paying the interest semiannually and the full principal at the end. On 15 April, MesTech takes out a $10 million three-year loan at 100 basis points over 180-day Libor from a bank called SenBank. Current 180-day Libor is 9 percent, which sets the rate for the first six-month period at 10 percent. Interest payments will be on the 15th of October and April for three years. This means that the day counts for the six payments will be 183, 182, 183, 182, 183, and 182.

To protect against increases in interest rates, MesTech purchases an interest rate cap with an exercise rate of 8 percent. The component caplets expire on 15 October, the following 15 April, and so forth until the last caplet expires on a subsequent 15 October. The loan has six interest payments, but because the first rate is already set, there are only five risky payments so the cap will contain five caplets. The payoff of each caplet will be determined on its expiration date, but the caplet payoff, if any, will actually be made on the next payment date. This enables the caplet payoff to line up with the date on which the loan interest is paid. The cap premium, paid up front on 15 April, is $75,000.

In the example of a single interest rate call, we looked at a range of outcomes several hundred basis points around the exercise rate. In a cap, however, many more outcomes are possible. Ideally we would examine a range of outcomes for each caplet. In the example of a single cap, we looked at the exercise rate and 8 rates above and below for a total of 17 rates. For five distinct rate resets, this same procedure would require 5^{17} or more than 762 billion different possibilities. So, we shall just look at one possible combination of rates.

We shall examine a set of outcomes in which Libor is

8.50 percent on 15 October
7.25 percent on 15 April the following year
7.00 percent on the following 15 October
6.90 percent on the following 15 April
8.75 percent on the following 15 October

The loan interest is computed as

$$\$10{,}000{,}000(\text{Libor on previous reset date} + 100 \text{ Basis points}) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

Thus, the first interest payment is

$$\$10{,}000{,}000(0.10)\left(\frac{183}{360}\right) = \$508{,}333$$

which is based on 183 days between 15 April and 15 October. This amount is certain, because the first interest rate has already been set. The remaining interest payments are based on the assumption we made above about the course of Libor over the life of the loan.

The results for these assumed rates are shown in the table at the end of Exhibit 17. Note several things about the effective interest, displayed in the last column. First, the initial interest payment is much higher than the other interest payments because the initial rate is somewhat higher than the remaining rates that prevailed over the life of the loan. Also, recall that the initial rate is already set, and it would make no sense to add a caplet to cover the initial rate, because the caplet would have to expire immediately in order to pay off on the first 15 October. If the caplet expired immediately, the amount MesTech would have to pay for it would be the amount of the caplet payoff, discounted for the deferral of the payoff. In other words, it would make no sense to have an option, or any derivative for that matter, that is purchased and expires immediately. Note also the variation in the effective interest payments, which occurs for two reasons. One is that, in contrast to previous examples, interest is computed over the exact number of days in the period. Thus, even if the rate were the same, the interest could vary by the effect of one or two days of interest. The other reason is that in some cases the caplets do expire with value, thereby reducing the effective interest paid.

Exhibit 17 Interest Rate Cap

Scenario (15 April)

Measure Technology (MesTech) is a corporation that borrows in the floating-rate instrument market. It typically takes out a loan for several years at a spread over Libor. MesTech pays the interest semiannually and the full principal at the end.

To protect against rising interest rates over the life of the loan, MesTech usually buys an interest rate cap in which the component caplets expire on the dates on which the loan rate is reset. The cap seller is a derivatives dealer.

Action

MesTech takes out a $10 million three-year loan at 100 basis points over Libor. The payments will be made semiannually. The lender is SenBank. Current Libor is 9 percent, which means that the first rate will be at 10 percent. Interest will be based on 1/360 of the exact number of days in the six-month period. MesTech selects an exercise rate of 8 percent. The caplets will expire on 15 October, 15 April of the following year, and so on for three years, but the caplet payoffs will occur on the next payment date to correspond with the interest payment based on Libor that determines the cap payoff. The cap premium is $75,000. We thus have the following information:

Loan amount	$10,000,000
Underlying	180-day Libor
Spread	100 basis points over Libor
Current Libor	9 percent
Interest based on	actual days/360
Component caplets	five caplets expiring 15 October, 15 April, etc.
Exercise rate	8 percent
Cap premium	$75,000

Exhibit 17 (Continued)

Scenario (Various Dates throughout the Loan)

Shown below is one particular set of outcomes for Libor:

8.50 percent on 15 October
7.25 percent on 15 April the following year
7.00 percent on the following 15 October
6.90 percent on the following 15 April
8.75 percent on the following 15 October

Outcome and Analysis

The loan interest due is computed as

$$\$10{,}000{,}000(\text{Libor on previous reset date} + 100 \text{ Basis points}) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The caplet payoff is

$$\$10{,}000{,}000\max(0, \text{Libor on previous reset date} - 0.08) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The previous reset date is the expiration date of the caplet. The effective interest is the interest due minus the caplet payoff.

The first caplet expires on the first 15 October and pays off the following April, because Libor on 15 October was 8.5 percent. The payoff is computed as

$$\$10{,}000{,}000\max(0, 0.085 - 0.08)\left(\frac{182}{360}\right)$$

$$= \$10{,}000{,}000(0.005)\left(\frac{182}{360}\right) = \$25{,}278$$

which is based on 182 days between 15 October and 15 April. The following table shows the payments on the loan and cap:

Date	Libor	Loan Rate	Days in Period	Interest Due	Caplet Payoffs	Effective Interest
15 April	0.0900	0.1000				
15 October	0.0850	0.0950	183	$508,333		$508,333
15 April	0.0725	0.0825	182	480,278	$25,278	455,000
15 October	0.0700	0.0800	183	419,375	0	419,375
15 April	0.0690	0.0790	182	404,444	0	404,444
15 October	0.0875	0.0975	183	401,583	0	401,583
15 April			182	492,917	37,917	455,000

Note that on the following three dates, the caplets are out-of-the-money, because the Libors are all lower than 8 percent. On the final 15 October, however, Libor is 8.75 percent, which leads to a final caplet payoff of $37,917 on the following 15 April, at which time the loan principal is repaid.

We do not show the effective rate on the loan. Because the loan has multiple payments, the effective rate would be analogous to the internal rate of return on a capital investment project or the yield-to-maturity on a bond. This rate would have

to be found with a financial calculator or spreadsheet, and we would have to account for the principal received up front and paid back at maturity, as well as the cap premium. It is sufficient for us to see that the cap protects the borrower any time the rate rises above the exercise rate and allows the borrower to benefit from rates lower than the exercise rate.

Finally, there is one circumstance under which this cap might contain a sixth caplet, one expiring on the date on which the loan is taken out. If the borrower purchased the cap in advance of taking out the loan, the first loan rate would not be set until the day the loan is actually taken out. The borrower would thus have an incentive to include a caplet that would protect the first rate setting.

EXAMPLE 13

Healthy Biosystems (HBIO) is a typical floating-rate borrower, taking out loans at Libor plus a spread. On 15 January 2002, it takes out a loan of $25 million for one year with quarterly payments on 12 April, 14 July, 16 October, and the following 14 January. The underlying rate is 90-day Libor, and HBIO will pay a spread of 250 basis points. Interest is based on the exact number of days in the period. Current 90-day Libor is 6.5 percent. HBIO purchases an interest rate cap for $20,000 that has an exercise rate of 7 percent and has caplets expiring on the rate reset dates.

Determine the effective interest payments if Libor on the following dates is as given:

12 April	7.250 percent
14 July	6.875 percent
16 October	7.125 percent

Solution:

The interest due for each period is computed as $25,000,000(Libor on previous reset date + 0.0250)(Days in period/360). For example, the first interest payment is calculated as $25,000,000(0.065 + 0.025)(87/360) = $543,750, based on the fact that there are 87 days between 15 January and 12 April. Each caplet payoff is computed as $25,000,000 max(0,Libor on previous reset date – 0.07)(Days in period/360), where the "previous reset date" is the caplet expiration. Payment is deferred until the date on which the interest is paid at the given Libor. For example, the caplet expiring on 12 April is worth $25,000,000 max(0,0.0725 – 0.07)(93/360) = $16,145, which is paid on 14 July and is based on the fact that there are 93 days between 12 April and 14 July.

The effective interest is the actual interest minus the caplet payoff. The payments are shown in the table below:

Date	Libor	Loan Rate	Days in Period	Interest Due	Caplet Payoff	Effective Interest
15 January	0.065	0.09				
12 April	0.0725	0.0975	87	$543,750		$543,750
14 July	0.06875	0.09375	93	629,688	$16,146	613,542
16 October	0.07125	0.09625	94	611,979	0	611,979
14 January			90	601,563	7,813	593,750

Lenders who use floating-rate loans face the same risk as borrowers. As such they can make use of combinations of interest rate puts.

3.4 Using an Interest Rate Floor with a Floating-Rate Loan

Let us now consider the same problem from the point of view of the lender, which is SenBank in this example. It would be concerned about falling interest rates. It could, therefore, buy a combination of interest rate put options that expire on the various interest rate reset dates. This combination of puts is called a **floor**, and the component options are called **floorlets**. Specifically, let SenBank buy a floor with floorlets expiring on the interest rate reset dates and with an exercise rate of 8 percent. The premium is $72,500.[24] Exhibit 18 illustrates the results using the same outcomes we looked at when examining the interest rate cap. Note that the floorlet expires in-the-money on three dates when Libor is less than 8 percent, and out-of-the-money on two dates when Libor is greater than 8 percent. In those cases in which the floorlet expires in-the-money, the actual payoff does not occur until the next settlement period. This structure aligns the floorlet payoffs with the interest payments they are designed to protect. We see that the floor protects the lender against falling interest rates. Any time the rate is below 8 percent, the floor compensates the bank for any difference between the rate and 8 percent. When the rate is above 8 percent, the floorlets simply expire unused.

Exhibit 18 Interest Rate Floor

Scenario (15 April)

SenBank lends in the floating-rate instrument market. Often it uses floating-rate financing, thereby protecting itself against decreases in the floating rates on its loans. Sometimes, however, it finds it can get a better rate with fixed-rate financing, but it then leaves itself exposed to interest rate decreases on its floating-rate loans. Its loans are typically for several years at a spread over Libor with interest paid semiannually and the full principal paid at the end.

To protect against falling interest rates over the life of the loan, SenBank buys an interest rate floor in which the component floorlets expire on the dates on which the loan rate is reset. The floor seller is a derivatives dealer.

Action

SenBank makes a $10 million three-year loan at 100 basis points over Libor to MesTech (see cap example). The payments will be made semiannually. Current Libor is 9 percent, which means that the first interest payment will be at 10 percent. Interest will be based on the exact number of days in the six-month period divided by 360. SenBank selects an exercise rate of 8 percent. The floorlets will expire on 15 October, 15 April of the following year, and so on for three years, but the floorlet payoffs will occur on the next payment date so as to correspond with the interest payment based on Libor that determines the floorlet payoff. The floor premium is $72,500. We thus have the following information:

Loan amount	$10,000,000
Underlying	180-day Libor

(continued)

24 Note that the premiums for the cap and floor are not the same. This difference occurs because the premiums for a call and a put with the same exercise price are not the same, as can be seen by examining put–call parity.

Exhibit 18 (Continued)

Spread	100 basis points over Libor
Current Libor	9 percent
Interest based on	actual days/360
Component floorlets	five floorlets expiring 15 October, 15 April, etc.
Exercise rate	8 percent
Floor premium	$72,500

Outcomes (Various Dates throughout the Loan)

Shown below is one particular set of outcomes for Libor:

8.50 percent on 15 October
7.25 percent on 15 April the following year
7.00 percent on the following 15 October
6.90 percent on the following 15 April
8.75 percent on the following 15 October

Outcome and Analysis

The loan interest is computed as

$$\$10{,}000{,}000(\text{Libor on previous reset date} + 100 \text{ Basis points}) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The floorlet payoff is

$$\$10{,}000{,}000\max(0, 0.08 - \text{Libor on previous reset date}) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The effective interest is the interest due plus the floorlet payoff. The following table shows the payments on the loan and floor:

Date	Libor	Loan Rate	Days in Period	Interest Due	Floorlet Payoffs	Effective Interest
15 April	0.0900	0.1000				
15 October	0.0850	0.0950	183	$508,333		$508,333
15 April	0.0725	0.0825	182	480,278	$0	480,278
15 October	0.0700	0.0800	183	419,375	38,125	457,500
15 April	0.0690	0.0790	182	404,444	50,556	455,000
15 October	0.0875	0.0975	183	401,583	55,917	457,500
15 April			182	492,917	0	492,917

EXAMPLE 14

Capitalized Bank (CAPBANK) is a lender in the floating-rate loan market. It uses fixed-rate financing on its floating-rate loans and buys floors to hedge the rate. On 1 May 2002, it makes a loan of $40 million at 180-day Libor plus 150 basis points. Interest will be paid on 1 November, the following 5 May, the following

1 November, and the following 2 May, at which time the principal will be repaid. The exercise rate is 4.5 percent, the floorlets expire on the rate reset dates, and the premium will be $120,000. Interest will be calculated based on the actual number of days in the period over 360. The current 180-day Libor is 5 percent.

Determine the effective interest payments CAPBANK will receive if Libor on the following dates is as given:

1 November	4.875 percent
5 May	4.25 percent
1 November	5.125 percent

Solution:

The interest due for each period is computed as $40,000,000(Libor on previous reset date + 0.0150)(Days in period/360). For example, the first interest payment is $40,000,000(0.05 + 0.0150)(184/360) = $1,328,889, based on the fact that there are 184 days between 1 May and 1 November. Each floorlet payoff is computed as $40,000,000 max(0,0.045 – Libor on previous reset date)(Days in period/360), where the "previous reset date" is the floorlet expiration. Payment is deferred until the date on which the interest is paid at the given Libor. For example, the floorlet expiring on 5 May is worth $40,000,000 max(0,0.045 – 0.0425)(180/360) = $50,000, which is paid on 1 November and is based on the fact that there are 180 days between 5 May and 1 November.

The effective interest is the actual interest plus the floorlet payoff. The payments are shown in the table below:

Date	Libor	Loan Rate	Days in Period	Interest Due	Floorlet Payoff	Effective Interest
1 May	0.05	0.065				
1 November	0.04875	0.06375	184	$1,328,889		$1,328,889
5 May	0.0425	0.0575	185	1,310,417	$0	1,310,417
1 November	0.05125	0.06625	180	1,150,000	50,000	1,200,000
2 May			183	1,347,083	0	1,347,083

When studying equity option strategies, we combined puts and calls into a single transaction called a collar. In a similar manner, we now combine caps and floors into a single transaction, also called a collar.

3.5 Using an Interest Rate Collar with a Floating-Rate Loan

As we showed above, borrowers are attracted to caps because they protect against rising interest rates. They do so, however, at the cost of having to pay a premium in cash up front. A collar combines a long position in a cap with a short position in a floor. The sale of the floor generates a premium that can be used to offset the premium on the cap. Although it is not necessary that the floor premium completely offset the cap premium, this arrangement is common.[25] The exercise rate on the floor is selected such that the floor premium is precisely the cap premium. As with equity options, this type of strategy is called a zero-cost collar. Recall, however, that this term is a bit misleading because it suggests that this transaction has no true "cost." The cost is

25 It is even possible for the floor premium to be greater than the cap premium, thereby *generating cash* up front.

simply not up front in cash. The sale of the floor results in the borrower giving up any gains from interest rates below the exercise rate on the floor. Therefore, the borrower pays for the cap by giving away some of the gains from the possibility of falling rates.

Recall that for equity investors, the collar typically entails ownership of the underlying asset and the purchase of a put, which is financed with the sale of a call. In contrast, an interest rate collar is more commonly seen from the borrower's point of view: a position as a borrower and the purchase of a cap, which is financed by the sale of a floor. It is quite possible, however, that a lender would want a collar. The lender is holding an asset, the loan, and wants protection against falling interest rates, which can be obtained by buying a floor, which itself can be financed by selling a cap. Most interest rate collars, however, are initiated by borrowers.

In the example we used previously, MesTech borrows $10 million at Libor plus 100 basis points. The cap exercise rate is 8 percent, and the premium is $75,000. We now change the numbers a little and let MesTech set the exercise rate at 8.625 percent. To sell a floor that will generate the same premium as the cap, the exercise rate is set at 7.5 percent. It is not necessary for us to know the amounts of the cap and floor premiums; it is sufficient to know that they offset.

Exhibit 19 shows the collar results for the same set of interest rate outcomes we have been previously using. Note that on the first 15 October, Libor is between the cap and floor exercise rates, so neither the caplet nor the floorlet expires in-the-money. On the following 15 April, 15 October, and the next 15 April, the rate is below the floor exercise rate, so MesTech has to pay up on the expiring floorlets. On the final 15 October, Libor is above the cap exercise rate, so MesTech gets paid on its cap.

Exhibit 19 Interest Rate Collar

Scenario (15 April)

Consider the Measure Technology (MesTech) scenario described in the cap and floor example in Exhibits 17 and 18. MesTech is a corporation that borrows in the floating-rate instrument market. It typically takes out a loan for several years at a spread over Libor. MesTech pays the interest semiannually and the full principal at the end.

To protect against rising interest rates over the life of the loan, MesTech usually buys an interest rate cap in which the component caplets expire on the dates on which the loan rate is reset. To pay for the cost of the interest rate cap, MesTech can sell a floor at an exercise rate lower than the cap exercise rate.

Action

Consider the $10 million three-year loan at 100 basis points over Libor. The payments are made semiannually. Current Libor is 9 percent, which means that the first rate will be at 10 percent. Interest is based on the exact number of days in the six-month period divided by 360. MesTech selects an exercise rate of 8.625 percent for the cap. Generating a floor premium sufficient to offset the cap premium requires a floor exercise rate of 7.5 percent. The caplets and floorlets will expire on 15 October, 15 April of the following year, and so on for three years, but the payoffs will occur on the following payment date to correspond with the interest payment based on Libor that determines the caplet and floorlet payoffs. Thus, we have the following information:

Loan amount	$10,000,000
Underlying	180-day Libor
Spread	100 basis points over Libor
Current Libor	9 percent

Exhibit 19 (Continued)

Interest based on	actual days/360
Component options	five caplets and floorlets expiring 15 October, 15 April, etc.
Exercise rate	8.625 percent on cap, 7.5 percent on floor
Premium	no net premium

Scenario (Various Dates throughout the Loan)

Shown below is one particular set of outcomes for Libor:

8.50 percent on 15 October
7.25 percent on 15 April the following year
7.00 percent on the following 15 October
6.90 percent on the following 15 April
8.75 percent on the following 15 October

Outcome and Analysis

The loan interest is computed as

$$\$10{,}000{,}000(\text{Libor on previous reset date} + 100 \text{ Basis points}) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The caplet payoff is

$$\$10{,}000{,}000\max(0, \text{Libor on previous reset date} - 0.08625) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The floorlet payoff is

$$(\$10{,}000{,}000\max(0, 0.075 - \text{Libor on previous reset date}) \times \left(\frac{\text{Days in settlement period}}{360}\right)$$

The effective interest is the interest due minus the caplet payoff minus the floorlet payoff. Note that because the floorlet was sold, the floorlet payoff is either negative (so we would subtract a negative number, thereby adding an amount to obtain the total interest due) or zero.

The following table shows the payments on the loan and collar:

Date	Libor	Loan Rate	Days in Period	Interest Due	Caplet Payoffs	Floorlet Payoffs	Effective Interest
15 April	0.0900	0.1000					
15 October	0.0850	0.0950	183	$508,333			$508,333
15 April	0.0725	0.0825	182	480,278	$0	$0	480,278
15 October	0.0700	0.0800	183	419,375	0	–12,708	432,083
15 April	0.0690	0.0790	182	404,444	0	–25,278	429,722
15 October	0.0875	0.0975	183	401,583	0	–30,500	432,083
15 April			182	492,917	6,319	0	486,598

A collar establishes a range, the cap exercise rate minus the floor exercise rate, within which there is interest rate risk. The borrower will benefit from falling rates and be hurt by rising rates within that range. Any rate increases above the cap exercise rate will have no net effect, and any rate decreases below the floor exercise rate will have no net effect. The net cost of this position is zero, provided that the floor exercise rate is set such that the floor premium offsets the cap premium.[26] It is probably easy to see that collars are popular among borrowers.

EXAMPLE 15

Exegesis Systems (EXSYS) is a floating-rate borrower that manages its interest rate risk with collars, purchasing a cap and selling a floor in which the cost of the cap and floor are equivalent. EXSYS takes out a $35 million one-year loan at 90-day Libor plus 200 basis points. It establishes a collar with a cap exercise rate of 7 percent and a floor exercise rate of 6 percent. Current 90-day Libor is 6.5 percent. The interest payments will be based on the exact day count over 360. The caplets and floorlets expire on the rate reset dates. The rates will be set on the current date (5 March), 4 June, 5 September, and 3 December, and the loan will be paid off on the following 3 March.

Determine the effective interest payments if Libor on the following dates is as given:

4 June	7.25 percent
5 September	6.5 percent
3 December	5.875 percent

Solution:

The interest due for each period is computed as $35,000,000(Libor on previous reset date + 0.02)(Days in period/360). For example, the first interest payment is $35,000,000(0.065 + 0.02)(91/360) = $752,014, based on the fact that there are 91 days between 5 March and 4 June. Each caplet payoff is computed as $35,000,000 max(0,Libor on previous reset date – 0.07)(Days in period/360), where the "previous reset date" is the caplet expiration. Payment is deferred until the date on which the interest is paid at the given Libor. For example, the caplet expiring on 4 June is worth $35,000,000 max(0,0.0725 – 0.07)(93/360) = $22,604, which is paid on 5 September and is based on the fact that there are 93 days between 4 June and 5 September. Each floorlet payoff is computed as $35,000,000 max(0,0.06 – Libor on previous reset date)(Days in period/360). For example, the floorlet expiring on 3 December is worth $35,000,000 max(0,0.06 – 0.05875) (90/360) = $10,938, based on the fact that there are 90 days between 3 December and 3 March. The effective interest is the actual interest minus the caplet payoff minus the floorlet payoff. The payments are shown in the table below:

Date	Libor	Loan Rate	Days in Period	Interest Due	Caplet Payoff	Floorlet Payoff	Effective Interest
5 March	0.065	0.085					
4 June	0.0725	0.0925	91	$752,014			$752,014

26 It is certainly possible that the floor exercise rate would be set first, and the cap exercise rate would then be set to have the cap premium offset the floor premium. This would likely be the case if a lender were doing the collar. We assume, however, the case of a borrower who wants protection above a certain level and then decides to give up gains below a particular level necessary to offset the cost of the protection.

Date	Libor	Loan Rate	Days in Period	Interest Due	Caplet Payoff	Floorlet Payoff	Effective Interest
5 September	0.065	0.085	93	836,354	$22,604	$0	813,750
3 December	0.05875	0.07875	89	735,486	0	0	735,486
3 March			90	689,063	0	–10,938	700,001

Of course, caps, floors, and collars are not the only forms of protection against interest rate risk. We have previously covered FRAs and interest rate futures. The most widely used protection, however, is the interest rate swap. We cover swap strategies in the reading on risk management applications of swap strategies.

In the final section of this reading, we examine the strategies used to manage the risk of an option portfolio.

OPTION PORTFOLIO RISK MANAGEMENT STRATEGIES

4

So far we have looked at examples of how companies and investors use options. As we have described previously, many options are traded by dealers who make markets in these options, providing liquidity by first taking on risk and then hedging their positions in order to earn the bid–ask spread without taking the risk. In this section, we shall take a look at the strategies dealers use to hedge their positions.[27]

Let us assume that a customer contacts a dealer with an interest in purchasing a call option. The dealer, ready to take either side of the transaction, quotes an acceptable ask price and the customer buys the option. Recall from earlier in this reading that a short position in a call option is a very dangerous strategy, because the potential loss on an upside underlying move is open ended. The dealer would not want to hold a short call position for long. The ideal way to lay off the risk is to find someone else who would take the exact opposite position, but in most cases, the dealer will not be so lucky.[28] Another ideal possibility is for the dealer to lay off the risk using put–call parity. Recall that put–call parity says that $c = p + S - X/(1 + r)^T$. The dealer that has sold a call needs to buy a call to hedge the position. The put–call parity equation means that a long call is equivalent to a long put, a long position in the asset, and issuing a zero-coupon bond with a face value equal to the option exercise price and maturing on the option expiration date. Therefore, if the dealer could buy a put with the same exercise price and expiration, buy the asset, and sell a bond or take out a loan with face value equal to the exercise price and maturity equal to that of the option's expiration, it would have the position hedged. Other than buying an identical call, as described above, this hedge would be the best because it is static: No change to the position is required as time passes.

Unfortunately, neither of these transactions can be commonly employed. The necessary options may not be available or may not be favorably priced. As the next best alternative, dealers **delta hedge** their positions using an available and attractively

27 For over-the-counter options, these dealers are usually the financial institutions that make markets in these options. For exchange-traded options, these dealers are the traders at the options exchanges, who may trade for their own accounts or could represent firms.

28 Even luckier would be the dealer's original customer who might stumble across a party who wanted to sell the call option. The two parties could then bypass the dealer and negotiate a transaction directly between each other, which would save each party half of the bid–ask spread.

priced instrument. The dealer is short the call and will need an offsetting position in another instrument. An obvious offsetting instrument would be a long position of a certain number of units of the underlying. The size of that long position will be related to the option's delta. Let us briefly review delta here. By definition,

$$\text{Delta} = \frac{\text{Change in option price}}{\text{Change in underlying price}}$$

Delta expresses how the option price changes relative to the price of the underlying. Technically, we should use an approximation sign (≈) in the above equation, but for now we shall assume the approximation is exact. Let ΔS be the change in the underlying price and Δc be the change in the option price. Then Delta = $\Delta c/\Delta S$. The delta usually lies between 0.0 and 1.0.[29] Delta will be 1.0 only at expiration and only if the option expires in-the-money. Delta will be 0.0 only at expiration and only if the option expires out-of-the-money. So most of the time, the delta will be between 0.0 and 1.0. Hence, 0.5 is often given as an "average" delta, but one must be careful because even before expiration the delta will tend to be higher than 0.5 if the option is in-the-money.

Now, let us assume that we construct a portfolio consisting of N_S units of the underlying and N_c call options. The value of the portfolio is, therefore,

$$V = N_S S + N_c c$$

The change in the value of the portfolio is

$$\Delta V = N_S \Delta S + N_c \Delta c$$

If we want to hedge the portfolio, then we want the change in V, given a change in S, to be zero. Dividing by ΔS, we obtain

$$\begin{aligned}\frac{\Delta V}{\Delta S} &= N_S \frac{\Delta S}{\Delta S} + N_c \frac{\Delta c}{\Delta S} \\ &= N_S + N_c \frac{\Delta c}{\Delta S}\end{aligned}$$

Setting this result equal to zero and solving for N_c/N_S, we obtain

$$\frac{N_c}{N_S} = -\frac{1}{\Delta c/\Delta S}$$

The ratio of calls to shares has to be the negative of 1 over the delta. Thus, if the dealer sells a given number of calls, say 100, it will need to own 100(Delta) shares.

How does delta hedging work? Let us say that we sell call options on 200 shares (this quantity is 2 standardized call contracts on an options exchange) and the delta is 0.5. We would, therefore, need to hold 200(0.5) = 100 shares. Say the underlying falls by $1. Then we lose $100 on our position in the underlying. If the delta is accurate, the option should decline by $0.50. By having 200 options, the loss in value of the options collectively is $100. Because we are short the options, the loss in value of the options is actually a gain. Hence, the loss on the underlying is offset by the gain on the options. If the dealer were long the option, it would need to sell short the shares.

This illustration may make delta hedging sound simple: Buy (sell) delta shares for each option short (long). But there are three complicating issues. One is that delta is only an approximation of the change in the call price for a change in the underlying. A second issue is that the delta changes if anything else changes. Two factors that change are the price of the underlying and time. When the price of the underlying

29 In the following text, we always make reference to the delta lying between 0.0 and 1.0, which is true for calls. For puts, the delta is between −1.0 and 0.0. It is common, however, to refer to a put delta of −1.0 as just 1.0, in effect using its absolute value and ignoring the negative. In all discussions in this reading, we shall refer to delta as ranging between 1.0 and 0.0, recalling that a put delta would range from −1.0 to 0.0.

changes, delta changes, which affects the number of options required to hedge the underlying. Delta also changes as time changes; because time changes continuously, delta also changes continuously. Although a dealer can establish a delta-hedged position, as soon as anything happens—the underlying price changes or time elapses—the position is no longer delta hedged. In some cases, the position may not be terribly out of line with a delta hedge, but the more the underlying changes, the further the position moves away from being delta hedged. The third issue is that the number of units of the underlying per option must be rounded off, which leads to a small amount of imprecision in the balancing of the two opposing positions.

In the following section, we examine how a dealer delta hedges an option position, carrying the analysis through several days with the additional feature that excess cash will be invested in bonds and any additional cash needed will be borrowed.

4.1 Delta Hedging an Option over Time

In the previous section, we showed how to set up a delta hedge. As we noted, a delta-hedged position will not remain delta hedged over time. The delta will change as the underlying changes and as time elapses. The dealer must account for these effects.

Let us first examine how actual option prices are sensitive to the underlying and what the delta tells us about that sensitivity. Consider a call option in which the underlying is worth 1210, the exercise price is 1200, the continuously compounded risk-free rate is 2.75 percent, the volatility of the underlying is 20 percent, and the expiration is 120 days. There are no dividends or cash flows on the underlying. Substituting these inputs into the Black–Scholes–Merton model, the option is worth 65.88. Recall from our study of the Black–Scholes–Merton model that delta is the term "$N(d_1)$" in the formula and represents a normal probability associated with the value d_1, which is provided as part of the Black–Scholes–Merton formula. In this example, the delta is 0.5826.[30]

Suppose that the underlying price instantaneously changes to 1200, a decline of 10. Using the delta, we would estimate that the option price would be

$$65.88 + (1200 - 1210)(0.5826) = 60.05$$

If, however, we plugged into the Black–Scholes–Merton model the same parameters but with a price of the underlying of 1200, we would obtain a new option price of 60.19—not much different from the previous result. But observe in Exhibit 20 what we obtain for various other values of the underlying. Two patterns become apparent: 1) The further away we move from the current price, the worse the delta-based approximation, and 2) the effects are asymmetric. A given move in one direction does not have the same effect on the option as the same move in the other direction. Specifically, for calls, the delta underestimates the effects of increases in the underlying and overestimates the effects of decreases in the underlying.[31] Because of this characteristic, the delta hedge will not be perfect. The larger the move in the underlying, the worse the hedge. Moreover, whenever the underlying price changes, the delta changes, which requires a rehedging or adjustment to the position. Observe in the last column of the table in Exhibit 20 we have recomputed the delta using the new price of the underlying. A dealer must adjust the position according to this new delta.

30 All calculations were done on a computer for best precision.

31 For puts, delta underestimates the effects of price decreases and overestimates the effects of price increases.

Exhibit 20 Delta and Option Price Sensitivity

S = 1210
X = 1200
r^c = 0.0275 (continuously compounded)
σ = 0.20
T = 0.328767 (based on 120 days/365)
No dividends
c = 65.88 (from the Black–Scholes–Merton model)

New Price of Underlying	Delta-Estimated Call Price[a]	Actual Call Price[b]	Difference (Actual – Estimated)	New Delta
1180	48.40	49.69	1.29	0.4959
1190	54.22	54.79	0.57	0.5252
1200	60.05	60.19	0.14	0.5542
1210	65.88	65.88	0.00	0.5826
1220	71.70	71.84	0.14	0.6104
1230	77.53	78.08	0.55	0.6374
1240	83.35	84.59	1.24	0.6635

[a] Delta-estimated call price = Original call price + (New price of underlying – Original price of underlying)Delta.
[b] Actual call price obtained from Black–Scholes–Merton model using new price of underlying; all other inputs are the same.

Now let us consider the effect of time on the delta. Exhibit 21 shows the delta and the number of units of underlying required to hedge 1,000 short options when the option has 120 days, 119, etc. on down to 108. A critical assumption is that we are holding the underlying price constant. Of course, this constancy would not occur in practice, but to focus on understanding the effect of time on the delta, we must hold the underlying price constant. Observe that the delta changes slowly and the number of units of the underlying required changes gradually over this 12-day period. Another not-so-obvious effect is also present: When we round up, we have more units of the underlying than needed, which has a negative effect that hurts when the underlying goes down. When we round down, we have fewer units of the underlying than needed, which hurts when the underlying goes up.

Exhibit 21 The Effect of Time on the Delta

S = 1210
X = 1200
r^c = 0.0275 (continuously compounded)
σ = 0.20
T = 0.328767 (based on 120 days/365)
No dividends
c = 65.88 (from the Black–Scholes–Merton model)
Delta = 0.5826
Delta hedge 1,000 short options by holding 1,000(0.5826) = 582.6 units of the underlying.

Exhibit 21 (Continued)

Time to Expiration (Days)	Delta	Number of Units of Underlying Required
120	0.5826	582.6
119	0.5825	582.5
118	0.5824	582.4
117	0.5823	582.3
116	0.5822	582.2
115	0.5821	582.1
114	0.5820	582.0
113	0.5819	581.9
112	0.5818	581.8
111	0.5817	581.7
110	0.5816	581.6
109	0.5815	581.5
108	0.5814	581.4

The combined effects of the underlying price changing and the time to expiration changing interact to present great challenges for delta hedgers. Let us set up a delta hedge and work through a few days of it. Recall that for the option we have been working with, the underlying price is $1,210, the option price is $65.88, and the delta is 0.5826. Suppose a customer comes to us and asks to buy calls on 1,000 shares. We need to buy a sufficient number of shares to offset the sale of the 1,000 calls. Because we are short 1,000 calls, and this number is fixed, we need 0.5826 shares per call or about 583 shares. So we buy 583 shares to balance the 1,000 short calls. The value of this portfolio is

583($1,210) – 1,000($65.88) = $639,550

So, to initiate this delta hedge, we would need to invest $639,550. To determine if this hedge is effective, we should see this value grow at the risk-free rate. Because the Black–Scholes–Merton model uses continuously compounded interest, the formula for compounding a value at the risk-free rate for one day is $\exp(r^c/365)$, where r^c is the continuously compounded risk-free rate. One day later, this value should be $639,550 exp(0.0275/365) = $639,598. This value becomes our benchmark.

Now, let us move forward one day and have the underlying go to $1,215. We need a new value of the call option, which now has one less day until expiration and is based on an underlying with a price of $1,215. The market would tell us the option price, but we do not have the luxury here of asking the market for the price. Instead, we have to appeal to a model that would tell us an appropriate price. Naturally, we turn to the Black–Scholes–Merton model. We recalculate the value of the call option using Black–Scholes–Merton, with the price of the underlying at $1,215 and the time to expiration at 119/365 = 0.3260. The option value is $68.55, and the new delta is 0.5966. The portfolio is now worth

583($1,215) – 1,000($68.55) = $639,795

This value differs from the benchmark by a small amount: $639,795 – $639,598 = $197. Although the hedge is not perfect, it is off by only about 0.03 percent.

Now, to move forward and still be delta hedged, we need to revise the position. The new delta is 0.5966. So now we need 1,000(0.5966) = 597 units of the underlying and must buy 14 units of the underlying. This purchase will cost 14($1,215) = $17,010. We obtain this money by borrowing it at the risk-free rate. So we issue bonds in the amount of $17,010. Now our position is 597 units of the underlying, 1,000 short calls, and a loan of $17,010. The value of this position is still

597($1,215) – 1,000($68.55) – $17,010 = $639,795

Of course, this is the same value we had before adjusting the position. We could not expect to generate or lose money just by rearranging our position. As we move forward to the next day, we should see this value grow by one day's interest to $639,795 exp(0.0275/365) = $639,843. This amount is the benchmark for the next day.

Suppose the next day the underlying goes to $1,198, the option goes to 58.54, and its delta goes to 0.5479. Our loan of $17,010 will grow to $17,010 exp(0.0275/365) = $17,011. The new value of the portfolio is

597($1,198) – 1,000($58.54) – $17,011 = $639,655

This amount differs from the benchmark by $639,655 – $639,843 = –$188, an error of about 0.03 percent.

With the new delta at 0.5479, we now need 548 shares. Because we have 597 shares, we now must sell 597 – 548 = 49 shares. Doing so would generate 49($1,198) = $58,702. Because the value of our debt was $17,011 and we now have $58,702 in cash, we can pay back the loan, leaving $58,702 – $17,011 = $41,691 to be invested at the risk-free rate. So now we have 548 units of the underlying, 1,000 short calls, and bonds of $41,691. The value of this position is

548($1,198) – 1,000($58.54) + $41,691 = $639,655

Of course, this is the same value we had before buying the underlying. Indeed, we cannot create or destroy any wealth by just rearranging the position.

Exhibit 22 illustrates the delta hedge, carrying it through one more day. After the third day, the value of the position should be $639,655 exp(0.0275/365) = $639,703. The actual value is $639,870, a difference of $639,870 – $639,703 = $167.

Exhibit 22 Delta Hedge of a Short Options Position

S = $1,210
X = $1,200
r^c = 0.0275 (continuously compounded)
σ = 0.20
T = 0.328767 (based on 120 days/365)
No dividends
c = $65.88 (from the Black–Scholes–Merton model)
Delta = 0.5826
Units of option constant at 1,000
Units of underlying required = 1000 × Delta
Units of underlying purchased = (Units of underlying required one day) – (Units of underlying required previous day)
Bonds purchased = –S(Units of underlying purchased)
Bond balance = (Previous balance) exp(r^c/365) + Bonds purchased
Value of portfolio = (Units of underlying)S + (Units of options)c + Bond balance

Exhibit 22 (Continued)

Day	S	c	Delta	Options Sold	Units of Underlying Required	Units of Underlying Purchased	Value of Bonds Purchased	Bond Balance	Value of Portfolio
0	$1,210	$65.88	0.5826	1,000	583	583	$0	$0	$639,550
1	1,215	68.55	0.5965	1,000	597	14	–17,010	–17,010	639,795
2	1,198	58.54	0.5479	1,000	548	–49	58,702	41,691	639,655
3	1,192	55.04	0.5300	1,000	530	–18	21,456	63,150	639,870

As we can see, the delta hedge is not perfect, but it is pretty good. After three days, we are off by $167, only about 0.03 percent of the benchmark.

In our example and the discussions here, we have noted that the dealer would typically hold a position in the underlying to delta-hedge a position in the option. Trading in the underlying would not, however, always be the preferred hedge vehicle. In fact, we have stated quite strongly that trading in derivatives is often easier and more cost-effective than trading in the underlying. As noted previously, ideally a short position in a particular option would be hedged by holding a long position in that same option, but such a hedge requires that the dealer find another customer or dealer who wants to sell that same option. It is possible, however, that the dealer might be able to more easily buy a different option on the same underlying and use that option as the hedging instrument.

For example, suppose one option has a delta of Δ_1 and the other has a delta of Δ_2. These two options are on the same underlying but are not identical. They differ by exercise price, expiration, or both. Using c_1 and c_2 to represent their prices and N_1 and N_2 to represent the quantity of each option in a portfolio that hedges the value of one of the options, the value of the position is

$$V = N_1c_1 + N_2c_2$$

Dividing by ΔS, we obtain

$$\frac{\Delta V}{\Delta S} = N_1\frac{\Delta c_1}{\Delta S} + N_2\frac{\Delta c_2}{\Delta S}$$

To delta hedge, we set this amount to zero and solve for N_1/N_2 to obtain

$$\frac{N_1}{N_2} = -\frac{\Delta c_2}{\Delta c_1}$$

The negative sign simply means that a long position in one option will require a short position in the other. The desired quantity of Option 1 relative to the quantity of Option 2 is the ratio of the delta of Option 2 to the delta of Option 1. As in the standard delta-hedge example, however, these deltas will change and will require monitoring and modification of the position.[32]

32 Because the position is long one option and short another, whenever the options differ by exercise price, expiration, or both, the position has the characteristics of a spread. In fact, it is commonly called a **ratio spread**.

EXAMPLE 16

DynaTrade is an options trading company that makes markets in a variety of derivative instruments. DynaTrade has just sold 500 call options on a stock currently priced at $125.75. Suppose the trade date is 18 November. The call has an exercise price of $125, 60 days until expiration, a price of $10.89, and a delta of 0.5649. DynaTrade will delta-hedge this transaction by purchasing an appropriate number of shares. Any additional transactions required to adjust the delta hedge will be executed by borrowing or lending at the continuously compounded risk-free rate of 4 percent.

DynaTrade has begun delta hedging the option. Two days later, 20 November, the following information applies:

Stock price	$122.75
Option price	$9.09
Delta	0.5176
Number of options	500
Number of shares	328
Bond balance	–$6,072
Market value	$29,645

A At the end of 19 November, the delta was 0.6564. Based on this number, show how 328 shares of stock is used to delta hedge 500 call options.

B Show the allocation of the $29,645 market value of DynaTrade's total position among stock, options, and bonds on 20 November.

C Show what transactions must be done to adjust the portfolio to be delta hedged for the following day (21 November).

D On 21 November, the stock is worth $120.50 and the call is worth $7.88. Calculate the market value of the delta-hedged portfolio and compare it with a benchmark, based on the market value on 20 November.

Solution to A:

If the stock moves up (down) $1, the 328 shares should change by $328. The 500 calls should change by 500(0.6564) = $328.20, rounded off to $328. The calls are short, so any change in the value of the stock position is an opposite change in the value of the options.

Solution to B:

Stock worth 328($122.75) = $40,262

Options worth –500($9.09) = –$4,545

Bonds worth –$6,072

Total of $29,645

Solution to C:

The new required number of shares is 500(0.5176) = 258.80. Round this number to 259. So we need to have 259 shares instead of 328 shares and must sell 69 shares, generating 69($122.75) = $8,470. We invest this amount in risk-free bonds. We had a bond balance of –$6,072, so the proceeds from the sale will pay off all of this debt, leaving a balance of $8,470 –$6,072 = $2,398 going into the next day. The composition of the portfolio would then be as follows:

Shares worth 259($122.75) = $31,792

Options worth –500($9.09) = –$4,545

Bonds worth $2,398

Total of $29,645

Solution to D:

The benchmark is $29,645 exp(0.04/365) = $29,648. Also, the value of the bond one day later will be $2,398 exp(0.04/365) = $2,398. (This is less than a half-dollar's interest, so it essentially leaves the balance unchanged.) Now we have

Shares worth 259($120.50) = $31,210

Options worth –500($7.88) = –$3,940

Bonds worth $2,398

Total of $29,668

This is about $20 more than the benchmark.

As previously noted, the delta is a fairly good approximation of the change in the option price for a very small and rapid change in the price of the underlying. But the underlying does not always change in such a convenient manner, and this possibility introduces a risk into the process of delta hedging.

Note Exhibit 23, a graph of the actual option price and the delta-estimated option price from the perspective of day 0 in Exhibit 20. At the underlying price of $1,210, the option price is $65.88. The curved line shows the exact option price, calculated with the Black–Scholes–Merton model, for a range of underlying prices. The heavy line shows the option price estimated using the delta as we did in Exhibit 20. In that exhibit, we did not stray too far from the current underlying price. In Exhibit 23, we let the underlying move a little further. Note that the further we move from the current price of the underlying of $1,210, the further the heavy line deviates from the solid line. As noted earlier, the actual call price moves up more than the delta approximation and moves down less than the delta approximation. This effect occurs because the option price is convex with respect to the underlying price. This convexity, which is quite similar to the convexity of a bond price with respect to its yield, means that a first-order price sensitivity measure like delta, or its duration analog for bonds, is accurate only if the underlying moves by a small amount. With duration, a second-order measure called convexity reflects the extent of the deviation of the actual pricing curve from the approximation curve. With options, the second-order measure is called **gamma**.

Exhibit 23 Actual Option Price and Delta-Estimated Option Price

4.2 Gamma and the Risk of Delta

A gamma is a measure of several effects. It reflects the deviation of the exact option price change from the price change as approximated by the delta. It also measures the sensitivity of delta to a change in the underlying. In effect, it is the delta of the delta. Specifically,

$$\text{Gamma} = \frac{\text{Change in delta}}{\text{Change in underlying price}}$$

Like delta, gamma is actually an approximation, but we shall treat it as exact. Although a formula exists for gamma, we need to understand only the concept.

If a delta-hedged position were risk free, its gamma would be zero. The larger the gamma, the more the delta-hedged position deviates from being risk free. Because gamma reflects movements in the delta, let us first think about how delta moves. Focusing on call options, recall that the delta is between 0.0 and 1.0. At expiration, the delta is 1.0 if the option expires in-the-money and 0.0 if it expires out-of-the-money. During its life, the delta will tend to be above 0.5 if the option is in-the-money and below 0.5 if the option is out-of-the-money. As expiration approaches, the deltas of in-the-money options will move toward 1.0 and the deltas of out-of-the-money options will move toward 0.0.[33] They will, however, move slowly in their respective directions. The largest moves occur near expiration, when the deltas of at-the-money options move quickly toward 1.0 or 0.0. These rapid movements are the ones that cause the most problems for delta hedgers. Options that are deep in-the-money or deep out-of-the-money tend to have their deltas move closer to 1.0 or 0.0 well before expiration. Their movements are slow and pose fewer problems for delta hedgers. Thus, it is the

33 The deltas of options that are very slightly in-the-money will temporarily move down as expiration approaches. Exhibit 21 illustrates this effect. But they will eventually move up toward 1.0.

rapid movements in delta that concern delta hedgers. These rapid movements are more likely to occur on options that are at-the-money and/or near expiration. Under these conditions, the gammas tend to be largest and delta hedges are hardest to maintain.

When gammas are large, some delta hedgers choose to also gamma hedge. This somewhat advanced strategy requires adding a position in another option, combining the underlying and the two options in such a manner that the delta is zero and the gamma is zero. Because it is a somewhat advanced and specialized topic, we do not cover the details of how this is done.

The delta is not the only important factor that changes in the course of managing an option position. The volatility of the underlying can also change.

4.3 Vega and Volatility Risk

The sensitivity of the option price to the volatility is called the vega and is defined as

$$\text{Vega} = \frac{\text{Change in option price}}{\text{Change in volatility}}$$

As with delta and gamma, the relationship above is an approximation, but we shall treat it as exact. An option price is very sensitive to the volatility of the underlying. Moreover, the volatility is the only unobservable variable required to value an option. Hence, volatility is the most critical variable. When we examined option-pricing models, we studied the Black–Scholes–Merton and binomial models. In neither of these models is the volatility allowed to change. Yet no one believes that volatility is constant; on some days the stock market is clearly more volatile than on other days. This risk of changing volatility can greatly affect a dealer's position in options. A delta-hedged position with a zero or insignificant gamma can greatly change in value if the volatility changes. If, for example, the dealer holds the underlying and sells options to delta hedge, an increase in volatility will raise the value of the options, generating a potentially large loss for the dealer.

Measuring the sensitivity of the option price to the volatility is difficult. The vega from the Black–Scholes–Merton or binomial models is a somewhat artificial construction. It represents how much the model price changes if one changes the volatility by a small amount. But in fact, the model itself is based on the assumption that volatility does not change. Forcing the volatility to change in a model that does not acknowledge that volatility can change has unclear implications.[34] It is clear, however, that an option price is more sensitive to the volatility when it is at-the-money.

Dealers try to measure the vega, monitor it, and in some cases hedge it by taking on a position in another option, using that option's vega to offset the vega on the original option. Managing vega risk, however, cannot be done independently of managing delta and gamma risk. Thus, the dealer is required to jointly monitor and manage the risk associated with the delta, gamma, and vega. We should be aware of the concepts behind managing these risks.

34 If this point seems confusing, consider this analogy. In the famous Einstein equation $E = mc^2$, E is energy, m is mass, and c is the constant representing the speed of light. For a given mass, we could change c, which would change E. The equation allows this change, but in fact the speed of light is constant at 186,000 miles per second. So far as scientists know, it is a universal constant and can never change. In the case of option valuation, the model assumes that volatility of a given stock is like a universal constant. We can change it, however, and the equation would give us a new option price. But are we allowed to do so? Unlike the speed of light, volatility does indeed change, even though our model says that it does not. What happens when we change volatility in our model? We do not know.

5 FINAL COMMENTS

In the reading on risk management applications of forward and futures strategies, we examined forward and futures strategies. These types of contracts provide gains from movements of the underlying in one direction but result in losses from movements of the underlying in the other direction. The advantage of a willingness to incur losses is that no cash is paid at the start. Options offer the advantage of having one-directional effects: The buyer of an option gains from a movement in one direction and loses only the premium from movements in the other direction. The cost of this advantage is that options require the payment of cash at the start. Some market participants choose forwards and futures because they do not have to pay cash at the start. They can justify taking positions without having to come up with the cash to do so. Others, however, prefer the flexibility to benefit when their predictions are right and suffer only a limited loss when wrong. The trade-off between the willingness to pay cash at the start versus incurring losses, given one's risk preferences, is the deciding factor in whether to use options or forwards/futures.

All option strategies are essentially rooted in the transactions of buying a call or a put. Understanding a short position in either type of option means understanding the corresponding long position in the option. All remaining strategies are just combinations of options, the underlying, and risk-free bonds. We looked at a number of option strategies associated with equities, which can apply about equally to index options or options on individual stocks. The applicability of these strategies to bonds is also fairly straightforward. The options must expire before the bonds mature, but the general concepts associated with equity option strategies apply similarly to bond option strategies.

Likewise, strategies that apply to equity options apply in nearly the same manner to interest rate options. Nonetheless, significant differences exist between interest rate options and equity or bond options. If nothing else, the notion of bullishness is quite opposite. Bullish (bearish) equity investors buy calls (puts). In interest rate markets, bullish (bearish) investors buy puts (calls) on interest rates, because being bullish (bearish) on interest rates means that one thinks rates are going down (up). Interest rate options pay off as though they were interest payments. Equity or bond options pay off as though the holder were selling or buying stocks or bonds. Finally, interest rate options are very often combined into portfolios in the form of caps and floors for the purpose of hedging floating-rate loans. Standard option strategies such as straddles and spreads are just as applicable to interest rate options.

Despite some subtle differences between the option strategies examined in this reading and comparable strategies using options on futures, the differences are relatively minor and do not warrant separate coverage here. If you have a good grasp of the basics of the option strategies presented in this reading, you can easily adapt those strategies to ones in which the underlying is a futures contract.

In the reading on risk management applications of swap strategies, we take up strategies using swaps. As we have so often mentioned, interest rate swaps are the most widely used financial derivative. They are less widely used with currencies and equities than are forwards, futures, and options. Nonetheless, there are many applications of swaps to currencies and equities, and we shall certainly look at them. To examine swaps, however, we must return to the types of instruments with two-directional payoffs and no cash payments at the start. Indeed, swaps are a lot like forward contracts, which themselves are a lot like futures.

SUMMARY

OPTIONAL SEGMENT

- The profit from buying a call is the value at expiration, $\max(0,S_T - X)$, minus c_0, the option premium. The maximum profit is infinite, and the maximum loss is the option premium. The breakeven underlying price at expiration is the exercise price plus the option premium. When one sells a call, these results are reversed.
- The profit from buying a put is the value at expiration, $\max(0,X - S_T)$, minus p_0, the option premium. The maximum profit is the exercise price minus the option premium, and the maximum loss is the option premium. The breakeven underlying price at expiration is the exercise price minus the option premium. When one sells a put, these results are reversed.

END OPTIONAL SEGMENT

- The profit from a covered call—the purchase of the underlying and sale of a call—is the value at expiration, $S_T - \max(0,S_T - X)$, minus $(S_0 - c_0)$, the cost of the underlying minus the option premium. The maximum profit is the exercise price minus the original underlying price plus the option premium, and the maximum loss is the cost of the underlying less the option premium. The breakeven underlying price at expiration is the original price of the underlying minus the option premium.
- The profit from a protective put—the purchase of the underlying and a put—is the value at expiration, $S_T + \max(0,X - S_T)$, minus the cost of the underlying plus the option premium, $(S_0 + p_0)$. The maximum profit is infinite, and the maximum loss is the cost of the underlying plus the option premium minus the exercise price. The breakeven underlying price at expiration is the original price of the underlying plus the option premium.
- The profit from a bull spread—the purchase of a call at one exercise price and the sale of a call with the same expiration but a higher exercise price—is the value at expiration, $\max(0,S_T - X_1) - \max(0,S_T - X_2)$, minus the net premium, $c_1 - c_2$, which is the premium of the long option minus the premium of the short option. The maximum profit is $X_2 - X_1$ minus the net premium, and the maximum loss is the net premium. The breakeven underlying price at expiration is the lower exercise price plus the net premium.
- The profit from a bear spread—the purchase of a put at one exercise price and the sale of a put with the same expiration but a lower exercise price—is the value at expiration, $\max(0,X_2 - S_T) - \max(0,X_1 - S_T)$, minus the net premium, $p_2 - p_1$, which is the premium of the long option minus the premium of the short option. The maximum profit is $X_2 - X_1$ minus the net premium, and the maximum loss is the net premium. The breakeven underlying price at expiration is the higher exercise price minus the net premium.
- The profit from a butterfly spread—the purchase of a call at one exercise price, X_1, sale of two calls at a higher exercise price, X_2, and the purchase of a call at a higher exercise price, X_3—is the value at expiration, $\max(0,S_T - X_1) - 2\max(0,S_T - X_2), + \max(0,S_T - X_3)$, minus the net premium, $c_1 - 2c_2 + c_3$. The maximum profit is $X_2 - X_1$ minus the net premium, and the maximum loss is the net premium. The breakeven underlying prices at expiration are $2X_2 - X_1$ minus the net premium and X_1 plus the net premium. A butterfly spread can also be constructed by trading the corresponding put options.
- The profit from a collar—the holding of the underlying, the purchase of a put at one exercise price, X_1, and the sale of a call with the same expiration and a higher exercise price, X_2, and in which the premium on the put equals the premium on the call—is the value at expiration, $S_T + \max(0,X_1 - S_T) - \max(0,S_T$

– X_2), minus S_0, the original price of the underlying. The maximum profit is $X_2 - S_0$, and the maximum loss is $S_0 - X_1$. The breakeven underlying price at expiration is the initial price of the underlying.

- The profit from a straddle—a long position in a call and a put with the same exercise price and expiration—is the value at expiration, $\max(0,S_T - X) + \max(0,X - S_T)$, minus the premiums on the call and put, $c_0 + p_0$. The maximum profit is infinite, and the maximum loss is the sum of the premiums on the call and put, $c_0 + p_0$. The breakeven prices at expiration are the exercise price plus and minus the premiums on the call and put.
- A box spread is a combination of a bull spread using calls and a bear spread using puts, with one call and put at an exercise price of X_1 and another call and put at an exercise price of X_2. The profit is the value at expiration, $X_2 - X_1$, minus the net premiums, $c_1 - c_2 + p_2 - p_1$. The transaction is risk free, and the net premium paid should be the present value of this risk-free payoff.
- A long position in an interest rate call can be used to place a ceiling on the rate on an anticipated loan from the perspective of the borrower. The call provides a payoff if the interest rate at expiration exceeds the exercise rate, thereby compensating the borrower when the rate is higher than the exercise rate. The effective interest paid on the loan is the actual interest paid minus the call payoff. The call premium must be taken into account by compounding it to the date on which the loan is taken out and deducting it from the initial proceeds received from the loan.
- A long position in an interest rate put can be used to lock in the rate on an anticipated loan from the perspective of the lender. The put provides a payoff if the interest rate at expiration is less than the exercise rate, thereby compensating the lender when the rate is lower than the exercise rate. The effective interest paid on the loan is the actual interest received plus the put payoff. The put premium must be taken into account by compounding it to the date on which the loan is taken out and adding it to initial proceeds paid out on the loan.
- An interest rate cap can be used to place an upper limit on the interest paid on a floating-rate loan from the perspective of the borrower. A cap is a series of interest rate calls, each of which is referred to as a caplet. Each caplet provides a payoff if the interest rate on the loan reset date exceeds the exercise rate, thereby compensating the borrower when the rate is higher than the exercise rate. The effective interest paid is the actual interest paid minus the caplet payoff. The premium is paid at the start and is the sum of the premiums on the component caplets.
- An interest rate floor can be used to place a lower limit on the interest received on a floating-rate loan from the perspective of the lender. A floor is a series of interest rate puts, each of which is called a floorlet. Each floorlet provides a payoff if the interest rate at the loan reset date is less than the exercise rate, thereby compensating the lender when the rate is lower than the exercise rate. The effective interest received is the actual interest plus the floorlet payoff. The premium is paid at the start and is the sum of the premiums on the component floorlets.
- An interest rate collar, which consists of a long interest rate cap at one exercise rate and a short interest rate floor at a lower exercise rate, can be used to place an upper limit on the interest paid on a floating-rate loan. The floor, however, places a lower limit on the interest paid on the floating-rate loan. Typically the floor exercise rate is set such that the premium on the floor equals the premium

on the cap, so that no cash outlay is required to initiate the transaction. The effective interest is the actual interest paid minus any payoff from the long caplet plus any payoff from the short floorlet.

- Dealers offer to take positions in options and typically hedge their positions by establishing delta-neutral combinations of options and the underlying or other options. These positions require that the sensitivity of the option position with respect to the underlying be offset by a quantity of the underlying or another option. The delta will change, moving toward 1.0 for in-the-money calls (–1.0 for puts) and 0.0 for out-of-the-money options as expiration approaches. Any change in the underlying price will also change the delta. These changes in the delta necessitate buying and selling options or the underlying to maintain the delta-hedged position. Any additional funds required to buy the underlying or other options are obtained by issuing risk-free bonds. Any additional funds released from selling the underlying or other options are invested in risk-free bonds.
- The delta of an option changes as the underlying changes and as time elapses. The delta will change more rapidly with large movements in the underlying and when the option is approximately at-the-money and near expiration. These large changes in the delta will prevent a delta-hedged position from being truly risk free. Dealers usually monitor their gammas and in some cases hedge their gammas by adding other options to their positions such that the gammas offset.
- The sensitivity of an option to volatility is called the vega. An option's volatility can change, resulting in a potentially large change in the value of the option. Dealers monitor and sometimes hedge their vegas so that this risk does not impact a delta-hedged portfolio.

PRACTICE PROBLEMS

1 You are bullish about an underlying that is currently trading at a price of $80. You choose to go long one call option on the underlying with an exercise price of $75 and selling at $10, and go short one call option on the underlying with an exercise price of $85 and selling at $2. Both the calls expire in three months.

A What is the term commonly used for the position that you have taken?

B Determine the value at expiration and the profit for your strategy under the following outcomes:

i. The price of the underlying at expiration is $89.

ii. The price of the underlying at expiration is $78.

iii. The price of the underlying at expiration is $70.

C Determine the following:

i. the maximum profit.

ii. the maximum loss.

D Determine the breakeven underlying price at expiration of the call options.

E Verify that your answer to Part D above is correct.

2 You expect a currency to depreciate with respect to the US dollar. The currency is currently trading at a price of $0.75. You decide to go long one put option on the currency with an exercise price of $0.85 and selling at $0.15, and go short one put option on the currency with an exercise price of $0.70 and selling at $0.03. Both the puts expire in three months.

A What is the term commonly used for the position that you have taken?

B Determine the value at expiration and the profit for your strategy under the following outcomes:

i. The price of the currency at expiration is $0.87.

ii. The price of the currency at expiration is $0.78.

iii. The price of the currency at expiration is $0.68.

C Determine the following:

i. the maximum profit.

ii. the maximum loss.

D Determine the breakeven underlying price at the expiration of the put options.

E Verify that your answer to Part D above is correct.

3 A stock is currently trading at a price of $114. You construct a butterfly spread using calls of three different strike prices on this stock, with the calls expiring at the same time. You go long one call with an exercise price of $110 and selling at $8, go short two calls with an exercise price of $115 and selling at $5, and go long one call with an exercise price of $120 and selling at $3.

A Determine the value at expiration and the profit for your strategy under the following outcomes:

i. The price of the stock at the expiration of the calls is $106.

ii. The price of the stock at the expiration of the calls is $110.

iii. The price of the stock at the expiration of the calls is $115.

Practice Problems and Solutions: *Analysis of Derivatives for the Chartered Financial Analyst® Program*, by Don M. Chance, CFA. © 2003 CFA Institute. All rights reserved.

iv. The price of the stock at the expiration of the calls is $120.

v. The price of the stock at the expiration of the calls is $123.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

iii. the stock price at which you would realize the maximum profit.

iv. the stock price at which you would incur the maximum loss.

C Determine the breakeven underlying price at expiration of the call options.

4 A stock is currently trading at a price of $114. You construct a butterfly spread using puts of three different strike prices on this stock, with the puts expiring at the same time. You go long one put with an exercise price of $110 and selling at $3.50, go short two puts with an exercise price of $115 and selling at $6, and go long one put with an exercise price of $120 and selling at $9.

A Determine the value at expiration and the profit for your strategy under the following outcomes:

i. The price of the stock at the expiration of the puts is $106.

ii. The price of the stock at the expiration of the puts is $110.

iii. The price of the stock at the expiration of the puts is $115.

iv. The price of the stock at the expiration of the puts is $120.

v. The price of the stock at the expiration of the puts is $123.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

iii. the stock price at which you would realize the maximum profit.

iv. the stock price at which you would incur the maximum loss.

C Determine the breakeven underlying price at expiration of the put options.

D Verify that your answer to Part C above is correct.

5 A stock is currently trading at a price of $80. You decide to place a collar on this stock. You purchase a put option on the stock, with an exercise price of $75 and a premium of $3.50. You simultaneously sell a call option on the stock with the same maturity and the same premium as the put option. This call option has an exercise price of $90.

A Determine the value at expiration and the profit for your strategy under the following outcomes:

i. The price of the stock at expiration of the options is $92.

ii. The price of the stock at expiration of the options is $90.

iii. The price of the stock at expiration of the options is $82.

iv. The price of the stock at expiration of the options is $75.

v. The price of the stock at expiration of the options is $70.

B Determine the following:

i. the maximum profit.

ii. the maximum loss.

iii. the stock price at which you would realize the maximum profit.

iv. the stock price at which you would incur the maximum loss.

C Determine the breakeven underlying price at expiration of the put options.

6 You believe that the market will be volatile in the near future, but you do not feel particularly strongly about the direction of the movement. With this expectation, you decide to buy both a call and a put with the same exercise price and the same expiration on the same underlying stock trading at $28. You buy one call option and one put option on this stock, both with an exercise price of $25. The premium on the call is $4 and the premium on the put is $1.

A What is the term commonly used for the position that you have taken?

B Determine the value at expiration and the profit for your strategy under the following outcomes:

i. The price of the stock at expiration is $35.

ii. The price of the stock at expiration is $29.

iii. The price of the stock at expiration is $25.

iv. The price of the stock at expiration is $20.

v. The price of the stock at expiration is $15.

C Determine the following:

i. the maximum profit.

ii. the maximum loss.

D Determine the breakeven stock price at expiration of the options.

The following information relates to Questions 7–12

Stanley Singh, CFA, is the risk manager at SS Asset Management. Singh works with individual clients to manage their investment portfolios. One client, Sherman Hopewell, is worried about how short-term market fluctuations over the next three months might impact his equity position in Walnut Corporation. While Hopewell is concerned about short-term downside price movements, he wants to remain invested in Walnut shares as he remains positive about its long-term performance. Hopewell has asked Singh to recommend an option strategy that will keep him invested in Walnut shares while protecting against a short-term price decline. Singh gathers the information in Exhibit 1 to explore various strategies to address Hopewell's concerns.

Another client, Nigel French, is a trader who does not currently own shares of Walnut Corporation. French has told Singh that he believes that Walnut shares will experience a large move in price after the upcoming quarterly earnings release in two weeks. However, French tells Singh he is unsure which direction the stock will move. French asks Singh to recommend an option strategy that would allow him to profit should the share price move in either direction.

A third client, Wanda Tills, does not currently owns Walnut shares and has asked Singh to explain the profit potential of three strategies using options in Walnut: a bull call spread, a straddle and a butterfly spread. In addition, Tills asks Singh to explain the gamma of a call option. In response, Singh prepares a memo to be shared with Tills that provides a discussion of gamma and presents his analysis on three option strategies:

Strategy 1: A straddle position at the $67.50 strike option

Strategy 2: A bull call spread using the $65 and $70 strike options

Strategy 3: A butterfly spread using the $65, $67.50, and $70 strike call options

Exhibit 1 Walnut Corporation Current Stock Price: $67.79
Walnut Corporation European Options

Exercise Price	Market Call Price	Call Delta	Market Put Price	Put Delta
$55.00	$12.83	4.7	$0.24	–16.7
$65.00	$3.65	12.0	$1.34	–16.9
$67.50	$1.99	16.5	$2.26	–15.3
$70.00	$0.91	22.2	$3.70	–12.9
$80.00	$0.03	35.8	$12.95	–5.0

Note: Each option has 106 days remaining until expiration.

7 The option strategy Singh is *most likely* to recommend to Hopewell is a:

A collar.

B covered call.

C protective put.

8 The option strategy that Singh is *most likely* to recommend to French is a:

A straddle.

B butterfly.

C box spread.

9 Based upon Exhibit 1, Strategy 1 is profitable when the share price at expiration is *closest* to:

A $63.24.

B $65.24.

C $69.49.

10 Based upon Exhibit 1, the maximum profit, on a per share basis, from investing in Strategy 2, is *closest* to:

A $2.26.

B $2.74.

C $5.00.

11 Based upon Exhibit 1, and assuming the market price of Walnut's shares at expiration is $66, the profit or loss, on a per share basis, from investing in Strategy 3, is *closest* to:

A –$1.57.

B $0.42.

C $1.00.

12 Based on the data in Exhibit 1, Singh would advise Tills that the call option with the *largest* gamma would have a strike price *closest* to:

A $ 55.

B $ 67.50.

C $ 80.

SOLUTIONS

1 A This position is commonly called a bull spread.

B Let X_1 be the lower of the two strike prices and X_2 be the higher of the two strike prices.

i. $V_T = \max(0, S_T - X_1) - \max(0, S_T - X_2)$

$= \max(0, 89 - 75) - \max(0, 89 - 85) = 14 - 4 = 10$

$\Pi = V_T - V_0 = V_T - (c_1 - c_2) = 10 - (10 - 2) = 2$

ii. $V_T = \max(0, S_T - X_1) - \max(0, S_T - X_2)$

$= \max(0, 78 - 75) - \max(0, 78 - 85) = 3 - 0 = 3$

$\Pi = V_T - V_0 = V_T - (c_1 - c_2) = 3 - (10 - 2) = -5$

iii. $V_T = \max(0, S_T - X_1) - \max(0, S_T - X_2)$

$= \max(0, 70 - 75) - \max(0, 70 - 85) = 0 - 0 = 0$

$\Pi = V_T - V_0 = V_T - (c_1 - c_2) = 0 - (10 - 2) = -8$

C **i.** Maximum profit $= X_2 - X_1 - (c_1 - c_2) = 85 - 75 - (10 - 2) = 2$

ii. Maximum loss $= c_1 - c_2 = 10 - 2 = 8$

D $S_T^* = X_1 + (c_1 - c_2) = 75 + (10 - 2) = 83$

E $V_T = \max(0, S_T - X_1) - \max(0, S_T - X_2)$

$= \max(0, 83 - 75) - \max(0, 83 - 85) = 8 - 0 = 8$

$\Pi = V_T - V_0 = V_T - (c_1 - c_2) = 8 - (10 - 2) = 0$

Therefore, the profit or loss if the price of the underlying increases to 83 at expiration is indeed zero.

2 A This position is commonly called a bear spread.

B Let X_1 be the lower of the two strike prices and X_2 be the higher of the two strike prices.

i. $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 0.85 - 0.87) - \max(0, 0.70 - 0.87) = 0 - 0 = 0$

$\Pi = V_T - V_0 = V_T - (p_2 - p_1) = 0 - (0.15 - 0.03) = -0.12$

ii. $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 0.85 - 0.78) - \max(0, 0.70 - 0.78) = 0.07 - 0 = 0.07$

$\Pi = V_T - V_0 = V_T - (p_2 - p_1) = 0.07 - (0.15 - 0.03) = -0.05$

iii. $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 0.85 - 0.68) - \max(0, 0.70 - 0.68) = 0.17 - 0.02 = 0.15$

$\Pi = V_T - V_0 = V_T - (p_2 - p_1) = 0.15 - (0.15 - 0.03) = 0.03$

C **i.** Maximum profit $= X_2 - X_1 - (p_2 - p_1)$

$= 0.85 - 0.70 - (0.15 - 0.03) = 0.03$

ii. Maximum loss $= p_2 - p_1 = 0.15 - 0.03 = 0.12$

D Breakeven point $= X_2 - (p_2 - p_1) = 0.85 - (0.15 - 0.03) = 0.73$

E $V_T = \max(0, X_2 - S_T) - \max(0, X_1 - S_T)$

$= \max(0, 0.85 - 0.73) - \max(0, 0.70 - 0.73) = 0.12 - 0 = 0.12$

$\Pi = V_T - V_0 = V_T - (p_2 - p_1) = 0.12 - (0.15 - 0.03) = 0$

Therefore, the profit or loss if the price of the currency decreases to \$0.73 at expiration of the puts is indeed zero.

3 A Let X_1 be 110, X_2 be 115, and X_3 be 120.

$$V_0 = c_1 - 2c_2 + c_3 = 8 - 2(5) + 3 = 1$$

i. $V_T = \max(0, S_T - X_1) - 2\max(0, S_T - X_2) + \max(0, S_T - X_3)$

$V_T = \max(0, 106 - 110) - 2\max(0, 106 - 115)$

$\quad + \max(0, 106 - 120) = 0$

$\Pi = V_T - V_0 = 0 - 1 = -1$

ii. $V_T = \max(0, S_T - X_1) - 2\max(0, S_T - X_2) + \max(0, S_T - X_3)$

$V_T = \max(0, 110 - 110) - 2\max(0, 110 - 115)$

$\quad + \max(0, 110 - 120) = 0$

$\Pi = V_T - V_0 = 0 - 1 = -1$

iii. $V_T = \max(0, S_T - X_1) - 2\max(0, S_T - X_2) + \max(0, S_T - X_3)$

$V_T = \max(0, 115 - 110) - 2\max(0, 115 - 115)$

$\quad + \max(0, 115 - 120) = 5$

$\Pi = V_T - V_0 = 5 - 1 = 4$

iv. $V_T = \max(0, S_T - X_1) - 2\max(0, S_T - X_2) + \max(0, S_T - X_3)$

$V_T = \max(0, 120 - 110) - 2\max(0, 120 - 115)$

$\quad + \max(0, 120 - 120) = 10 - 10 + 0 = 0$

$\Pi = V_T - V_0 = 0 - 1 = -1$

v. $V_T = \max(0, S_T - X_1) - 2\max(0, S_T - X_2) + \max(0, S_T - X_3)$

$V_T = \max(0, 123 - 110) - 2\max(0, 123 - 115)$

$\quad + \max(0, 123 - 120) = 13 - 16 + 3 = 0$

$\Pi = V_T - V_0 = 0 - 1 = -1$

B **i.** Maximum profit = $X_2 - X_1 - (c_1 - 2c_2 + c_3) = 115 - 110 - 1 = 4$

ii. Maximum loss = $c_1 - 2c_2 + c_3 = 1$

iii. The maximum profit would be realized if the price of the stock at expiration of the options is at the exercise price of $115.

iv. The maximum loss would be incurred if the price of the stock is at or below the exercise price of $110, or if the price of the stock is at or above the exercise price of $120.

C Breakeven: $S_T^* = X_1 + (c_1 - 2c_2 + c_3)$ and $S_T^* = 2X_2 - X_1 - (c_1 - 2c_2 + c_3)$. So, $S_T^* = 110 + 1 = 111$ and $S_T^* = 2(115) - 110 - 1 = 119$

4 A Let X_1 be 110, X_2 be 115, and X_3 be 120.

$$V_0 = p_1 - 2p_2 + p_3 = 3.50 - 2(6) + 9 = 0.50$$

i. $V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 106) - 2\max(0, 115 - 106)$

$\quad + \max(0, 120 - 106) = 4 - 2(9) + 14 = 0$

$\Pi = V_T - V_0 = 0 - 0.50 = -0.50$

ii. $V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 110) - 2\max(0, 115 - 110)$

$\quad + \max(0, 120 - 110) = 0 - 2(5) + 10 = 0$

$\Pi = V_T - V_0 = 0 - 0.50 = -0.50$

iii. $V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 115) - 2\max(0, 115 - 115)$

$+ \max(0, 120 - 115) = 0 - 2(0) + 5 = 5$

$\Pi = V_T - V_0 = 5 - 0.50 = 4.50$

iv. $V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 120) - 2\max(0, 115 - 120)$

$+ \max(0, 120 - 120) = 0$

$\Pi = V_T - V_0 = 0 - 0.50 = -0.50$

v. $V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 123) - 2\max(0, 115 - 123)$

$+ \max(0, 120 - 123) = 0$

$\Pi = V_T - V_0 = 0 - 0.50 = -0.50$

B **i.** Maximum profit = $X_2 - X_1 - (p_1 - 2p_2 + p_3) = 115 - 110 - 0.50 = 4.50$

ii. Maximum loss = $p_1 - 2p_2 + p_3 = 0.50$

iii. The maximum profit would be realized if the expiration price of the stock is at the exercise price of $115.

iv. The maximum loss would be incurred if the expiration price of the stock is at or below the exercise price of $110, or if the expiration price of the stock is at or above the exercise price of $120.

C Breakeven: $S_T^* = X_1 + (p_1 - 2p_2 + p_3)$ and $S_T^* = 2X_2 - X_1 - (p_1 - 2p_2 + p_3)$. So, $ST^* = 110 + 0.50 = 110.50$ and $S_T^* = 2(115) - 110 - 0.50 = 119.50$.

D For $S_T = 110.50$:

$V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 110.50) - 2\max(0, 115 - 110.50) + \max(0, 120 - 110.50)$

$= -2(4.50) + 9.50 = 0.50$

$\Pi = V_T - V_0 = 0.50 - 0.50 = 0$

For $S_T = 119.50$:

$V_T = \max(0, X_1 - S_T) - 2\max(0, X_2 - S_T) + \max(0, X_3 - S_T)$

$V_T = \max(0, 110 - 119.50) - 2\max(0, 115 - 119.50) + \max(0, 120 - 119.50) = 0.50$

$\Pi = V_T - V_0 = 0.50 - 0.50 = 0$

Therefore, we see that the profit or loss at the breakeven points computed in Part D above is indeed zero.

5 A **i.** $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 92 + \max(0, 75 - 92) - \max(0, 92 - 90) = 92 + 0 - 2 = 90$

$\Pi = V_T - S_0 = 90 - 80 = 10$

ii. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 90 + \max(0, 75 - 90) - \max(0, 90 - 90) = 90 + 0 - 0 = 90$

$\Pi = V_T - S_0 = 90 - 80 = 10$

iii. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 82 + \max(0, 75 - 82) - \max(0, 82 - 90) = 82 + 0 - 0 = 82$

$\Pi = V_T - S_0 = 82 - 80 = 2$

iv. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 75 + \max(0, 75 - 75) - \max(0, 75 - 90) = 75 + 0 - 0 = 75$

$\Pi = V_T - S_0 = 75 - 80 = -5$

v. $V_T = S_T + \max(0, X_1 - S_T) - \max(0, S_T - X_2)$

$= 70 + \max(0, 75 - 70) - \max(0, 70 - 90) = 70 + 5 - 0 = 75$

$\Pi = V_T - S_0 = 75 - 80 = -5$

B **i.** Maximum profit = $X_2 - S_0 = 90 - 80 = 10$

ii. Maximum loss = $-(X_1 - S_0) = -(75 - 80) = 5$

iii. The maximum profit would be realized if the price of the stock at the expiration of options is at or above the exercise price of $90.

iv. The maximum loss would be incurred if the price of the stock at the expiration of options were at or below the exercise price of $75.

C Breakeven: $S_T^* = S_0 = 80$

6 **A** This position is commonly called a straddle.

B **i.** $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 35 - 25) + \max(0, 25 - 35) = 10 + 0 = 10$

$\Pi = V_T - (c_0 + p_0) = 10 - (4 + 1) = 5$

ii. $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 29 - 25) + \max(0, 25 - 29) = 4 + 0 = 4$

$\Pi = V_T - (c_0 + p_0) = 4 - (4 + 1) = -1$

iii. $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 25 - 25) + \max(0, 25 - 25) = 0 + 0 = 0$

$\Pi = V_T - (c_0 + p_0) = 0 - (4 + 1) = -5$

iv. $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 20 - 25) + \max(0, 25 - 20) = 0 + 5 = 5$

$\Pi = V_T - (c_0 + p_0) = 5 - (4 + 1) = 0$

v. $V_T = \max(0, S_T - X) + \max(0, X - S_T)$

$= \max(0, 15 - 25) + \max(0, 25 - 15) = 0 + 10 = 10$

$\Pi = V_T - (c_0 + p_0) = 10 - (4 + 1) = 5$

C **i.** Maximum profit = ∞

ii. Maximum loss = $c_0 + p_0 = 4 + 1 = 5$

D $S_T^* = X \pm (c_0 + p_0) = 25 \pm (4 + 1) = 30, 20$

7 C is correct. A protective put accomplishes Hopewell's goal of short-term price protection. A protective put provides downside protection while retaining the upside potential. While Hopewell is concerned about the downside in the short-term, he wants to remain invested in Walnut shares, as he is positive about the stock in the long-term.

8 A is correct. The straddle strategy is a strategy based upon the expectation of high volatility in the underlying stock. The straddle strategy consists of simultaneously buying a call option and a put option at the same strike price. Singh could recommend that French buy a straddle using near at-the-money options ($67.50 strike). This allows French to profit should Walnut stock price experience a large move in either direction after the earnings release.

9 A is correct. The straddle strategy consists of simultaneously buying a call option and buying a put option at the same strike price. The market price for the $67.50 call option is $1.99, and the market price for the $67.50 put option is $2.26, for an initial net cost of $4.25 per share. Thus, this straddle position requires a move greater than $4.25 in either direction from the strike price of $67.50 to become profitable. So, the straddle becomes profitable at $67.50 – $4.26 = $63.24 or lower, or $67.50 + $4.26 = $71.76 or higher. At $63.24, the profit on the straddle is positive.

10 A is correct. The bull call strategy consists of buying the lower strike option, and selling the higher strike option. The purchase of the $65 strike call option costs $3.65 per share, and selling the $70 strike call option generates an inflow of $0.91 per share, for an initial net cost of $2.74 per share. At expiration, the maximum profit occurs when the stock price is $70 or higher, which yields a $5.00 per share payoff ($70 – 65). After deduction of the $2.74 per share cost required to initiate the bull call spread, the profit is $2.26 ($5.00 – $2.74).

11 B is correct. The butterfly strategy consists of buying a call option with a low strike price ($65), selling 2 call options with a higher strike price ($67.50), and buying another call option with an even higher strike price ($70). The market price for the $65 call option is $3.65 per share, the market price for the $70 call option is $0.91 per share, and selling the two call options generates an inflow of $3.98 per share (market price of $1.99 per share × 2 contracts). Thus, the initial net cost of the butterfly position is $3.65 + $0.91 – $3.98 = $0.58 per share. If Walnut shares are $66 at expiration, the $67.50 strike option and $70 strike option are both out-of-the-money and therefore worthless. The $65 call option is in the money by $1.00 per share, and after deducting the cost of $0.58 per share to initiate the butterfly position, the net profit is $0.42 per share.

12 B is correct. The $67.50 call option is approximately at-the-money, as Walnut share price is currently $67.76. A gamma measures i) the deviation of the exact option price changes from the price change approximated by the delta and ii) the sensitivity of delta to a change in the underlying. The largest moves for gamma occur when options are trading at-the-money or near expiration, when the deltas of at-the-money options move quickly toward 1.0 or 0.0. Under these conditions, the gammas tend to be largest and delta hedges are hardest to maintain.

READING

30

Risk Management Applications of Swap Strategies

by Don M. Chance, PhD, CFA

Don M. Chance, PhD, CFA, is at Louisiana State University (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** demonstrate how an interest rate swap can be used to convert a floating-rate (fixed-rate) loan to a fixed-rate (floating-rate) loan;
☐	**b.** calculate and interpret the duration of an interest rate swap;
☐	**c.** explain the effect of an interest rate swap on an entity's cash flow risk;
☐	**d.** determine the notional principal value needed on an interest rate swap to achieve a desired level of duration in a fixed-income portfolio;
☐	**e.** explain how a company can generate savings by issuing a loan or bond in its own currency and using a currency swap to convert the obligation into another currency;
☐	**f.** demonstrate how a firm can use a currency swap to convert a series of foreign cash receipts into domestic cash receipts;
☐	**g.** explain how equity swaps can be used to diversify a concentrated equity portfolio, provide international diversification to a domestic portfolio, and alter portfolio allocations to stocks and bonds;
☐	**h.** demonstrate the use of an interest rate swaption 1) to change the payment pattern of an anticipated future loan and 2) to terminate a swap.

Analysis of Derivatives for the Chartered Financial Analyst® Program, by Don M. Chance, CFA. © 2003 CFA Institute. All rights reserved.

1 INTRODUCTION

This reading is the final in a series of three in which we examine strategies and applications of various derivative instruments. We now turn to swaps. Recall that a swap is a transaction in which two parties agree to exchange a series of cash flows over a specific period of time. At least one set of cash flows must be variable—that is, not known at the beginning of the transaction and determined over the life of the swap by the course of an underlying source of uncertainty. The other set of cash flows can be fixed or variable. Typically, no net exchange of money occurs between the two parties at the start of the contract.[1]

Because at least one set of swap payments is random, it must be driven by an underlying source of uncertainty. This observation provides a means for classifying swaps. The four types of swaps are interest rate, currency, equity, and commodity swaps. Interest rate swaps typically involve one side paying at a floating interest rate and the other paying at a fixed interest rate. In some cases both sides pay at a floating rate, but the floating rates are different. Currency swaps are essentially interest rate swaps in which one set of payments is in one currency and the other is in another currency. The payments are in the form of interest payments; either set of payments can be fixed or floating, or both can be fixed or floating. With currency swaps, a source of uncertainty is the exchange rate so the payments can be fixed and still have uncertain value. In equity swaps, at least one set of payments is determined by the course of a stock price or stock index. In commodity swaps at least one set of payments is determined by the course of a commodity price, such as the price of oil or gold. In this reading we focus exclusively on financial derivatives and, hence, do not cover commodity swaps.

Swaps can be viewed as combinations of forward contracts. A forward contract is an agreement between two parties in which one party agrees to buy from another an underlying asset at a future date at a price agreed on at the start. This agreed-upon price is a fixed payment, but the value received for the asset at the future date is a variable payment because it is subject to risk. A swap extends this notion of an exchange of variable and fixed payments to more than one payment. Hence, a swap is like a series of forward contracts.[2] We also saw that a swap is like a combination of options. We showed that pricing a swap involves determining the terms that the two parties agree to at the start, which usually involves the amount of any fixed payment. Because no net flow of money changes hands at the start, a swap is a transaction that starts off with zero market value. Pricing the swap is done by finding the terms that result in equivalence of the present values of the two streams of payments.

After a swap begins, market conditions change and the present values of the two streams of payments are no longer equivalent. The swap then has a nonzero market value. To one party, the swap has a positive market value; to the other, its market value is negative. The process of valuation involves determining this market value. For the most part, valuation and pricing is a process that requires only the determination of present values using current interest rates and, as necessary, stock prices or exchange rates.

---

1 Currency swaps can be structured to have an exchange of the notional principals in the two currencies at the start, but because these amounts are equivalent after adjusting for the exchange rate, no *net* exchange of money takes place. At expiration of the swap, the two parties reverse the original exchange, which does result in a net flow of money if the exchange rate has changed, as will probably be the case. A few swaps, called *off-market swaps*, involve an exchange of money at the start, but they are the exception, not the rule.

2 There are some technical distinctions between a series of forward contracts and a swap, but the essential elements of equivalence are there.

We also examined the swaption, an instrument that combines swaps and options. Specifically, a swaption is an option to enter into a swap. There are two kinds of swaptions: those to make a fixed payment, called payer swaptions, and those to receive a fixed payment, called receiver swaptions. Like options, swaptions require the payment of a premium at the start and grant the right, but not the obligation, to enter into a swap.[3]

In this reading, we shall examine ways in which swaps can be used to achieve risk management objectives. We already examined certain risk management strategies when we discussed swaps in the reading on risk management applications of option strategies. Here, we go into more detail on these strategies and, of course, introduce quite a few more. We shall also discuss how swaptions are used to achieve risk management objectives.

STRATEGIES AND APPLICATIONS FOR MANAGING INTEREST RATE RISK

2

In previous readings, we examined the use of forwards, futures, and options to manage interest rate risk. The interest rate swap, however, is unquestionably the most widely used instrument to manage interest rate risk.[4] In the readings on risk management applications of forward, futures, and options strategies, we examined two primary forms of interest rate risk. One is the risk associated with borrowing and lending in short-term markets. This risk itself has two dimensions: the risk of rates changing from the time a loan is anticipated until it is actually taken out, and the risk associated with changes in interest rates once the loan is taken out. Swaps are not normally used to manage the risk of an anticipated loan; rather, they are designed to manage the risk on a series of cash flows on loans already taken out or in the process of being taken out.[5]

The other form of interest rate risk that concerns us is the risk associated with managing a portfolio of bonds. As we saw in the reading on risk management applications of forward and futures strategies, managing this risk generally involves controlling the portfolio duration. Although futures are commonly used to make duration changes, swaps can also be used, and we shall see how in this reading.

In this section, we look at one more situation in which swaps can be used to manage interest rate risk. This situation involves the use of a relatively new financial instrument called a **structured note**, which is a variation of a floating-rate note that has some type of unusual characteristic. We cover structured notes in Section 2.3.

2.1 Using Interest Rate Swaps to Convert a Floating-Rate Loan to a Fixed-Rate Loan (and Vice Versa)

Because much of the funding banks receive is at a floating rate, most banks prefer to make floating-rate loans. By lending at a floating rate, banks pass on the interest rate risk to borrowers. Borrowers can use forwards, futures, and options to manage their exposure to rising interest rates, but swaps are the preferred instrument for managing

3 Forward swaps, on the other hand, are obligations to enter into a swap.

4 The Bank for International Settlements, in its June 2002 survey of derivative positions of global banks published on 8 November 2002, indicates that swaps make up more than 75 percent of the total notional principal of all interest rate derivative contracts (see www.bis.org).

5 It is technically possible to use a swap to manage the risk faced in anticipation of taking out a loan, but it would not be easy and would require a great deal of analytical skill to match the volatility of the swap to the volatility of the gain or loss in value associated with changes in interest rates prior to the date on which a loan is taken out. Other instruments are better suited for managing this type of risk.

this risk.[6] A typical situation involves a corporation agreeing to borrow at a floating rate even though it would prefer to borrow at a fixed rate. The corporation will use a swap to convert its floating-rate loan to a fixed-rate loan.

Internet Book Publishers (IBP) is a corporation that typically borrows at a floating rate from a lender called Prime Lending Bank (PLB). In this case, it takes out a one-year $25 million loan at 90-day Libor plus 300 basis points. The payments will be made at specific dates about 91 days apart. The rate is initially set today, the day the loan is taken out, and is reset on each payment date: On the first payment date, the rate is reset for the second interest period. With four loan payments, the first rate is already set, but IBP is exposed to risk on the other three reset dates. Interest is calculated based on the actual day count since the last payment date, divided by 360. The loan begins on 2 March and the interest payment dates are 2 June, 2 September, 1 December, and the following 1 March.

IBP manages this interest rate risk by using a swap. It contacts a swap dealer, Swaps Provider Inc. (SPI), which is the derivatives subsidiary of a major investment banking firm. Under the terms of the swap, SPI will make payment to IBP at a rate of Libor, and IBP will pay SPI a fixed rate of 6.27 percent, with payments to be made on the dates on which the loan interest payments are made.

The dealer prices the fixed rate on a swap into the swap such that the present values of the two payment streams are equal. The floating rates on the swap will be set today and on the first, second, and third loan interest payment dates, thereby corresponding to the dates on which the loan interest rate is reset. The notional principal on the swap is $25 million, the face value of the loan. The swap interest payments are structured so that the actual day count is used, as is done on the loan.

So, IBP borrows $25 million at a floating rate and arranges for the swap, which involves no cash flows at the origination date. The flow of money on each loan/swap payment date is illustrated in Exhibit 1. We see that IBP makes its loan payments at Libor plus 0.03.[7] The actual calculation of the loan interest is as follows:

($25 million)(Libor + 0.03)(Days/360)

6 It is not clear why swaps are preferred over other instruments to manage the exposure to rising interest rates, but one possible reason is that when swaps were first invented, they were marketed as equivalent to a pair of loans. By being long one loan and short another, a corporation could alter its exposure without having to respond to claims that it was using such instruments as futures or options, which might be against corporate policy. In other words, while swaps are derivatives, their equivalence to a pair of loans meant that no policy existed to prevent their use. Moreover, because of the netting of payments and no exchange of notional principal, interest rate swaps were loans with considerably less credit risk than ordinary loans. Hence, the corporate world easily and widely embraced them.

7 Remember that when we refer to the payment at a rate of Libor, that rate was established at the previous settlement date or at the beginning of the swap if this is the first settlement period.

Exhibit 1 Converting a Floating-Rate Loan to a Fixed-Rate Loan Using an Interest Rate Swap

The swap payments are calculated in the same way but are based on either Libor or the fixed rate of 6.27 percent. The interest owed on the loan based on Libor is thus offset by the interest received on the swap payment based on Libor.[8] Consequently, IBP does not *appear to be exposed* to the uncertainty of changing Libor, but we shall see that it is indeed exposed. The net effect is that IBP pays interest at the swap fixed rate of 6.27 percent plus the 3 percent spread on the loan for a total of 9.27 percent.

IBP's swap transaction appears to remove its exposure to Libor. Indeed, having done this transaction, most corporations would consider themselves hedged against rising interest rates, which is usually the justification corporations give for doing swap transactions. It is important to note, however, that IBP is also speculating on rising interest rates. If rates fall, IBP will not be able to take advantage, as it is locked in to a synthetic fixed-rate loan at 9.27 percent. There can be a substantial opportunity cost to taking this position and being wrong. To understand this point, let us reintroduce the concept of duration.

We need to measure the sensitivity of the market value of the overall position compared to what it would have been had the loan been left in place as a floating-rate loan. For that we turn to duration, a measure of sensitivity to interest rates. If a default-free bond is a floating-rate bond, its duration is nearly zero because interest sensitivity reflects how much the market value of an asset changes for a given change in interest rates. A floating-rate bond is designed with the idea that its market value will not drift far from par. Because the coupon will catch up with the market rate periodically, only during the period between interest payment dates can the market value stray from par value. Moreover, during this period, it would take a substantial interest rate change to have much effect on the market value of the floating-rate bond. Without showing the details, we shall simply state the result that a floating-rate bond's duration is approximately the amount of time remaining until the next coupon payment. For a bond with quarterly payments, the maximum duration is 0.25 years and the minimum duration is zero. Consequently, the average duration is about 0.125 years. From the perspective of the *issuer* rather than the holder, the duration of the position is –0.125.

The duration of IBP's floating-rate loan position in this example is an average of –0.125, which is fairly low compared with most financial instruments. Therefore, the market value of the loan is not very interest-rate sensitive. If interest rates fall,

8 Of course in practice, the swap payments are netted and only a single payment flows from one party to the other. Netting reduces the credit risk but does not prevent the Libor component of the net swap payment from offsetting the floating loan interest payment, which is the objective of the swap.

the loan rate will fall in three months, and IBP will not have much of a loss from the market value of the loan. If interest rates rise, IBP will not have much of a gain from the market value of the loan.

Now let us discuss the duration of a swap. Remember that entering a pay-fixed, receive-floating swap is similar to issuing a fixed-rate bond and using the proceeds to buy a floating-rate bond. The duration of a swap is thus equivalent to the duration of a long position in a floating-rate bond and a short position in a fixed-rate bond. The duration of the long position in the floating-rate bond would, again, be about 0.125. What would be the duration of the short position in the fixed-rate bond? A one-year fixed-rate bond with quarterly payments would probably have a duration of between 0.6 and 1.0. Let us assume this duration is about 0.75 (nine months) or 75 percent of the maturity, an assumption we shall make from here out. So the duration of the swap would be roughly 0.125 – 0.75 = –0.625.

Combining the swap with the loan means that the duration of IBP's overall position will be –0.125 – 0.625 = –0.75. The swap was designed to convert the floating-rate loan to a fixed-rate loan. Hence, the position should be equivalent to that of taking out a fixed-rate loan. As we assumed for a one-year fixed-rate bond with quarterly payments, the duration would be 0.75. The duration of a borrower's position in a fixed-rate loan would be –0.75, the same as the duration of borrowing with the floating-rate loan and engaging in the swap. The negative duration means that a fixed-rate borrower will be helped by rising rates and a falling market value.[9]

Although the duration of the one-year fixed-rate loan is not large, at least relative to that of bonds and longer-term loans, it is nonetheless six times that of the floating-rate loan. Consequently, the sensitivity of the market value of the overall position is six times what it would have been had the loan been left in place as a floating-rate loan. From this angle, it is hard to see how such a transaction could be called a hedge because declining rates and increasing market values will hurt the fixed-rate borrower. The actual risk increases sixfold with this transaction![10]

So, can this transaction be viewed as a hedge? If not, why is it so widely used? From a cash flow perspective, the transaction does indeed function as a hedge. IBP knows that its interest payments will all be $25,000,000(0.0927)(Days/360). Except for the slight variation in days per quarter, this amount is fixed and can be easily built into plans and budgets. So from a planning and accounting perspective, the transaction serves well as a hedge. From a market value perspective, however, it is tremendously speculative. But does market value matter? Indeed it does. From the perspective of finance theory, maximizing the market value of shareholders' equity is the objective of a corporation. Moreover, under recently enacted accounting rules, companies must mark derivative and asset positions to market values, which has improved transparency.

So, in summary, using a swap to convert a floating-rate loan to a fixed-rate loan is a common transaction, one ostensibly structured as a hedge. Such a transaction, despite stabilizing a company's cash outflows, however, increases the risk of the company's market value. Whether this issue is of concern to most companies is not clear. This situation remains one of the most widely encountered scenarios and the one for which interest rate swaps are most commonly employed.

---

9 Remember from the reading on risk management applications of forward and futures strategies that the percentage change in the market value of an asset or portfolio is –1 times the duration times the change in yield over 1 plus the yield. So, if the duration is negative, the double minus results in the position benefiting from rising interest rates.

10 In the example here, the company is a corporation. A bank might have assets that would be interest sensitive and could be used to balance the duration. A corporation's primary assets have varying, inconsistent, and difficult-to-measure degrees of interest sensitivity.

EXAMPLE 1

Consider a bank that holds a $5 million loan at a fixed rate of 6 percent for three years, with quarterly payments. The bank had originally funded this loan at a fixed rate, but because of changing interest rate expectations, it has now decided to fund it at a floating rate. Although it cannot change the terms of the loan to the borrower, it can effectively convert the loan to a floating-rate loan by using a swap. The fixed rate on three-year swaps with quarterly payments at Libor is 7 percent. We assume the number of days in each quarter to be 90 and the number of days in a year to be 360.

A Explain how the bank could convert the fixed-rate loan to a floating-rate loan using a swap.

B Explain why the effective floating rate on the loan will be less than Libor.

Solution to A:

The interest payments it will receive on the loan are $5,000,000(0.06)(90/360) = $75,000. The bank could do a swap to pay a fixed rate of 7 percent and receive a floating rate of Libor. Its fixed payment would be $5,000,000(0.07)(90/360) = $87,500. The floating payment it would receive is $5,000,000L(90/360), where L is Libor established at the previous reset date. The overall cash flow is thus $5,000,000(L – 0.01)(90/360), Libor minus 100 basis points.

Solution to B:

The bank will effectively receive less than Libor because when the loan was initiated, the rate was 6 percent. Then when the swap was executed, the rate was 7 percent. This increase in interest rates hurts the fixed-rate lender. The bank cannot implicitly change the loan from fixed rate to floating rate without paying the price of this increase in interest rates. It pays this price by accepting a lower rate than Libor when the loan is effectively converted to floating. Another factor that could contribute to this rate being lower than Libor is that the borrower's credit risk at the time the loan was established is different from the bank's credit risk as reflected in the swap fixed rate, established in the Libor market when the swap is initiated.

Equipped with our introductory treatment of the duration of a swap, we are now in a position to move on to understanding how to use swaps to manage the risk of a longer-term position that is also exposed to interest rate risk.

2.2 Using Swaps to Adjust the Duration of a Fixed-Income Portfolio

We saw in the previous section that the duration of a swap is the net of the durations of the equivalent positions in fixed- and floating-rate bonds. Thus, the position of the pay-fixed party in a pay-fixed, receive-floating swap has the duration of a floating-rate bond minus the duration of a fixed-rate bond, where the floating- and fixed-rate bonds have cash flows equivalent to the corresponding cash flows of the swap.[11] The pay-fixed, receive-floating swap has a negative duration, because the duration of a

11 Recall, however, that an interest rate swap does not involve a notional principal payment up front or at expiration. But because a swap is equivalent to being long a fixed- (or floating-) rate bond and short a floating- (or fixed-) rate bond, the principals on the bonds offset, leaving their cash flows identical to that of a swap.

fixed-rate bond is positive and larger than the duration of a floating-rate bond, which is near zero. Moreover, the negative duration of this position makes sense in that the position would be expected to benefit from rising interest rates.

Consider the following transaction. Quality Asset Management (QAM) controls a $500 million fixed-income portfolio that has a duration of 6.75. It is considering reducing the portfolio duration to 3.50 by using interest rate swaps. QAM has determined that the interest sensitivity of the bond portfolio is adequately captured by its relationship with Libor; hence, a swap using Libor as the underlying rate would be appropriate. But first there are several questions to ask:

- Should the swap involve paying fixed, receiving floating or paying floating, receiving fixed?
- What should be the terms of the swap (maturity, payment frequency)?
- What should be the notional principal?

As for whether the swap should involve paying fixed or receiving fixed, the value of the bond portfolio is inversely related to interest rates. To reduce the duration, it would be necessary to hold a position that moves directly with interest rates. To do this we must add a negative-duration position. Hence, the swap should be a pay-fixed swap to receive floating.

The terms of the swap will affect the need to renew it as well as its duration and the notional principal required. It would probably be best for the swap to have a maturity at least as long as the period during which the duration adjustment applies. Otherwise, the swap would expire before the bond matures, and QAM would have to initiate another swap. The maturity and payment frequency of the swap affect the duration. Continuing with the assumption (for convenience) that the duration of the fixed-rate bond is approximated as 75 percent of its maturity, we find, for example, that a one-year swap with semi-annual payments would have a duration of 0.25 – 0.75 = –0.50. A one-year swap with quarterly payments would have a duration of 0.125 – 0.75 = –0.625. A two-year swap with semiannual payments would have a duration of 0.25 – 1.50 = –1.25. A two-year swap with quarterly payments would have a duration of 0.125 – 1.50 = –1.375.

These different durations affect the notional principal required, which leads us to the third question. Prior to the duration adjustment, the portfolio consists of $500 million at a duration of 6.75. QAM then adds a position in a swap with a notional principal of NP and a modified duration of $MDUR_S$. The swap will have zero market value.[12] The bonds and the swap will then combine to make up a portfolio with a market value of $500 million and a duration of 3.50. This relationship can be expressed as follows:

$$\$500{,}000{,}000(6.75) + NP(MDUR_S) = \$500{,}000{,}000(3.50)$$

The solution for NP is

$$NP = \$500{,}000{,}000\left(\frac{3.50 - 6.75}{MDUR_S}\right)$$

The duration of the swap is determined once QAM decides which swap to use. Suppose it uses a one-year swap with semiannual payments. Then, as shown above, the duration would be –0.50. The amount of notional principal required would, therefore, be

$$NP = \$500{,}000{,}000\left(\frac{3.50 - 6.75}{-0.50}\right) = \$3{,}250{,}000{,}000$$

12 Recall that the market value of a swap is zero at the start. This market value can obviously vary over time from zero, and such deviations should be taken into account, but to start, the market value will be zero.

In other words, this portfolio adjustment would require a swap with a notional principal of more than $3 billion! This would be a very large swap, probably too large to execute. Consider the use of a five-year swap with semiannual payments. Its duration would be 0.25 – 3.75 = –3.50. Then the notional principal would be

$$NP = \$500{,}000{,}000\left(\frac{3.50 - 6.75}{-3.50}\right) = \$464{,}290{,}000$$

With this longer duration, the notional principal would be about $464 million, a much more reasonable amount, although still a fairly large swap.

So, in general, the notional principal of a swap necessary to change the duration of a bond portfolio worth B from $MDUR_B$ to a target duration, $MDUR_T$, is

$$NP = B\left(\frac{MDUR_T - MDUR_B}{MDUR_S}\right)$$

EXAMPLE 2

A $250 million bond portfolio has a duration of 5.50. The portfolio manager wants to reduce the duration to 4.50 by using a swap. Consider the possibility of using a one-year swap with monthly payments or a two-year swap with semiannual payments.

A Determine the durations of the two swaps under the assumption of paying fixed and receiving floating. Assume that the duration of a fixed-rate bond is 75 percent of its maturity.

B Choose the swap with the longer absolute duration and determine the notional principal of the swap necessary to change the duration as desired. Explain your results.

Solution to A:

The duration of a one-year pay-fixed, receive-floating swap with monthly payments is the duration of a one-year floating-rate bond with monthly payments minus the duration of a one-year fixed-rate bond with monthly payments. The duration of the former is about one-half of the length of the payment interval. That is 1/24 of a year, or 0.042. Because the duration of the one-year fixed-rate bond is 0.75 (75 percent of one year), the duration of the swap is 0.042 – 0.75 = –0.708.

The duration of a two-year swap with semiannual payments is the duration of a two-year floating-rate bond with semiannual payments minus the duration of a two-year fixed-rate bond. The duration of the former is about one-quarter of a year, or 0.25. The duration of the latter is 1.50 (75 percent of two years). The duration of the swap is thus 0.25 – 1.50 = –1.25.

Solution to B:

The longer (more negative) duration swap is the two-year swap with semiannual payments. The current duration of the $250 million portfolio is 5.50 and the target duration is 4.50. Thus, the required notional principal is

$$NP = B\left(\frac{MDUR_T - MDUR_B}{MDUR_S}\right)$$

$$= \$250{,}000{,}000\left(\frac{4.50 - 5.50}{-1.25}\right) = \$200{,}000{,}000$$

So, to lower the duration requires the addition of an instrument with a duration lower than that of the portfolio. The duration of a receive-floating, pay-fixed swap is negative and, therefore, lower than that of the existing portfolio.

2.3 Using Swaps to Create and Manage the Risk of Structured Notes

Structured notes are short- or intermediate-term floating-rate securities that have some type of unusual feature that distinguishes them from ordinary floating-rate notes. This unusual feature can be in the form of leverage, which results in the interest rate on the note moving at a multiple of market rates, or can be an inverse feature, meaning that the interest rate on the note moves opposite to market rates. Structured notes are designed to be sold to specific investors, who are often motivated by constraints that restrict their ability to hold derivatives or use leverage. For example, many insurance companies and pension funds are attracted to structured notes, because the instruments qualify as fixed-income securities but have features that are similar to options, swaps, and margin transactions. Issuers typically create the notes, sell them to these investors, and then manage the risk, earning a profit by replicating the opposite position at a cost lower than what they could sell the notes for.

In this section, we shall use the notation FP as the principal/face value of the note, ci as the fixed interest rate on a bond, and FS as the fixed interest rate on the swap.

2.3.1 *Using Swaps to Create and Manage the Risk of Leveraged Floating-Rate Notes*

Kappa Alpha Traders (KAT) engages in a variety of arbitrage-related transactions designed to make small risk-free or low-risk profits. One such transaction involves the issuance of structured notes, which it sells to insurance companies. KAT plans to issue a leveraged structured note with a principal of FP that pays an interest rate of 1.5 times Libor. This type of instrument is usually called a **leveraged floating-rate note**, or leveraged floater. The reference to *leverage* is to the fact that the coupon is a multiple of a specific market rate of interest such as Libor. The note will be purchased by an insurance company called LifeCo. KAT will use the proceeds to buy a fixed-rate bond that pays an interest rate of ci. It will then combine the position with a plain vanilla swap with dealer Omega Swaps. Exhibit 2 illustrates how this works.

Exhibit 2 Proceeds from a Leveraged Floater Used to Buy a Fixed-Rate Bond, with Risk Managed with a Plain Vanilla Swap

KAT issues the leveraged floater, selling it to LifeCo Insurance with the intent of financing it with a fixed-rate bond and swapping the fixed rate for a floating rate to match the leveraged floater. The periodic interest payment on the leveraged floater will be 1.5L, where L is Libor, times FP.[13] It then takes the proceeds and buys a fixed-rate bond issued by a company called American Factories Inc. This bond will have face value of 1.5(FP) and pay a coupon of ci. KAT is then in a position of receiving a fixed coupon of ci on principal of 1.5(FP) and paying a floating coupon of 1.5L on a principal of FP. It then enters into a swap with dealer Omega Swaps on notional principal of 1.5FP. KAT will pay a fixed rate of FS and receive a floating rate of Libor (L). Note the net effect: KAT's obligation on the leveraged floater of 1.5L(FP) is matched by its receipt on the swap. KAT receives 1.5(ci)(FP) on the fixed-rate bond and pays out 1.5(FS)(FP) on the swap, netting 1.5(FP)(ci – FS). Is this amount an inflow or outflow? It depends. If the interest rate on American Factories' debt reflects greater credit risk than that implied by the fixed rate on the swap, then KAT receives a net payment. Generally that would be the case. Thus, KAT identifies an attractively priced fixed-rate note and captures its return over the swap rate, offsetting the floating rate on the swap with the structured note. Of course, KAT is assuming some credit risk, the risk of default by American Factories, as well as the risk of default by Omega Swaps. On the other hand, KAT put up no capital to engage in this transaction. The cost of the American Factories bond was financed by issuing the structured note.

EXAMPLE 3

A company issues a floating-rate note that pays a rate of twice Libor on notional principal FP. It uses the proceeds to buy a bond paying a rate of ci. It also enters into a swap with a fixed rate of FS to manage the risk of the Libor payment on the leveraged floater.

A Demonstrate how the company can engage in these transactions, leaving it with a net cash flow of 2(FP)(ci – FS).

B Explain under what condition the amount (ci – FS) is positive.

Solution to A:

The company has issued a leveraged floater at a rate of 2L on notional principal FP. Then it should purchase a bond with face value of 2(FP) and coupon ci. It enters into a swap to pay a fixed rate of FS and receive a floating rate of L on notional principal 2(FP). The net cash flows are as follows:

From leveraged floater	–2L(FP)
From bond	+(ci)2(FP)
Floating side of swap	+(L)2(FP)
Fixed side of swap	–(FS)2(FP)
Total	2FP(ci – FS)

13 These payments could be made semiannually, in which case they would be half of 1.5L(FP).

Solution to B:

The difference between the bond coupon rate, ci, and the swap fixed rate, FS, will be positive if the bond has greater credit risk than is implied by the fixed rate in the swap, which is based on the Libor term structure and reflects the borrowing rate of London banks. Thus, the gain of 2(ci – FS)(FP) is likely to reflect a credit risk premium.

2.3.2 *Using Swaps to Create and Manage the Risk of Inverse Floaters*

Another type of structured note is the **inverse floater**. Consider a company called Vega Analytics that, like KAT, engages in a variety of arbitrage trades using structured notes. Vega wants to issue an inverse floater paying a rate of b minus Libor, b – L, on notional principal FP. Vega sets the value of b in negotiation with the buyer of the note, taking into account a number of factors. The rate on the note moves inversely with Libor, but if Libor is at the level b, the rate on the note goes to zero. If Libor rises above b, the rate on the note is negative! We shall address this point later in this section.

The pattern will be the same as the pattern used for the leveraged floater: Finance the structured note by a fixed-rate note and then swap the fixed rate for a floating rate to match the structured note. Exhibit 3 shows how Vega issues the note to a company called Metrics Finance and uses the proceeds to purchase a fixed-rate note issued by a company called Telltale Systems, Inc., which pays a rate of (ci)(FP). Vega then enters into an interest rate swap with notional principal FP with a counterparty called Denman Dealer Holdings. In this swap, Vega receives a fixed rate of FS and pays L. Observe that the net effect is that Vega's overall cash flow is FP[– (b – L) + ci + FS – L] = FP(FS + ci – b).

Exhibit 3 Proceeds from an Inverse Floater Used to Buy a Fixed-Rate Bond, with Risk Managed with a Plain Vanilla Swap

Clearly if b is set below FS + ci, then the overall cash flow is positive. Vega can potentially do this because of the credit risk it assumes. Vega sets b but cannot set FS, and ci is based on both the level of market interest rates and the credit risk of Telltale. The lower Vega sets b, the larger its cash flow from the overall transactions. But one major consideration forces Vega to limit how low it sets b: The lower it sets b, the less attractive the note will be to potential investors.

Remember that the inverse floater pays b – L. When L reaches the level of b, the interest rate on the inverse floater is zero. If L rises above b, then the interest rate on the inverse floater becomes negative. A negative interest rate would imply that the

lender (Metrics) pays interest to the borrower (Vega). Most lenders would find this result unacceptable, but the lower b is set, the more likely this outcome will occur. Thus, Vega will want to set b at a reasonably high level but below FS + ci.

Regardless of where Vega sets b, the possibility remains that L will exceed b. Metrics may have Vega guarantee that the interest rate on the floater will go no lower than 0 percent. To manage the risk associated with this guarantee, Vega will buy an interest rate cap. Let us see how all of this works with a numerical example.

Suppose the swap fixed rate, FS, is 6 percent, and ci, the rate on Telltale's note, is 7 percent. Vega sets b at 12 percent and guarantees to Metrics that the interest rate will go no lower than zero. Then the inverse floater pays 12 percent – L. As long as Libor is below 12 percent, Vega's cash flow is 6 + 7 – 12 = 1 percent. Suppose L is 14 percent. Then Vega's cash flows are

+7 percent from the Telltale note

0 percent to Metrics

+6 percent from Denman

14 percent to Denman

Net: outflow of 1 percent

Vega's net cash flow is negative. To avoid this problem, Vega would buy an interest rate cap in which the underlying is Libor and the exercise rate is b. The cap would have a notional principal of FP and consist of individual caplets expiring on the dates on which the inverse floater rates are set. Thus, on a payment date, when L exceeds b, the inverse floater does not pay interest, but the caplet expires in-the-money and pays L – b. Then the cash flows would be

+7 percent from the Telltale note

0 percent to Metrics

+6 percent from Denman

14 percent to Denman

(14% – 12%) = 2 percent from the caplet

Net: inflow of 1 percent

Thus, Vega has restored its guaranteed cash inflow of 1 percent.

Of course, the premium on the cap would be an additional cost that Vega would pass on in the form of a lower rate paid to Metrics on the inverse floater. In other words, for Metrics to not have to worry about ever having a negative interest rate, it would have to accept a lower overall rate. Thus, b would be set a little lower.

EXAMPLE 4

A company issues an inverse floating-rate note with a face value of $30 million and a coupon rate of 14 percent minus Libor. It uses the proceeds to buy a bond with a coupon rate of 8 percent.

A Explain how the company would manage the risk of this position using a swap with a fixed rate of 7 percent, and calculate the overall cash flow given that Libor is less than 14 percent.

B Explain what would happen if Libor exceeds 14 percent. What could the company do to offset this problem?

Solution to A:

The company would enter into a swap in which it pays Libor and receives a fixed rate of 7 percent on notional principal of $30 million. The overall cash flows are as follows:

From the inverse floater	– (0.14 – L)$30,000,000
From the bond it buys	+ (0.08)$30,000,000
From the swap	
Fixed payment	+ (0.07)$30,000,000
Floating payment	– (L)$30,000,000
Overall total	+ (0.01)$30,000,000

Solution to B:

If Libor is more than 14 percent, then the inverse floater payment of (0.14 – L) would be negative. The lender would then have to pay interest to the borrower (the company). For this reason, in most cases, an inverse floater has a floor at zero. In such a case, the total cash flow to this company would be (0 + 0.08 + 0.07 – L)$30,000,000. There would be zero total cash flow at L = 15 percent. But at an L higher than 15 percent, the otherwise positive cash flow to the company becomes negative.

To offset this effect, the company would typically buy an interest rate cap with an exercise rate of 14 percent. The cap would have caplets that expire on the interest rate reset dates of the swap/loan and have a notional principal of $30 million. Then when L > 0.14, the caplet would pay off L – 0.14 times the $30 million. This payoff would make up the difference. The price paid for the cap would be an additional cost.

Interest rate swaps are special cases of currency swaps—cases in which the payments are made in different currencies. We now take a look at ways in which currency swaps are used.

3 STRATEGIES AND APPLICATIONS FOR MANAGING EXCHANGE RATE RISK

Currency swaps are designed for the purpose of managing exchange rate risk. They also play a role in managing interest rate risk, but only in cases in which exchange rate risk is present. In this section, we look at three situations in which exchange rate risk can be managed using currency swaps.

3.1 Converting a Loan in One Currency into a Loan in Another Currency

Royal Technology Ltd. (ROTECH) is a British high-tech company that is currently planning an expansion of about £30 million into Europe. To implement this expansion, it requires funding in euros. The current exchange rate is €1.62/£, so the expansion will cost €48.6 million. ROTECH could issue a euro-denominated bond, but it is not as well known in the euro market as it is in the United Kingdom where, although not

a top credit, its debt is rated investment grade. As an alternative, ROTECH could issue a pound-denominated bond and convert it to a euro-denominated bond using a currency swap. Exhibit 4 illustrates how it could do this.

The transaction begins on 1 June. ROTECH will borrow for three years. It issues a bond for £30 million, receiving the proceeds from its bondholders. The bond carries an interest rate of 5 percent and will require annual interest payments each 1 June. ROTECH then enters into a currency swap with a dealer called Starling Bank (SB). It pays SB £30 million and receives from SB €48.6 million. The terms of the swap call for ROTECH to pay interest to SB at a rate of 3.25 percent in euros and receive interest from SB at a rate of 4.5 percent in pounds. With the exchange of principals up front, ROTECH then has the euros it needs to proceed with its expansion. Panel A of Exhibit 4 illustrates the flow of funds at the start of the transaction.

The interest payments and swap payments, illustrated in Panel B, occur each year on 1 June. The interest payments on the pound-denominated bond will be £30,000,000(0.05) = £1,500,000. The interest due to ROTECH from SB is £30,000,000(0.045) = £1,350,000. The interest ROTECH owes SB is €48,600,000(0.0325) = €1,579,500. The net effect is that ROTECH pays interest in euros. The interest received from the dealer, however, does not completely offset the interest it owes on its bond. ROTECH cannot borrow in pounds at the swap market fixed rate, because its credit rating is not as good as the rating implied in the Libor market term structure.[14] The net effect is that ROTECH will pay additional interest of (0.05 – 0.045)£30,000,000 = £150,000.

Panel C of Exhibit 4 shows the cash flows that occur at the end of the life of the swap and the maturity date of the bond. ROTECH receives the principal of £30 million from SB and pays it to its bondholders, discharging its liability. It then pays €48.6 million to SB to make the final principal payment on the swap.

14 Remember that swap fixed rates are determined in the Libor market. This market consists of high-quality London banks, which borrow at an excellent rate. Hence, it is unlikely that ROTECH can borrow at as favorable a rate as these London banks.

Exhibit 4 Issuing a Pound-Denominated Bond and Using a Currency Swap to Convert to a Euro-Denominated Bond

This type of transaction is an extremely common use of currency swaps. The advantage of borrowing this way rather than directly in another currency lies in the fact that the borrower can issue a bond or loan in the currency in which it is better known as a creditor. Then, by engaging in a swap with a bank with which it is familiar and probably already doing business, it can borrow in the foreign currency indirectly. For example, in this case, SB is probably a large multinational bank and is well known in foreign markets. But SB also has a longstanding banking relationship with ROTECH. Consequently, SB can operate in foreign exchange markets, using its advantage, and pass that advantage on to ROTECH.[15]

Another reason this transaction is attractive for borrowers like ROTECH is that the company can lower its borrowing cost by assuming some credit risk. If ROTECH had issued debt in euros directly, it would face no credit risk.[16] By engaging in the swap,

15 SB accepts the foreign exchange in the swap from ROTECH and almost surely passes on that risk by hedging its position with some other type of foreign exchange transaction.

16 Of course, ROTECH's bondholders would face the credit risk that ROTECH could default.

however, ROTECH assumes the credit risk that SB will default on its swap payments. If SB defaults, ROTECH would still have to make its interest and principal payments to its bondholders. In exchange for accepting this risk, it is likely that ROTECH would get a better overall deal. Of course, the desired result would not be achieved if SB defaults. But ROTECH would not engage in the transaction if it thought there was much chance of default. Therefore, ROTECH acknowledges and accepts some credit risk in return for expecting a better overall rate than if it issues euro-denominated debt.

Because it cannot borrow at the same rate as the fixed rate on the swap, ROTECH must pay £150,000 more in interest annually. Recall that the fixed rate on the swap is the rate that would be paid if a London bank issued a par bond. ROTECH, like most companies, would not be able to borrow at a rate that attractive. The £150,000 in interest that ROTECH pays can be viewed as a credit risk premium, which it would have to pay regardless of whether it borrowed directly in the euro market or indirectly through a swap.

In this transaction, the interest payments were made at a fixed rate. As we previously learned, a currency swap can be structured to have both sides pay fixed, both pay floating, or one pay fixed and the other floating. If ROTECH wanted to issue debt in euros at a floating rate, it could issue the bond at a fixed rate and structure the swap so that the dealer pays it pounds at a fixed rate and it pays the dealer euros at a floating rate. Alternatively, it could issue the pound-denominated bond at a floating rate and structure the swap so that the dealer pays it pounds at a floating rate and ROTECH pays euros at a floating rate.[17] A currency swap party's choice to pay a fixed or floating rate depends on its views about the direction of interest rate movements. Companies typically choose floating rates when they think interest rates are likely to fall. They choose fixed rates when they think interest rates are likely to rise.

It should also be noted that companies often choose a particular type of financing (fixed or floating) and then change their minds later by executing another swap. For example, suppose ROTECH proceeds with this transaction as we illustrated it: paying a fixed rate on its pound-denominated bonds, receiving a fixed rate on the pound payments on its swap, and paying a fixed rate on its euro payments on the swap. Suppose that part of the way through the life of the swap, ROTECH thinks that euro interest rates are going down. If it wants to take action based on this view, it could enter into a plain vanilla interest rate swap in euros with SB or some other dealer. It would promise to pay the counterparty interest in euros at a floating rate and receive interest in euros at a fixed rate. This transaction would shift the euro interest obligation to floating.

Exhibit 5 illustrates this example. Of course, this transaction is speculative, based as it is on a perception of likely interest rate movements. Moreover, the fixed payments would not offset due to different interest rates.

17 It would not matter how ROTECH structured the payments on the pound-denominated bond. Either type of payment would be passed through with the currency swap, which would be structured to match that type of payment.

Exhibit 5 Reversing a Prior Swap to Change from a Fixed-Rate to an Overall Floating-Rate Status

One important way in which currency swaps differ from interest rate swaps is that currency swaps involve the payment of notional principal. However, not all currency swaps involve the payment of notional principal. In transactions such as the ROTECH swap with SB described here, the payment of notional principal is important. The notional principal payment is required, because it offsets the principal on the bond that ROTECH issued in pounds. In the next section, we look at a currency swap in which the notional principal is not paid.

EXAMPLE 5

A Japanese company issues a bond with face value of ¥1.2 billion and a coupon rate of 5.25 percent. It decides to use a swap to convert this bond into a euro-denominated bond. The current exchange rate is ¥120/€. The fixed rate on euro-denominated swaps is 6 percent, and the fixed rate on yen-denominated swaps is 5 percent. All payments will be made annually, so there is no adjustment such as Days/360.

A Describe the terms of the swap and identify the cash flows at the start.

B Identify all interest cash flows at each interest payment date.

C Identify all principal cash flows at the maturity of the bond.

Solution to A:

The company will enter into a swap with notional principal of ¥1,200,000,000/(¥120/€1) = €10,000,000. The swap will involve an exchange of notional principals at the beginning and end. The annual cash flows will involve paying euros and receiving yen. The following cash flows occur at the start:

From issuance of yen bond	+ ¥1,200,000,000
From swap	– ¥1,200,000,000
	+ €10,000,000
Net	+ €10,000,000

Solution to B:

The following cash flows occur at the annual interest payment dates:

Interest payments on bond	(¥1,200,000,000)(0.0525) = – ¥63,000,000
Swap payments	
Yen	+ (¥1,200,000,000)(0.05) = + ¥60,000,000
Euro	– (€10,000,000)(0.06) = – €600,000
Net	– ¥3,000,000 – €600,000

Solution to C:

The following cash flows occur at the end of the life of the swap:

Principal repayment on bond	– ¥1,200,000,000
Swap principal payments	
Yen	+ ¥1,200,000,000
Euro	– €10,000,000
Net	– €10,000,000

3.2 Converting Foreign Cash Receipts into Domestic Currency

Companies with foreign subsidiaries regularly generate cash in foreign currencies. Some companies repatriate that cash back into their domestic currency on a regular basis. If these cash flows are predictable in quantity, the rate at which they are converted can be locked in using a currency swap.

Colorama Software (COLS) is a US company that writes software for digital imaging. So far it has expanded internationally only into the Japanese market, where it generates a net cash flow of about ¥1.2 billion a year. It converts this cash flow into US dollars four times a year, with conversions taking place on the last day of March, June, September, and December. The amounts converted are equal to ¥300 million at each conversion.

COLS would like to lock in its conversion rate for several years, but it does not feel confident in predicting the amount it will convert beyond one year. Thus, it feels it can commit to only a one-year transaction to lock in the conversion rate. It engages in a currency swap with a dealer bank called US Multinational Bank (USMULT) in which COLS will make fixed payments in Japanese yen and receive fixed payments in US dollars. The current spot exchange rate is ¥132/$, which is $0.00757576/¥, or $0.757576 per 100 yen.

The fixed rate on plain vanilla swaps in Japan is 6 percent, and the fixed rate on plain vanilla swaps in the United States is 6.8 percent. To create a swap that will involve the exchange of ¥300 million per quarter into US dollars would require a Japanese notional principal of ¥300,000,000/(0.06/4) = ¥20,000,000,000, which is equivalent to a US dollar notional principal of ¥20,000,000,000/¥132 = $151,515,152.[18]

Thus, COLS engages in a swap for ¥20 billion in which it will pay 6 percent on a quarterly basis, or 1.5 percent per quarter in Japanese yen, and receive 6.8 percent on a quarterly basis, or 1.7 percent on $151,515,152. There is no initial or final exchange of notional principals. The cash flows in the swap are illustrated in Exhibit 6.

18 A currency swap at 6 percent with quarterly payments and a notional principal of ¥20 billion would require payments of (¥20,000,000,000)(0.06/4) = ¥300,000,000 per quarter.

Exhibit 6 Converting a Series of Foreign Cash Flows into Domestic Currency Using a Currency Swap

COLS pays USMULT ¥20,000,000,000(0.06/4) = ¥300,000,000 quarterly on the swap. This amount corresponds to the cash flow it generates on its Japanese operations. It then receives 6.8 percent on a dollar notional principal of $151,515,152 for a total of $151,515,152(0.068/4) = $2,575,758. So the swap effectively locks in the conversion of its quarterly yen cash flows for one year.

COLS does face some risk in this transaction. Besides the credit risk of the swap counterparty defaulting, COLS faces the risk that its operations will not generate at least ¥300 million. Of course, COLS' operations could generate more than ¥300 million, but that would mean only that some of its cash flows would not convert at a locked-in rate. If its operations do not generate at least ¥300 million, COLS still must pay ¥300 million to the swap counterparty.

Currency swaps can be used for purposes other than managing conversion risks. These swaps are also used by dealers to create synthetic strategies that allow them to offer new instruments or hedge existing instruments. In the next section, we look at how currency swaps can be used to synthesize an instrument called a dual-currency bond.

EXAMPLE 6

A Canadian corporation with a French subsidiary generates cash flows of €10 million a year. It wants to use a currency swap to lock in the rate at which it converts to Canadian dollars. The current exchange rate is C$0.825/€. The fixed rate on a currency swap in euros is 4 percent, and the fixed rate on a currency swap in Canadian dollars is 5 percent.

A Determine the notional principals in euros and Canadian dollars for a swap with annual payments that will achieve the corporation's objective.

B Determine the overall periodic cash flow from the subsidiary operations and the swap.

Solution to A:

With the euro fixed rate at 4 percent, the euro notional principal should be

$$\frac{€10{,}000{,}000}{0.04} = €250{,}000{,}000$$

The equivalent Canadian dollar notional principal would be €250,000,000 × C$0.825 = C$206,250,000.

Solution to B:

The cash flows will be as follows:

From subsidiary operations	€10,000,000
Swap euro payment	–0.04(€250,000,000) = –€10,000,000
Swap Canadian dollar payment	0.05(C$206,250,000) = C$10,312,500

The net effect is that the €10 million converts to C$10,312,500.

3.3 Using Currency Swaps to Create and Manage the Risk of a Dual-Currency Bond

A financial innovation in recent years is the dual-currency bond, on which the interest is paid in one currency and the principal is paid in another. Such a bond can be useful to a multinational company that might generate sufficient cash in a foreign currency to pay interest but not enough to pay the principal, which it thus might want to pay in its home currency. Dual-currency bonds can be shown to be equivalent to issuing an ordinary bond in one currency and combining it with a currency swap that has no principal payments. Consider the following transactions:

- Issue a bond in dollars.
- Engage in a currency swap with no principal payments. The swap will require the company to pay interest in the foreign currency and receive interest in dollars.

Because the company issued the bond in dollars, it will make interest payments in dollars. The currency swap, however, will result in the company receiving interest in dollars to offset the interest paid on the dollar-denominated bond and making interest payments on the currency swap in the foreign currency.[19] Effectively, the company will make interest payments in the foreign currency. At the maturity date of the bond and swap, the company will pay off the dollar-denominated bond, and there will be no payments on the swap.

Of course, this example illustrates the synthetic creation of a dual-currency bond. Alternatively, a company can create the dual-currency bond directly by issuing a bond in which it promises to pay the principal in one currency and the interest in another. Then, it might consider offsetting the dual-currency bond by synthetically creating the opposite position. The company is short a dual-currency bond. A synthetic dual-currency bond can be created through the purchase of a domestic bond and a currency swap. If the synthetic dual-currency bond is cheaper than the actual dual-currency bond, the company can profit by offsetting the short position in the actual bond by a long position in the synthetic bond. Let us see how this strategy can be implemented using a trading firm that finds an opportunity to earn an arbitrage profit doing so.

Trans Mutual Arbitrage (TMARB) is such a firm. It has a major client, Omega Construction (OGCONS), that would like to purchase a five-year dual-currency bond. The bond will have a face value of $10 million and an equivalent face value in euros of €12.5 million.[20] The bond will pay interest in euros at a rate of 4.5 percent. TMARB sees an opportunity to issue the bond, take the proceeds, and buy a 5.25 percent (coupon rate) US dollar-denominated bond issued by an insurance company called Kappa Insurance Co. (KINSCO). TMARB will also engage in a currency swap with dealer American Trading Bank (ATB) in which TMARB will receive interest payments in

19 It does not matter if the dollar bond has fixed- or floating-rate interest. The currency swap would be structured to have the same type of interest to offset.

20 The current exchange rate must, therefore, be $0.80/€.

euros at a rate of 4.5 percent on notional principal of €12.5 million and pay interest at a rate of 5.0 percent on notional principal of $10 million.[21] The swap does not involve the payment of notional principals. The swap and bond begin on 15 May and involve annual payments every 15 May for five years.

Exhibit 7 illustrates the structure of this swap. In Panel A, we see the initial cash flows. TMARB receives $10 million from OGCONS for the issuance of the dual-currency bond. It then takes the $10 million and buys a $10 million dollar-denominated bond issued by KINSCO. There are no initial cash flows on the currency swap.

Panel B shows the annual cash flows, which occur on 15 May for five years. TMARB pays interest of €12,500,000(0.045) = €562,500 to OGCONS on the dual-currency bond. It receives interest of an equivalent amount from ATB on the currency swap. It pays interest of $10,000,000(0.05) = $500,000 on the currency swap and receives interest of $10,000,000 × 0.0525 = $525,000 from KINSCO on the dollar-denominated bond. TMARB's euro interest payments are fully covered, and it nets a gain from its dollar interest payments. This opportunity resulted because TMARB found a synthetic way to issue a bond at 5.00 percent and buy one paying 5.25 percent. Of course, TMARB will be accepting some credit risk, from both the swap dealer and KINSCO, and its gain may reflect only this credit risk.

Panel C provides the final payments. TMARB pays off OGCONS its $10 million obligation on the dual-currency bond and receives $10 million from KINSCO on the dollar-denominated bond. There are no payments on the swap.

The end result is that TMARB issued a dual-currency bond and offset it with an ordinary dollar-denominated bond and a currency swap with no principal payments. TMARB earned a profit, which may be compensation for the credit risk taken.

21 We have made the fixed rate on the bond the same as the euro fixed rate on the swap for convenience. In practice, there probably would be a spread between the two rates, but the size of the spread would be fixed.

Exhibit 7 Issuing a Dual-Currency Bond and Managing the Risk with an Ordinary Bond and a Currency Swap

EXAMPLE 7

From the perspective of the issuer, construct a synthetic dual-currency bond in which the principal is paid in US dollars and the interest is paid in Swiss francs. The face value will be $20 million, and the interest rate will be 5 percent in Swiss

francs. The exchange rate is $0.80/SF. Assume that the appropriate interest rate for a $20 million bond in dollars is 5.5 percent. The appropriate fixed rates on a currency swap are 5.5 percent in dollars and 5.0 percent in Swiss francs.

Solution:

Issue a $20 million bond in dollars, paying interest at 5.5 percent. Enter into a currency swap on $20 million, equivalent to SF25 million. The currency swap will involve the receipt of dollar interest at 5.5 percent and payment of Swiss franc interest at 5.0 percent. You will receive $20 million at the start and pay back $20 million at maturity. The annual cash flows will be as follows:

On dollar bond issued:	– 0.055($20,000,000) =	– $1,100,000
On swap:		
Dollars	+ 0.055($20,000,000) =	+ $1,100,000
Swiss francs	– 0.05(SF25,000,000) =	– SF1,250,000
Net		– SF1,250,000

In the next section, we look at swap strategies in the management of equity market risk.

4 STRATEGIES AND APPLICATIONS FOR MANAGING EQUITY MARKET RISK

Equity portfolio managers often want to realign the risk of their portfolios. Swaps can be used for this purpose. In the reading on risk management applications of forward and futures strategies, we covered equity swaps, which are swaps in which at least one set of payments is tied to the price of a stock or stock index. Equity swaps are ideal for use by equity managers to make changes to portfolios by synthetically buying and selling stock without making any trades in the actual stock. Of course, equity swaps have a defined expiration date and thus achieve their results only temporarily. To continue managing equity market risk, a swap would need to be renewed periodically and would be subject to whatever new conditions exist in the market on the renewal date.

4.1 Diversifying a Concentrated Portfolio

Diversification is one of the most important principles of sound investing. Some portfolios, however, are not very diversified. A failure to diversify can be due to investor ignorance or inattention, or it can arise through no fault of the investor. For example, a single large donation to a charitable organization can result in a high degree of concentration of an endowment portfolio. The recipient could be constrained or at least feel constrained from selling the stock. Equity swaps can be used to achieve diversification without selling the stock, as we shall see in the following example.

Commonwealth Foundation (CWF) is a charitable organization with an endowment of $50 million invested in diversified stock. Recently, Samuel Zykes, a wealthy member of the community, died and left CWF a large donation of stock in a company he founded called Zykes Technology (ZYKT). The stock is currently worth $30 million. The overall endowment value is now at $80 million, but the portfolio is highly undiversified, with more than a third of its value concentrated in one stock. CWF has considered selling the stock, but its development director believes that the Zykes

family will possibly give more money to the foundation at a later date. If CWF sells the stock, the Zykes family may get the impression that the foundation does not want or appreciate the gift. Therefore, the foundation has concluded that it must hold onto the stock. The prospects for very limited growth in the portfolio through other sources, combined with the desire to attract further donations from the Zykes family, lead CWF to conclude that it cannot diversify the portfolio by traditional means anytime soon.

CWF's bank suggests that it consult with a swap dealer called Capital Swaps (CAPS). CAPS recommends an equity swap in which CWF would pay CAPS the return on the $30 million of ZYKT stock, while CAPS would pay CWF the return on $30 million of the S&P 500 Index, considered by all parties to be an acceptable proxy for a diversified portfolio. The payments will be made quarterly. CAPS mentions that technically the transaction would need an ending date. Anticipating the possibility of another transaction of this sort pending further donations by the Zykes family in about five years, the parties agree to set the maturity date of the swap at five years. The transaction entails no exchange of notional principal at the start or at the end of the life of the swap. Thus, CWF will maintain possession of the stock, including the voting rights. Exhibit 8 illustrates the structure of the transaction.

Exhibit 8 Diversifying a Concentrated Portfolio

So, CWF passes through the return on $30 million of ZYKT stock and receives the return on the S&P 500. Both parties, however, must keep in mind a number of considerations. One is that a cash flow problem could arise for CWF, which must make cash payments each quarter equal to the return on the ZYKT stock. Though CWF will receive cash payments equal to the return on the S&P 500, CWF will have a net cash outflow if ZYKT outperforms the S&P 500. In fact, it is quite possible that in some quarters, ZYKT will have a positive total return, necessitating a cash obligation, and the S&P 500 will have a negative total return. In that case, the cash payment that CAPS would ordinarily make to CWF for the S&P 500 return would actually be reversed: CWF would owe CAPS for the S&P 500. In short, CWF would owe on both legs of the swap. This possibility could pose a significant cash flow problem and might necessitate the actual sale of some ZYKT stock. The position would then be imbalanced because CWF would own less than $30 million of ZYKT stock but still owe payments on $30 million of ZYKT stock. Cash flow management can be a major difficulty in equity swaps.

EXAMPLE 8

The manager of a charitable foundation's $50 million stock portfolio is concerned about the portfolio's heavy concentration in one stock, Noble Petroleum (NBP). Specifically, the fund has $20 million of this stock as a result of a recent donation to the fund. She is considering using an equity swap to reduce the exposure to NBP and allow the fund to invest indirectly in the Wilshire 5000 Index. The stock is currently selling for $20 a share, and the fund owns 1 million shares. The manager is not quite ready to reduce all of the fund's exposure to NBP, so she decides to synthetically sell off one-quarter of the position. Explain how she would do this and identify some problems she might encounter.

Solution:

To reduce her exposure on one quarter of her NBP holdings, the manager would have the fund enter into a swap to sell the total return on $5 million of NBP stock, which is 250,000 shares. The fund will receive from the swap dealer the return on $5 million invested in the Wilshire 5000.

The swap may result in cash flow problems, however, because the fund must pay out the return on 250,000 shares of NBP stock but does not want to sell that stock. If the return received on $5 million invested in the Wilshire 5000 is significantly less than the return the fund pays, or if the return on the Wilshire is negative, the fund could have insufficient cash to make its payment. Then it might be forced to sell the stock, something it was trying to avoid in the first place.

Continuing with the example of ZYKT stock, what is the position of the dealer CAPS? It agrees to accept the return on ZYKT stock and pay the return on the S&P 500. This means it is long ZYKT and short the S&P 500. It is likely to hedge its position by buying the equivalent of the S&P 500 through either an index fund or an exchange-traded fund, and selling short ZYKT stock.[22] In fact, its short sale of the ZYKT stock is analogous to CWF selling the stock. CAPS effectively sells the stock for CWF. Also, CAPS is not likely to be able to sell all of the ZYKT stock at one time so it will probably do so over a period of a few days. CAPS may also have a cash flow problem on occasion. If it owes more on the S&P 500 payment than is due it on the ZYKT payment, CAPS may have to liquidate some S&P 500 stock.[23]

In addition, to make a profit CAPS would probably either not pay quite the full return on the S&P 500 stock or require that CWF pay slightly more than the full return on the ZYKT stock.

We see that equity swaps can be used to diversify a concentrated portfolio. Next we turn to a situation in which equity swaps can be used to achieve diversification on an international scale.

4.2 Achieving International Diversification

The benefits of international diversification are well documented. The correlations between foreign markets and domestic markets generally lead to greater diversification and more efficient investing. Nonetheless, many investors have not taken the step of diversifying their portfolios across international boundaries. Here we shall take a look at a situation in which equity swaps can facilitate the transition from domestic to global diversification.

22 Instead of buying or selling short stock, it could use any of a variety of derivative strategies in which it would benefit from a decrease in the price of ZYKT relative to the S&P 500.

23 To make matters worse, if the S&P goes up and ZYKT goes down, it will owe both sets of payments.

In this example, Underscore Retirement Management (USRM) is responsible for a $500 million fund of retirement accounts in the United States. It has never diversified internationally, investing all of its funds in US stock. Representing US large-, medium- and small-cap stocks, the Russell 3000 Index is the portfolio's benchmark. USRM has decided that it needs to add non-US stocks to its portfolio. It would like to start by selling 10 percent of its US stock and putting the funds in non-US stock. Its advisor, American Global Bank (AGB), has suggested that an equity swap would be a better way to do this than to transact in the stock directly. AGB often deals in non-US stock and has subsidiaries and correspondent relationships in many countries to facilitate the transactions. It is capable of transacting in all stock at lower costs than its clients, and can pass on those savings through derivative transactions.

AGB suggests an equity swap with quarterly payments in which USRM would pay it the return on $50 million of the Russell 3000 Index. USRM would presumably generate this return from the portfolio it holds. AGB would, in turn, pay USRM the return on $50 million invested in the Morgan Stanley Capital International (MSCI) EAFE Index, which provides broad coverage of equity markets in Europe, Australasia, and the Far East. This transaction would result in USRM giving up some diversified domestic stock performance and receiving diversified international stock performance. Exhibit 9 illustrates the structure of the transaction.

Exhibit 9 Achieving International Diversification

USRM must also consider a number of additional factors. The points made in Section 4.1 regarding the possibility of negative cash flow are highly relevant here as well, and we shall not repeat them. In addition, USRM's domestic stock holding generates a return that will not match perfectly the return on the Russell 3000. This difference in returns, in which the performance of an index does not match the performance of a portfolio that is similar to the index, results in a tracking error. In an extreme case, the domestic stock may go down while the Russell index goes up, which could pose a serious cash flow problem for USRM. USRM may be able to quantify this problem and find that it can effectively manage it. Otherwise, this concern could be an important one for USRM to weigh against the benefits of doing this transaction, which are primarily the savings in transaction costs on the domestic side and on the foreign side. In addition, AGB has currency risk and market risk and passes on to USRM its costs of hedging that risk.

EXAMPLE 9

A Canadian trust fund holds a portfolio of C$300 million of Canadian domestic stock. The manager would like to sell off C$100 million and invest the funds in a pan-European portfolio. The manager arranges to do so using an equity swap in which the domestic stock is represented by the Toronto 300 Composite and the European portfolio is represented by the Dow Jones Euro STOXX 50, an index of leading stocks in the eurozone. Explain how to structure such a swap, and describe how tracking error could potentially interfere with the success of the transaction.

Solution:

The swap would specify the following transactions on a periodic basis for a specific number of years:

- receive return on DJ Euro STOXX 50,
- pay return on Toronto 300.

Tracking error here is the failure of the derivative cash flow to match precisely the cash flow from the underlying portfolio. In this case, tracking error means that the return actually earned on the domestic portfolio is not likely to perfectly match the Toronto 300 return. These returns are supposed to offset, but they are not likely to do so, certainly not with perfection. The return received on the DJ Euro STOXX 50 does not give rise to tracking error concerns. The index will simply represent the return on the investment in European stocks. If an actual investment in European stocks were made, it would likely differ from this return.

We see in this example that a company can use an equity swap to change its asset allocation. Indeed, an asset allocation change is the major use of equity swaps. In the next section, we shall see a company use equity swaps, combined with a similar swap based on a fixed-income instrument, to implement an asset allocation change. This fixed-income swap will be a slightly new and different instrument from what we have already seen.

4.3 Changing an Asset Allocation between Stocks and Bonds

Consider an investment management firm called Tactical Money Management (TMM). It is interested in changing the asset allocation on a $200 million segment of its portfolio. This money is invested 75 percent in domestic stock and 25 percent in US government and corporate bonds. Within the stock sector, the funds are invested 60 percent in large cap, 30 percent in mid cap, and 10 percent in small cap. Within the bond sector, the funds are invested 80 percent in US government and 20 percent in investment-grade corporate bonds. TMM would like to change the overall allocation to 90 percent stock and 10 percent bonds. Within each class, TMM would also like to make some changes. Specifically, TMM would like to change the stock allocation to 65 percent large cap and 25 percent mid cap, leaving the small-cap allocation at 10 percent. It would like to change the bond allocation to 75 percent US government and 25 percent investment-grade corporate. TMM knows that these changes would entail a considerable amount of trading in stocks and bonds. Below we show the current position, the desired new position, and the necessary transactions to get from the current position to the new position:

Stock	Current ($150 Million, 75%)	New ($180 Million, 90%)	Transaction
Large cap	$90 million (60%)	$117 million (65%)	Buy $27 million
Mid cap	$45 million (30%)	$45 million (25%)	None
Small cap	$15 million (10%)	$18 million (10%)	Buy $3 million

Bonds	Current ($50 Million, 25%)	New ($20 Million, 10%)	Transaction
Government	$40 million (80%)	$15 million (75%)	Sell $25 million
Corporate	$10 million (20%)	$5 million (25%)	Sell $5 million

TMM decides it can execute a series of swaps that would enable it to change its position temporarily, but more easily and less expensively than by executing the transactions in stock and bonds. It engages a dealer, Dynamic Derivatives Inc. (DYDINC), to perform the swaps. The return on the large-cap sector is represented by the return on $27 million invested in the S&P 500 (SP500) Index. Note that the mid-cap exposure of $45 million does not change, so we do not need to incorporate a mid-cap index into the swap. The return on the small-cap sector is represented by the return on $3 million invested in the S&P Small Cap 600 Index (SPSC). The return on the government bond sector is represented by the return on $25 million invested in the Lehman Long Treasury Bond index (LLTB), and the return on the corporate bond sector is represented by the return on $5 million invested in the Merrill Lynch Corporate Bond index (MLCB). Note that for the overall fixed-income sector, TMM will be reducing its exposure.

TMM must decide the frequency of payments and the length of the swap. Equity swap payments tend to be set at quarterly intervals. Fixed-income payments in the form of coupon interest tend to occur semiannually. TMM could arrange for quarterly equity swap payments and semiannual fixed-income swap payments. It decides, however, to structure the swap to have all payments occur on the same dates six months apart. The length of the swap should correspond to the period during which the firm wants this new allocation to hold. TMM decides on one year. Should it wish to extend this period, TMM would need to renegotiate the swap at expiration. Likewise, TMM could decide to unwind the position prior to one year, which it could do by executing a new swap with opposite payments for the remainder of the life of the original swap.

The equity swaps in this example involve receiving payments tied to the SP500 and the SPSC and making either fixed payments or floating payments tied to Libor. Let us start by assuming that the equity swap payments will be paired with Libor -based floating payments. For the fixed-income payments, however, TMM needs a slightly different type of swap—specifically, a fixed-income swap. This instrument is exactly like an equity swap, but instead of the payment being tied to a stock or stock index, it is tied to a bond or bond index. This type of swap is not the same as an interest rate swap, which involves payments tied to a floating rate such as Libor. Fixed-income swaps, like equity swaps, require the payment of the total return on a bond or bond index against some other index, such as Libor. They are very similar to equity swaps in many respects: The total return is not known until the end of the settlement period, and because the capital gain can be negative, it is possible for the overall payment to be negative. In contrast to equity swaps, however, fixed-income swaps are more

dominated by the fixed payment of interest. For equities, the dividends are small, not fixed, and do not tend to dominate capital gains. Other than the amounts paid, however, fixed-income swaps are conceptually the same as equity swaps.[24]

The swaps are initially structured as follows:

Equity swaps

Receive return on SP500 on $27 million

Pay Libor on $27 million

Receive return on SPSC on $3 million

Pay Libor on $3 million

Fixed-income swaps

Receive Libor on $25 million

Pay return on LLTB on $25 million

Receive Libor on $5 million

Pay return on MLCB on $5 million

Note that the overall position involves no Libor payments. TMM pays Libor on $27 million and on $3 million from its equity swaps, and it receives Libor on $25 million and on $5 million from the fixed-income swaps. Therefore, the Libor payments can be eliminated. Furthermore, the equity and fixed-income swaps can be combined into a single swap with the following payments:

Receive return on SP500 on $27 million

Receive return on SPSC on $3 million

Pay return on LLTB on $25 million

Pay return on MLCB on $5 million

This combined equity/fixed-income swap is a single transaction that accomplishes TMM's objective. Exhibit 10 illustrates the overall transaction.

Exhibit 10 Changing an Asset Allocation

24 Fixed-income swaps, when referred to as total return swaps, are a form of a credit derivative.

Of course, this transaction will not completely achieve TMM's goals. The performance of the various sectors of its equity and fixed-income portfolios are not likely to match perfectly the indexes on which the swap payments are based. This problem is what we referred to previously as tracking error. In addition, TMM could encounter a cash flow problem if its fixed-income payments exceed its equity receipts and its portfolio does not generate enough cash to fund its net obligation. The actual stock and bond portfolio will generate cash only from dividends and interest. The capital gains on the stock and bond portfolio will not be received in cash unless a portion of the portfolio is liquidated. But avoiding liquidation of the portfolio is the very reason that TMM wants to use swaps.[25]

EXAMPLE 10

A $30 million investment account of a bank trust fund is allocated one-third to stocks and two-thirds to bonds. The portfolio manager wants to change the overall allocation to 50 percent stock and 50 percent bonds, and the allocation within the stock fund from 70 percent domestic stock and 30 percent foreign stock to 60 percent domestic and 40 percent foreign. The bond allocation will remain entirely invested in domestic corporate issues. Explain how an equity swap could be used to implement this adjustment. You do not need to refer to specific stock indexes.

Solution:

Currently the allocation is $10 million stock and $20 million bonds. Within the stock category, the current allocation is $7 million domestic and $3 million foreign. The desired allocation is $15 million stock and $15 million bonds. Thus, the allocation must change by moving $5 million into stock and out of bonds. The desired stock allocation is $9 million domestic and $6 million foreign. The desired bond allocation is $15 million, all domestic corporate.

To make the change with a swap, the manager must enter into a swap to receive the return on $5 million based on a domestic equity index and pay the return on $5 million based on a domestic corporate bond index. The $5 million return based on a domestic equity index should be allocated such that $2 million is based on domestic stock and $3 million is based on foreign stock.

So far we have seen that an equity swap can be used to reduce or increase exposure to a stock or stock index. One type of investor that is highly exposed to the performance of a single stock is a corporate insider. In the following section, we examine a swap strategy that has been increasingly used in recent years to reduce such exposure.

4.4 Reducing Insider Exposure

Michael Spelling is the founder and sole owner of a US-based company called Spelling Software and Technology (SPST). After founding the company about 10 years ago, Spelling took it public 2 years ago and retains significant ownership in the form of 10,200,000 shares, currently valued at $35 a share, for a total value of $357 million, which represents about 10 percent of the company. Spelling wants to retain this degree of control of the company, so he does not wish to sell any of his shares. He is concerned, however, that his personal wealth is nearly 100 percent exposed to the fortunes of a single company.

25 Even worse would be if its fixed-income payments were positive and its equity receipts were negative.

A swap dealer called Swap Solutions Inc. (SSI) approaches Spelling about a strategy that it has been using lately with much success. This transaction involves an equity swap whereby Spelling would pay the dealer the return on some of his shares in SPST and receive a diversified portfolio return. Spelling finds the idea intriguing and begins thinking about how he would like to structure the arrangement. He decides to initially base the transaction on 500,000 shares of stock, about 4.9 percent of his ownership. If he is satisfied with how the strategy works, he may later increase his commitment to the swap. At $35 a share, this transaction has an exposure of $17.5 million. Specifically, Spelling will pay the total return on 500,000 shares of SPST stock and receive a diversified portfolio return on $17.5 million. He decides to split the diversified return into 80 percent stock and 20 percent bonds. The former will be represented by the return on $14.0 million invested in the Russell 3000, and the latter will be represented by the return on $3.5 million invested in the Lehman Brothers Government Bond Index (LGB). The payments will occur quarterly for two years, at which time Spelling will re-evaluate his position and may choose to extend the swap, terminate it, or change the allocation or other terms.

Exhibit 11 illustrates the structure of the swap. Spelling achieves his objectives, but he must consider some important issues in addition to the cash flow problem we have already mentioned. One is that under US law, this transaction is considered an insider sale and must be reported to the regulatory authorities. Thus, there is some additional paperwork. Shareholders and potential investors may consider the sale a signal of bad prospects for the company. US tax laws also require that the synthetic sale of securities through equity swaps forces a termination of the holding period on the stock. Hence, this transaction has no tax advantages. Spelling will also want to consider the fact that he has sold off some of his exposure but retains control. Shareholders will surely resent the fact that Spelling controls 500,000 votes but does not have any exposure to this stock.[26] Of course, he still retains exposure to 9.7 million shares.

Exhibit 11 Reducing Insider Exposure

26 An interesting question in this regard is whether the shareholders would actually know that the executive had done such a transaction. Careful research is required to identify that executives have made these transactions.

EXAMPLE 11

The CEO of a corporation owns 100 million shares of his company's stock, which is currently priced at €30 a share. Given the tremendous exposure of his personal wealth to this one company, he has decided to sell 10 percent of his position and invest the funds in a floating interest rate instrument. A derivatives dealer suggests that he do so using an equity swap. Explain how to structure such a swap.

Solution:

The swap is structured so that the executive pays the return on 10 million shares, which is 10 percent of his holdings, of the company's stock and receives the return based on a floating interest rate, such as Libor, on a notional principal of €300 million.

Equity swaps of this sort can be a significant concern for financial analysts. Their possible use makes it difficult to determine if executives have the full exposure represented by the number of shares they own.

Equity swaps involving executives can also have significant agency cost implications. A company incurs agency costs when an executive does not act on behalf of shareholders. Consider the extreme case of an executive who owns more than 50 percent of a company but who reduces her equity exposure to zero with equity swaps. The executive retains full control of the company, although she has eliminated her equity exposure. This action could entail significant costs to outside shareholders, as the executive does not bear any of the costs of actions or expenditures that increase her personal welfare at the expense of the company. Of course, executives are unlikely to sell off all of their exposure, but the elimination of any exposure on shares still retained for control purposes raises significant questions about whether an executive would act in the best interests of the shareholders. The executive's incentive to perform well would certainly be reduced.

In Sections 2, 3, and 4, we examined the use of interest rate swaps, currency swaps, and equity swaps for managing risk. In the following section, we examine strategies involving the use of swaptions to manage risk.

STRATEGIES AND APPLICATIONS USING SWAPTIONS 5

A swaption is an option to enter into a swap. Although there are swaptions to enter into equity, currency, and commodity swaps, we will focus exclusively on swaptions to enter into interest rate swaps, which is by far the largest swaptions market. Let us briefly review swaptions.

First, recall that there are two types of swaptions, payer swaptions and receiver swaptions, which are analogous to puts and calls. A payer swaption is an option that allows the holder to enter into a swap as the fixed-rate payer, floating-rate receiver. A receiver swaption is an option that allows the holder to enter into a swap as the fixed-rate receiver, floating-rate payer. In both cases, the fixed rate is specified when the option starts. The buyer of a swaption pays a premium at the start of the contract and receives the right to enter into a swap. The counterparty is the seller of the swaption. The seller receives the premium at the start and grants the right to enter into the swap at the specified fixed rate to the buyer of the swaption. A swaption can be European style or American style, meaning that it can be exercised only at expiration (European) or at any time prior to expiration (American). We shall illustrate applications of both.

A swaption is based on an underlying swap. The underlying swap has a specific set of terms: the notional principal, the underlying interest rate, the time it expires, the specific dates on which the payments will be made, and how the interest is calculated. *All* of the terms of the underlying swap must be specified. Although an ordinary option on an asset has an exercise *price*, a swaption is more like an interest rate option in that it has an exercise *rate.* The exercise rate is the fixed rate at which the holder can enter into the swap as either a fixed-rate payer or fixed-rate receiver. When a swaption expires, the holder decides whether to exercise it based on the relationship of the then-current market rate on the underlying swap to the exercise rate on the swaption. A swaption can be exercised either by actually entering into the swap or by having the seller pay the buyer an equivalent amount of cash. The method used is determined by the parties when the contract is created.

For example, suppose the underlying swap is a three-year swap with semiannual payments with Libor as the underlying floating rate. Consider a payer swaption, which allows entry into this swap as the fixed-rate payer, with an exercise rate of 7 percent. At expiration, let us say that three-year, semiannual-pay Libor swaps have a fixed rate of 7.25 percent. If the holder exercises the swaption, it enters a swap, agreeing to pay a fixed rate of 7 percent and receive a floating rate of Libor. If the holder has another position for which it might want to maintain the swap, it might simply hold the swap in place. If the holder does not want to maintain the swap, it can enter into a swap in the market, specifying the opposite set of payments—it can pay Libor and receive the market fixed rate of 7.25 percent. If this swap is done with a different counterparty than the swaption seller, then the two sets of Libor payments are made but are equivalent in amount. Then the payer swaption holder finds itself with a stream of cash flows consisting of 7 percent payments and 7.25 percent receipts, for a net overall position of an annuity of 0.25 percent, split into 0.125 percent twice a year, for three years. If this swap at the market rate of 7.25 percent is done with the swaption seller, the two parties are likely to agree to offset the Libor payments and have the swaption seller pay the holder the stream of payments of 0.125 percent twice a year. If the parties settle the contract in cash, the swaption seller pays the swaption holder the present value of a series of six semiannual payments of 0.125 percent.

A swaption can also be viewed as an option on a coupon bond. Specifically, a payer swaption with exercise rate x in which the underlying is a swap with notional principal P and maturity of N years at the swaption expiration is equivalent to an at-the-money put option in which the underlying is an N-year bond at expiration with a coupon of x percent. Likewise, a receiver swaption is analogous to an at-the-money call option on a bond. These identities will be useful in understanding swaption strategies.

5.1 Using an Interest Rate Swaption in Anticipation of a Future Borrowing

We have illustrated extensively the use of swaps to convert fixed-rate loans to floating-rate loans and vice versa. We now consider a situation in which a company anticipates taking out a loan at a future date. The company expects that the bank will require the loan to be at a floating rate, but the company would prefer a fixed rate. It will use a swap to convert the payment pattern of the loan. A swaption will give it the flexibility to enter into the swap at an attractive rate.

In this section, we will use the notation FS(1,3) for the fixed rate on a swap established at time 1 and ending at time 3.

Benelux Chemicals (BCHEM) is a Brussels-based industrial company that often takes out floating-rate loans. In the course of planning, BCHEM finds that it must borrow €10 million in one year at the floating rate of Euribor, the rate on euros in Frankfurt, from the Antwerp National Bank (ANB). The loan will require semiannual

payments for two years. BCHEM knows that it will swap the loan into a fixed-rate loan, using the going rate for two-year Euribor-based swaps at the time the loan is taken out. BCHEM is concerned that interest rates will rise before it takes out the loan. DTD, a Rotterdam derivatives dealer, approaches BCHEM with the idea of doing a European-style swaption. Specifically, for a cash payment up front of €127,500, BCHEM can obtain the right to enter into the swap in one year as a fixed-rate payer at a rate of 7 percent. BCHEM decides to go ahead with the deal; that is, it buys a 7 percent payer swaption.

Exhibit 12 illustrates this transaction. In Panel A, BCHEM pays DTD €127,500 in cash and receives the payer swaption. In Panel B, we examine what happens starting when the swaption expires one year later. Note first that regardless of the outcome of the swaption, BCHEM will make floating interest payments of Euribor (180/360)€10 million on its loan.[27] In Part (i) of Panel B, we assume that at expiration of the swaption, the rate in the market on the underlying swap, FS(1,3), is greater than the swaption exercise rate of 7 percent. In this case, the swaption is worth exercising.[28] BCHEM enters into the swap with DTD, thereby making payments of 0.07(180/360)€10 million and receiving payments of Euribor (180/360)€10 million.[29] Both streams of floating payments at Euribor are made, but the payment from DTD exactly offsets the payment to ANB. BCHEM is left paying 7 percent fixed.

27 Again, recall that being a floating rate, Euribor is set at the beginning of the settlement period, and the payment is made at the end of that period.

28 To review, remember that at the swaption expiration in one year, which we denote as time 1, the underlying swap is a two-year swap. If the fixed rate on a two-year swap is higher than the rate at which the swaption holder can pay to enter a two-year swap, the swaption is in-the-money. Its value at that point is the present value of a stream of payments equal to the difference between the market fixed rate and the exercise rate on the swaption.

29 The swap payments would, of course, be netted, but that fact does not affect the point we are making here.

Exhibit 12 Using a Swaption in Anticipation of a Future Borrowing

In Part (ii) of Panel B, at expiration of the swaption, the rate in the market on the underlying swap, FS(1,3), is less than or equal to the swaption exercise rate of 7 percent. The swaption, therefore, expires out-of-the-money. BCHEM still enters into a swap with DTD but does so at the market rate of FS(1,3), which is less than 7 percent and the payments are less than €350,000. Of course, both sets of Euribor payments must be made on the loan.

Thus, BCHEM obtained the advantage of flexibility, the right to pay a fixed rate of 7 percent or less. Of course, this right does not come without a cost. BCHEM had to pay a premium of €127,500 for that right. Therefore, when the loan was taken out one year after the swaption was purchased, the €10 million received was effectively reduced by the €127,500 paid one year earlier plus one year's interest. Whether this premium would be worth paying depends on whether the swaption is correctly priced.[30] Whether this premium was worth it after the fact depends on how far the market rate ended above 7 percent at the time the loan was taken out.

30 The basic idea behind swaption pricing is that a model would be used to obtain a fair price for the swaption, to which the market price of €127,500 would be compared.

EXAMPLE 12

A company plans to take out a $10 million floating-rate loan in two years. The loan will be for five years with annual payments at the rate of Libor. The company anticipates using a swap to convert the loan into a fixed-rate loan. It would like to purchase a swaption to give it the flexibility to enter into the swap at an attractive rate. The company can use a payer or a receiver swaption. Assume that the exercise rate would be 6.5 percent.

A Identify what type of swaption would achieve this goal and whether the company should buy or sell the swaption.

B Calculate the company's annual cash flows beginning two years from now for two cases: The fixed rate on a swap two years from now to terminate five years later, FS(2,7), is 1) greater or 2) not greater than the exercise rate. Assume the company takes out the $10 million floating-rate loan as planned.

C Suppose that when the company takes out the loan, it has changed its mind and prefers a floating-rate loan. Now assume that the swaption expires in-the-money. What would the company do, given that it now no longer wants to convert to a fixed-rate loan?

Solution to A:

The company wants the option to enter into the swap as a fixed-rate payer, so the company would buy a payer swaption.

Solution to B:

The outcomes based on the swap rate at swaption expiration, denoted as FS(2,7), are as follows:

FS(2,7) > 6.5 percent
Exercise the swaption, entering into a swap. The annual cash flows will be as follows:

Pay 0.065($10 million) = $650,000 on swap

Receive L($10 million) on swap

Pay L($10 million) on loan

Net, pay $650,000

FS(2,7) ≤ 6.5 percent
Do not exercise swaption; enter into swap at market rate. The annual cash flows will be as follows:

Pay FS(2,7)($10 million) on swap

Receive L($10 million) on swap

Pay L($10 million) on loan

Net, pay FS(2,7)($10 million)

(Note: This is less than $650,000)

Solution to C:

In this situation, the company has changed its mind about converting the floating-rate loan to a fixed-rate loan. If the swaption expires out-of-the-money, the company will simply take out the floating-rate loan. If the swaption expires in-the-money, it has value and the company should not fail to exercise it. But exercising the swaption will initiate a swap to pay fixed and receive floating, which would leave the company in the net position of paying a fixed rate of 6.5 percent when it wants a floating-rate loan. The company would exercise

the swaption and then enter into the opposite swap in the market, receiving a fixed rate of FS(2,7) and paying L. The net effect is that the company will pay 6.5 percent, receive FS(2,7), which is more than 6.5 percent, and pay L. So in effect it will pay a floating-rate loan of less than Libor.

In this example, we showed how a swaption is used to create a swap. Similarly, a swaption can be used to terminate a swap.

5.2 Using an Interest Rate Swaption to Terminate a Swap

When a company enters a swap, it knows it may need to terminate the swap before the expiration day. It can do so by either entering an offsetting swap or buying a swaption.

As with any over-the-counter option, the holder of a swap can terminate the swap by entering into an identical swap from the opposite perspective at whatever rate exists in the market. Consider, for example, a Japanese company that enters into a five-year ¥800 million notional principal swap in which it pays a fixed rate and receives a floating rate; that is, it enters a pay-fixed swap. Two years later, the company wants to terminate the swap. It can do so by entering into a new swap with a notional principal of ¥800 million, a remaining life of three years, and with the company paying the floating rate and receiving the fixed rate. If it engages in this swap with a different counterparty than the counterparty of the original swap, then both swaps would remain in place, but the floating payments would be equivalent. The net effect would be that the company would make a stream of fixed payments at one rate and receive a stream of fixed payments at another rate. The rate that is greater depends on the course of interest rates since the time the original swap was put into place. If the new swap is done with the same counterparty as in the original swap, the two parties would likely agree to offset and eliminate both swaps. Then one party would be paying the other a lump sum of the present value of the difference between the two streams of fixed payments. If the company offsets the swap with a new swap in this manner, it must accept the conditions in the market at the time it offsets the swap.

The second way of terminating a swap is for a company to buy a swaption before it wants to offset the swap. Suppose that when this Japanese company enters into a pay-fixed, receive-floating swap, it also purchases a receiver swaption that allows it to enter into an ¥800 million swap to receive fixed and pay floating with the same terms as the original swap. The swaption exercise rate is 8 percent. The company must pay cash up front for the swaption, but it then has the right to enter into a new swap to receive a fixed rate of 8 percent and pay the floating rate. We assume for maximum flexibility that the swaption is structured as an American-style option, allowing the company to exercise it at any time. We also assume that the swaption counterparty is the counterparty to the swap, so that if the swaption is exercised, the payments can be canceled and replaced by a lump sum payment.

Consider this example. Internet Marketing Solutions (IMS) takes out a $20 million one-year loan with quarterly floating payments at Libor from a lender called Financial Solutions (FINSOLS). Fearing an increase in interest rates, IMS engages in a pay-fixed, receive-floating swap that converts the loan into a fixed-rate loan at 8 percent. IMS believes, however, that the interest rate outlook could change, and it would like the flexibility to terminate the swap, thereby returning to the status of a floating-rate payer. To give it this flexibility, IMS purchases an American-style receiver swaption for $515,000. The swaption allows it to enter into a receive-fixed, pay-floating swap at a fixed rate of 8 percent at the swaption expiration. The swap and swaption counterparty is Wheatstone Dealer (WHD).

Exhibit 13 illustrates this transaction. In Panel A, IMS takes out the loan from FINSOLS, receiving $20 million. It engages in the swap with WHD, thereby committing to pay fixed and receive Libor. There are no cash flows at the start of the swap contract, but IMS pays WHD $515,000 for the swaption. Now let us move to the expiration of the swaption, at which time we shall assume that IMS is no longer concerned about rising interest rates and would like to return to the status of a floating-rate borrower. In Panel B(i), at the expiration of the swaption, the market swap rate is greater than or equal to 8 percent. This panel shows the cash flows if the loan plus swap (note that the loan is floating rate) is converted to a fixed rate using the market fixed rate because the swaption is out-of-the-money. IMS makes interest payments of Libor(90/360)$20 million to FINSOLS. IMS makes a swap payment of 8 percent, which is $400,000, to WHD, which pays Libor.[31] Thus, to offset the effect of the pay-fixed swap, IMS is better off entering a new swap rather than exercising its swaption. IMS then enters into a swap to receive the market fixed rate, FS, which is greater than or equal to 8 percent, and pay Libor. IMS is, in effect, paying a floating rate less than Libor (or equal to Libor if the market swap rate is exactly 8 percent).[32]

In Panel B(ii), the market swap rate is less than 8 percent and the loan is converted back to a floating-rate loan by exercising the swaption. IMS makes loan interest payments at Libor to FINSOLS and swap payment of 8 percent or $400,000 to WHD, which pays LIBOR. Exercise of the swaption results in IMS entering into a swap to receive a fixed rate of 8 percent and pay a floating rate of Libor. The swap and swaption would probably be structured to offset and terminate both swaps. At the end of the transaction, the loan is paid off and there are no payments on the swap or swaption. If IMS wants to continue as a fixed-rate payer, the swaption would still be exercised if it is in-the-money but not if it is out-of-the-money.

31 In practice, the two parties would net the difference and have one party pay the other.

32 In practice, IMS might choose to not enter into the swap at the market fixed rate and just carry the old swap to reduce the cost of the loan.

Exhibit 13 Using an American-Style Swaption to Terminate a Swap

We see that the swaption offers the holder the opportunity to terminate the swap at the exercise rate or better. Because the swaption is American style, a variety of complex issues are involved in the exercise decision, but let us focus on the moneyness and the holder's view of market conditions. If a borrower feels that rates will fall, it would then want to convert its pay-fixed position to a pay-floating position. If the market rate is more than the exercise rate, the borrower can do so by entering into a swap at the market rate. It can then receive more than the exercise rate, which more than offsets the rate it pays on the swap. The borrower would then effectively

be paying less than Libor. If the rate in the market is less than the exercise rate, the borrower can exercise the swaption, thereby receiving the exercise rate to offset the rate it pays on the swap. Alternatively, it can choose to continue paying a floating rate but can still exercise the swaption if doing so is optimal.

As we previously described, swaptions are equivalent to options on bonds. A payer swaption is equivalent to a put option on a bond, and a receiver swaption is equivalent to a call option on a bond. The interest rate swaptions market is a very liquid one, and many companies use swaptions as substitutes for options on bonds. Any strategy that one might apply with options on bonds can be applied with swaptions. We shall not go over the myriad of such strategies, as they have been covered extensively in other literature. We shall, however, look at a particular one, in which a swaption can be used to substitute for a callable bond.

EXAMPLE 13

A company is engaged in a two-year swap with quarterly payments. It is paying 6 percent fixed and receiving Libor. It would like the flexibility to terminate the swap at any time prior to the end of the two-year period.

A Identify the type of swaption that would achieve this objective.

B Consider a time t during this two-year life of the swaption in which it is being considered for exercise. Use a 7 percent exercise rate. The fixed rate in the market on a swap that would offset the existing swap is denoted as FS(t,2). Examine the payoffs of the swaption based on whether FS(t,2) is 1) equal to or above 7 percent or 2) below 7 percent.

Solution to A:

Because the company is paying a fixed rate and receiving a floating rate, it should enter into a swap to receive a fixed rate and pay a floating rate. It thus would want a receiver swaption. For maximum flexibility, it should structure the transaction as an American-style swaption.

Solution to B:

FS(t,2) ≥ 7 percent

The swaption is out-of-the-money and is not exercised. To terminate the existing swap, one would enter into a swap at the market rate. This swap would involve receiving the market rate FS(t,2), which is at least 7 percent, and paying Libor. The Libor payments offset, and the net effect is a net positive cash flow of FS(t,2) – 6 percent.

FS(t,2) < 7 percent

Exercise the swaption, entering into a swap to receive 7 percent and pay Libor. The other swap involves paying 6 percent and receiving Libor. The Libors offset, leaving a net positive cash flow of 7 – 6 = 1 percent.

Note: It is not necessary that the net cash flow be positive. The positive net cash flow here is a result of choosing a 7 percent exercise rate, but a lower exercise rate could be chosen. The higher the exercise rate, the more expensive the receiver swaption.

5.3 Synthetically Removing (Adding) a Call Feature in Callable (Noncallable) Debt

A callable bond is a bond in which the issuer has the right to retire it early. The issuer has considerable flexibility to take advantage of declining interest rates. This feature is like a call option on the bond. As interest rates fall, bond prices rise. By calling the bond, the issuer essentially buys back the bond at predetermined terms, making it equivalent to exercising a call option to buy the bond. The issuer pays for this right by paying a higher coupon rate on the bond.

In some cases, the issuer of a callable bond may find that it no longer expects interest rates to fall sufficiently over the remaining life of the bond to justify calling the bond. Then it would feel that it is not likely to use the call feature, but it is still paying the higher coupon rate for the call feature. A swaption can be used to effectively sell the embedded call. This strategy involves synthetically removing the call from callable debt by selling a receiver swaption.[33] A receiver swaption (receive fixed) becomes more valuable as rates decline, thus balancing the short call. In effect, the call feature is sold for cash. Recall that a receiver swaption is like a call option on a bond. Because the issuer of the callable bond holds a call on the bond, it would need to sell a call to offset the call embedded in the debt. It can effectively do so by selling a receiver swaption. This swaption will not cancel the bond's call feature. Both options will be in force, but both options should behave identically. If the call feature is worth exercising, so should the swaption. Let us see how this strategy works.

5.3.1 *Synthetically Removing the Call from Callable Debt*

Several years ago, Chemical Industries (CHEMIND) issued a callable $20 million face value bond that pays a fixed rate of 8 percent interest semiannually. The bond now has five years until maturity. CHEMIND does not believe it is likely to call the bond for the next two years and would like to effectively eliminate the call feature during that time. To simplify the problem somewhat, we shall assume that the bond would be called only in exactly two years and not any time sooner. Thus, CHEMIND can manage this problem by selling a European swaption that would expire in two years.[34] Because the bond would have a three-year life when it is called, the swap underlying the swaption would be a three-year swap. It would also be a swap to receive fixed and pay floating, with payment dates aligned with the interest payment dates on the bond.

Let us suppose that the 8 percent rate CHEMIND is paying on the bond includes a credit spread of 2.5 percent, which should be viewed as a credit premium paid over the Libor par rate. CHEMIND is paying 2.5 percent for the credit risk it poses for the holder of the bond. On the receiver swaption it wants to sell, CHEMIND must set the exercise rate at 8 – 2.5 = 5.5 percent. Note that the credit spread is not part of the exercise rate. The swaption can be used to manage only the risk of interest rate changes driven by the term structure and not credit. We are assuming no change in CHEMIND's credit risk. Hence, it will continue to pay the credit spread in the rate on the new bond that it issues if it calls the old bond.

The swaption dealer, Top Swaps (TSWAPS), prices the swaption at $425,000. The strategy is illustrated in Exhibit 14.

33 This strategy is sometimes referred to as *monetizing* a call.

34 CHEMIND might prefer an American swaption to give it the flexibility to exercise at any time, but we simplify the problem a little and use a European swaption.

Exhibit 14 Selling a Receiver Swaption to Offset the Call Feature on a Bond

Panel A shows that CHEMIND receives $425,000 from selling the receiver swaption to dealer TSWAPS. This cash effectively reduces its remaining interest payments on the bond. In Panel B, we see what happens at the swaption expiration in two years. Remember that the swaption is identical to a call option on the bond, so if the swaption is exercised, the call on the bond will be exercised at the same time. Let FS(2,5) be the fixed rate at the swaption expiration on a three-year swap. We first assume that FS(2,5) is greater than or equal to the exercise rate on the swaption of 5.5 percent. Because interest rates have not fallen below 5.5 percent, it is unprofitable to exercise the swaption or call the bond. CHEMIND continues making interest payments of 8 percent on $20 million, which is $800,000 semiannually for three more years. Panel B(i) illustrates this outcome.

In Panel B(ii), we let FS(2,5) be less than 5.5 percent. Then the swaption will be exercised and the bond will be called. To fund the bond call, a new bond will be issued at a rate of FS(2,5) plus the credit spread of 2.5 percent, which we assume has not

changed. The swaption is exercised, so CHEMIND is obligated to enter into a swap to pay 5.5 percent and receive Libor. Now, however, CHEMIND is receiving Libor and making fixed payments to its bondholders and to TSWAPS. It can reverse the Libor flow by entering into a swap at the market rate of FS(2,5). In other words, it enters into a new swap to receive FS(2,5) and pay Libor. Note from the figure that it receives Libor and pays Libor. These two flows would likely be canceled. CHEMIND makes fixed swap payments at a rate of 5.5 percent and receives fixed swap payments at a rate of FS(2,5), which is 250 basis points (the credit spread) less than the rate on the new fixed rate bond it has issued. These payments at the rate FS(2,5) offset all but the credit spread portion of the interest payments on its loan. CHEMIND then effectively pays a fixed rate of 5.5 percent, the swaption exercise rate, plus 2.5 percent, the credit spread. So, CHEMIND ends up paying 8 percent, the same as the rate on the original debt. The swaption has effectively converted the callable bond into a noncallable bond by removing the call feature from the bond. It hopes that this outcome, in which the bond is called and the swaption is exercised, does not occur, or it will regret having removed the call feature. Nonetheless, it received cash up front for the swaption and is paying a lower effective interest rate as it would had the bond been noncallable in the first place, so it must accept this risk.

5.3.2 *Synthetically Adding a Call to Noncallable Debt*

If a swaption can undo a call feature, it can also add a call feature. Market Solutions, Inc. (MSI) has a $40 million noncallable bond outstanding at a rate of 9 percent paid semiannually with three more years remaining. Anticipating the possibility of declining interest rates in about one year, MSI wishes this bond were callable. It can synthetically add the call feature by purchasing a receiver swaption. A receiver swaption is equivalent to a call option on a bond because the option to receive a fixed rate increases in value as rates decline. By purchasing the receiver swaption, it has in effect purchased an option on the bond.

To structure the receiver swaption properly, MSI notes that the interest rate it is paying on the bond includes a credit spread of 3 percent over the par bond rate from the Libor term structure. It should set the exercise rate on the swaption at 9 – 3 = 6 percent. The swaption will be on a two-year swap with payment dates coinciding with the interest payment dates on the bond. The notional principal will be the $40 million face value on the bond. To simplify the problem, we assume a European swaption, meaning that the only time MSI will consider exercising the swaption or calling the bond will be in exactly one year, with the bond having two years to maturity at that time. The swaption will cost $625,000, and the counterparty dealer will be Swap Shop (SWSHP). Exhibit 15 illustrates the transaction.

Exhibit 15 Buying a Receiver Swaption to Add a Call Feature to a Bond

In Panel A, we see MSI paying $625,000 for the swaption. This cost effectively raises the interest rate MSI pays on the bond to that of a callable bond. Panel B(i) illustrates the case in which the fixed rate on the underlying swap, FS(1,3), is greater than or equal to the exercise rate on the swaption at the swaption expiration. Remember that if market conditions are such that the swaption would be exercised, then the bond would be called. In this case, however, interest rates are not low enough to justify exercise of the swaption or calling of the bond. MSI will continue making its 9 percent interest payments on the bond.

In Panel B(ii), we let FS(1,3) be less than 6 percent. Then MSI will exercise the swaption, thereby entering into a swap to pay Libor and receive 6 percent. Note, however, that it is receiving a fixed rate of 6 percent, paying a fixed rate of 9 percent, and paying Libor. Here, this transaction is not equivalent to it having called the bond, because MSI makes floating payments. To offset the floating payments, it enters into a

new swap in the market at the market rate of FS(1,3). Specifically, it pays FS(1,3) and receives Libor. The two streams of Libor payments would offset and would probably be canceled, leaving an inflow of 6 percent and an outflow of FS(1,3) on the swaps and an outflow of 9 percent on the bond. The net effect would be an outflow of FS(1,3) plus 3 percent. Because FS(1,3) is below 6 percent, the overall rate paid is below 9 percent, thereby making this position similar to that of a bond that has been called, with a new bond issued in its place at a lower rate.

So we see that a swaption can be used to replicate the call feature on a callable bond. A swaption can synthetically add a call feature when it does not exist or offset a call feature that does exist. The cash paid or received from the swaption occurs all at once, but if allocated appropriately over time, it would be equivalent to the additional amount of interest that a borrower pays for the call feature. Of course, there are some tricky elements to making this strategy work. We have ignored taxes and transaction costs, which can affect exercise and call decisions. Also, when the swaption is held by another party, there is no guarantee that exercise will occur at the optimal time.

EXAMPLE 14

A German company issues a five-year noncallable bond with a face value of €40 million. The bond pays a coupon annually of 10 percent, of which 3 percent is estimated to be a credit premium.

A The company would like to make the bond callable in exactly two years. Design a strategy using a European swaption that will achieve this goal. When the swaption expires, the fixed rate on the underlying swap will be denoted as FS(2,5). Evaluate what happens when this rate is at least the exercise rate and also when it is less than the exercise rate.

B Reconsider the bond described above and assume it was actually issued as a callable bond with a 10 percent coupon. Construct a swaption strategy that will synthetically remove the call feature. As in Part A, let the swaption expire in two years and evaluate the outcomes.

Solution to A:

To synthetically add the call feature to this bond, the company should purchase a receiver swaption. The exercise rate should be the coupon rate on the bond minus the credit premium: 10 − 3 = 7 percent. At the swaption expiration, we have the following outcomes:

FS(2,5) ≥ 7 percent
The swaption will not be exercised, and the bond will not be called. The company continues to pay 10 percent on its bond.
FS(2,5) < 7 percent
The swaption is exercised.
Enter into swap
Receive 7 percent
Pay Libor
Enter into a new swap at the market rate.
Receive Libor
Pay FS(2,5)
Company continues to pay 10 percent on its bond
Net effect: Pay FS(2,5) + 10% − 7% = Pay FS(2,5) + 3% < 10%

The company has thus effectively issued a new bond at a lower rate. The option premium, however, effectively raised the coupon rate on the old bond to that of a callable bond.

Solution to B:

To synthetically remove the call feature on this bond, the company should sell a receiver swaption. The exercise rate should be the coupon rate on the bond minus the credit premium: 10 – 3 = 7 percent. At the swaption expiration, we have the following outcomes:

FS(2,5) ≥ 7 percent
The swaption will not be exercised. The company continues to pay 10 percent on its bond.

FS(2,5) < 7 percent
- The swaption is exercised.
  - Enter into swap
  - Receive Libor
  - Pay 7 percent
- Enter into a new swap at the market rate.
  - Receive FS(2,5)
  - Pay Libor
  - Bond called. Issue new bond at FS(2,5) + 3%
- Net effect: Pay FS(2,5) + 3% + 7% – FS(2,5) = 10%

Therefore, if the company sells the receiver swaption, the bond's call option is offset and effectively removed. The option premium, received up front, effectively reduces the coupon rate on the outstanding bond to make it equivalent to that of a noncallable bond.

Finally, you may be wondering why a receiver swaption was used in these strategies. Why not a payer swaption? Remember that a call feature on a bond is a call option. To add or offset a call feature, we need to use an instrument equivalent to a call option. A receiver swaption is equivalent to a call option. A payer swaption is equivalent to a put option. Payer swaptions would be useful in situations involving put features. Putable bonds do exist but are not particularly common. A putable bond allows the bondholder to sell the bond back, usually at par, to the issuer. Therefore, the option, which is a put, is held by the bondholder and sold by the bond issuer. If a bond is putable, the coupon rate on the bond would be lower. If the issuer of the bond wanted to synthetically add a put to an otherwise nonputable bond, it would sell a payer swaption. The premium received would effectively lower the coupon rate on the bond. If the issuer of a putable bond wanted to eliminate the put, it would buy a payer swaption. This would give it the right to exercise the swaption, which is a put on the bond, at the same time as the put feature would be exercised by the holder of the bond. Again, we note that put features are not common, and we shall not pursue this strategy here.

5.4 A Note on Forward Swaps

There are also forward contracts on swaps. Called forward swaps, these instruments are commitments to enter into swaps. They do not require a cash payment at the start but force the parties to enter into a swap at a later date at terms, including the fixed rate, set at the start. Although we shall not examine forward swap strategies, note that the same strategies examined in this section can all be used with forward swaps.

6 CONCLUSIONS

In the previous readings we saw how to use forwards, futures, options, and swaps in strategies. These instruments are designed to manage risk. Managing risk involves the buying and selling of risk, perhaps to increase the overall level of one's risk or perhaps to offset an existing risk. As we have seen, these instruments are highly leveraged. As you can imagine, proper use of derivatives requires a significant amount of expertise. More importantly, however, monitoring and control are essential ingredients for the proper use of derivatives. Managing risk is the primary justification for the use of derivatives.

SUMMARY

- A floating-rate loan can be converted to a fixed-rate loan by entering into an interest rate swap to pay a fixed rate and receive a floating rate. The floating cash flows offset, leaving the borrower with a net fixed payment. Likewise, a fixed-rate loan can be converted to a floating-rate loan by entering into an interest rate swap to pay a floating rate and receive a fixed rate. The fixed cash flows offset, leaving the party paying a floating rate.
- To obtain the duration of an interest rate swap, consider the difference between the duration of a fixed-rate bond and the duration of a floating-rate bond. The latter is close to zero, leaving the duration of an interest rate swap close to that of a fixed-rate bond. If the party pays a fixed rate and receives a floating rate, the duration of the position is that of the equivalent floating-rate bond minus that of the equivalent fixed-rate bond.
- When a floating-rate loan is converted to a fixed-rate loan, the resulting duration is that of a fixed-rate loan. The duration of a fixed-rate loan is normally much higher than that of a floating-rate loan, which has a duration relatively close to zero. Compared with a floating-rate loan, however, a fixed-rate loan has stable cash flows, which reduce cash flow risk, but has a much greater duration, which increases market value risk.
- The notional principal on an interest rate swap added to a position to adjust its overall duration is determined by the existing duration of the portfolio, the duration of the swap, the desired duration, and the market value of the portfolio. A swap can be used to change the duration of the position without changing the market value.
- An interest rate swap can be used to manage the risk related to a structured note with a coupon at a multiple of a floating rate by adjusting the notional principal on the swap to reflect the coupon multiple for the structured note. The swap should be a receive-floating, pay-fixed swap.

- An interest rate swap can be used to manage the risk of the issuance of an inverse floating-rate note by paying the floating rate to the swap dealer. When interest rates rise (fall), the inverse floater payments decrease (increase), and this effect is passed on to the dealer, which in turn pays a fixed rate.
- A loan in one currency can be converted into a loan in another currency by entering into a currency swap in which it pays interest in one currency and receives interest in the currency in which it makes its loan interest payments. This strategy leaves the borrower paying interest in a different currency than the one in which the loan interest is paid. To offset the principal payment, the currency swap should provide for payment of the notional principal as well.
- Converting a loan in one currency into a loan in another using a currency swap can offer savings because a borrower can normally issue debt at a more attractive rate in its own currency. By entering into a swap with a dealer that can operate more efficiently in global markets, the borrower can effectively convert its domestic debt into foreign debt. In addition, by engaging in the currency swap rather than borrowing in the desired currency in the first place, the borrower takes on a small amount of credit risk that can generate savings if no default takes place.
- The party to a currency swap would make the payments be fixed or floating depending on whether a loan paired with the currency swap is made at a fixed or floating rate and whether the party wants to make payments at a fixed or floating rate. This decision is usually made based on the expected direction of interest rates.
- A series of foreign cash receipts can be combined with a currency swap with no notional principal payments to convert the receipts into domestic currency cash flows. The foreign interest payments on the currency swap must equal the amounts of the foreign cash flows.
- In a dual-currency bond, the interest is paid in one currency and the principal is paid in another. A borrower issuing a dual-currency bond can use the proceeds to buy a bond denominated in the currency of the principal repayment on the dual-currency bond. It can then enter into a currency swap with no notional principal payment, enabling it to fund the interest payments from the dual-currency bond in one currency and make interest payments in another currency.
- An equity swap can be used to provide diversification to a concentrated portfolio by having the party pay the return on the stock that makes up too large a portion of the portfolio and receive the return on a diversified market proxy.
- An equity swap can add international diversification to a domestic portfolio by having the party pay the return on a domestic market benchmark and receive the return on an international market benchmark.
- An equity swap can be used to change the allocation between stock and bond asset classes by having the party pay the return on the asset class in which it wants to reduce its exposure and receive the return on the asset class in which it wants to increase its exposure.
- A corporate insider can use an equity swap to reduce exposure to his company by paying the return on the company's stock and receiving the return on a diversified portfolio benchmark or a fixed- or floating-rate interest payment.
- There can be important implications if corporate insiders use equity swaps. Insiders can reduce their exposure without giving up their voting rights, which can lead to significant agency costs. Although it is clearly necessary for investors and analysts to gauge the exposure of corporate insiders, equity swaps can make this task more difficult.

- Equity swaps pose some difficulties not faced in interest rate and currency swaps. In particular, equity swaps can generate significant cash flow problems, resulting from the fact that equity returns can be negative, meaning that one party can be required to make both sides of payments. In addition, equity swaps can involve tracking error, in which the swap returns, which are pegged to an index, do not match the returns on the actual equity portfolio that is combined with the swap.
- A party would use an interest rate swaption if it anticipates taking out a loan at a future date and entering into a swap to convert the loan from floating rate to fixed rate or vice versa. The swaption gives the party the right to enter into the swap at a specific fixed rate or better. The cost of this flexibility is the swaption premium paid up front.
- An interest rate swaption can be used to provide a means of terminating a swap at a favorable rate. A party engaged in a swap can use a swap with the opposite cash flows to effectively terminate the position. By purchasing a swaption, the party can enter into this swap at a specific rate, established in advance, or take a better rate as given in the market.
- An interest rate receiver swaption is equivalent to a call option on a bond. A party that has issued a callable bond and believes it will not call the bond can sell an interest rate receiver swaption to offset the call feature. The swaption premium received at the start offsets the higher coupon paid for the call feature on the bond. If interest rates fall enough to trigger the bond being called, the swaption will also be exercised. The party must enter into the underlying swap and can enter into an opposite swap at the market rate. The net effect is that the party ends up paying the same rate it would have paid if it had not called the bond.
- A party that has issued a noncallable bond can synthetically add a call feature by purchasing an interest rate receiver swaption. The premium paid for the swaption effectively raises the coupon rate on the bond. If rates fall sufficiently, the receiver swaption is exercised and the party enters into the underlying swap. The party then enters into a swap in the market at the market rate. The net effect is that the party pays a lower fixed rate, as though the bond had been called.

PRACTICE PROBLEMS

1 A company has issued floating-rate notes with a maturity of one year, an interest rate of Libor plus 125 basis points, and total face value of $50 million. The company now believes that interest rates will rise and wishes to protect itself by entering into an interest rate swap. A dealer provides a quote on a swap in which the company will pay a fixed rate 6.5 percent and receive Libor. Interest is paid quarterly, and the current Libor is 5 percent. Indicate how the company can use a swap to convert the debt to a fixed rate. Calculate the overall net payment (including the loan) by the company. Assume that all payments will be made on the basis of 90/360.

2 Assume that you manage a $100 million bond portfolio with a duration of 1.5 years. You wish to increase the duration of the bond portfolio to 3.5 years by using a swap. Assume the duration of a fixed-rate bond is 75 percent of its maturity.

A Discuss whether the swap you enter into should involve paying fixed, receiving floating or paying floating, receiving fixed.

B Would you prefer a four-year swap with quarterly payments or a three-year swap with semiannual payments?

C Determine the notional principal of the swap you would prefer.

3 A company issues a leveraged floating-rate note with a face value of $5,000,000 that pays a coupon of 2.5 times Libor. The company plans to generate a profit by selling the notes, using the proceeds to purchase a bond with a fixed coupon rate of 7 percent a year, and hedging the risk by entering into an appropriate swap. A swap dealer provides a quote with a fixed rate of 6 percent and a floating rate of Libor. Discuss whether the company should enter into a swap involving paying fixed, receiving floating or paying floating, receiving fixed. Calculate the amount of the arbitrage profit the company can earn by entering into the appropriate swap. In your answer, indicate the cash flows generated at each step. Also explain what additional risk the company is taking on by doing the swap.

4 A US company needs to raise €100,000,000. It plans to raise this money by issuing dollar-denominated bonds and using a currency swap to convert the dollars to euros. The company expects interest rates in both the United States and the eurozone to fall.

A Should the swap be structured with interest paid at a fixed or a floating rate?

B Should the swap be structured with interest received at a fixed or a floating rate?

5 A company based in the United Kingdom has a German subsidiary. The subsidiary generates €15,000,000 a year, received in equivalent semiannual installments of €7,500,000. The British company wishes to convert the euro cash flows to pounds twice a year. It plans to engage in a currency swap in order to lock in the exchange rate at which it can convert the euros to pounds. The current exchange rate is €1.5/£. The fixed rate on a plain vanilla currency swap in pounds is 7.5 percent per year, and the fixed rate on a plain vanilla currency swap in euros is 6.5 percent per year.

Practice Problems and Solutions: 1–9 taken from *Analysis of Derivatives for the Chartered Financial Analyst® Program*, by Don M. Chance, CFA. © 2003 CFA Institute. All other problems and solutions © CFA Institute. All rights reserved.

A Determine the notional principals in euros and pounds for a swap with semiannual payments that will help achieve the objective.

B Determine the semiannual cash flows from this swap.

6 A portfolio has a total market value of $105,000,000. The portfolio is allocated as follows: $65,000,000 is invested in a broadly diversified portfolio of domestic stocks, and $40,000,000 is invested in the stock of the JK Corporation. The portfolio manager wishes to reduce exposure to JK stock by $30,000,000. The manager plans to achieve this objective by entering into a three-year equity swap using the S&P 500. Assume that settlement is made at the end of each year. Also assume that after one year the return on JK stock is 4 percent and the return on the S&P 500 market index is –3 percent.

A Explain the structure of the equity swap.

B Calculate the net cash flow for the swap at the end of one year.

7 The LKS Company is a US-based mutual fund company that manages a global portfolio 80 percent invested in domestic stocks and 20 percent invested in international stocks. The international component mimics the MSCI EAFE index. The total market value of the portfolio is $750,000,000. The fund manager wishes to reduce the allocation to domestic stocks to 70 percent and increase the international allocation to 30 percent. The manager plans to achieve this objective by entering into a two-year equity swap using the Russell 3000 and the EAFE index. Assume that settlement is made at the end of the first year. Also assume that after one year, the return on the Russell 3000 market index is 5 percent and the return on the EAFE index is 6 percent.

A Explain the structure of the equity swap.

B Calculate the net cash flow for the swap at the end of one year.

8 A diversified portfolio with a market value of $800,000,000 currently has the following allocations:

Equity	80 percent	$640,000,000
Bonds	20 percent	$160,000,000

The equity portion of the portfolio is allocated as follows:

US large-cap stocks	70 percent	$448,000,000
International stocks	30 percent	$192,000,000

The bond portion of the portfolio is allocated as follows:

US government bonds	80 percent	$128,000,000
US corporate bonds	20 percent	$32,000,000

The portfolio manager wishes to change the overall allocation of the portfolio to 75 percent equity and 25 percent bonds. Within the equity category, the new allocation is to be 75 percent US large cap and 25 percent international stocks. In the bond category, the new allocation is to be 75 percent US government bonds and 25 percent US corporate bonds. The manager wants to use four-year swaps to achieve the desired allocations, with settlements at the end of each year. Assume that the counterparty payments or receipts are tied to Libor. Use generic stock or bond indexes where appropriate. Indicate how the manager can use swaps to achieve the desired allocations. Construct the most efficient overall swap, in which all equivalent but opposite Libor payments are consolidated.

9 A company plans to borrow $20,000,000 in two years. The loan will be for three years and pay a floating interest rate of Libor with interest payments made every quarter. The company expects interest rates to rise in future years and thus is certain to swap the loan into a fixed-rate loan. In order to ensure that it can lock in an attractive rate, the company plans to purchase a payer swaption expiring in two years, with an exercise rate of 5 percent a year. The cost of the swaption is $250,000, and the settlement dates coincide with the interest payment dates for the original loan. Assume Libor at the beginning of the settlement period is 6.5 percent a year.

A Calculate the net cash flows on the first settlement date if FS(2,5) is above the exercise rate.

B Calculate the net cash flows on the first settlement date if FS(2,5) is below the exercise rate.

The following information relates to Questions 10–14 and is based on the readings on Risk Management Applications of Derivatives

Catherine Gide is the risk management director of the Millau Corporation, a large, diversified, French multinational corporation with subsidiaries in Japan, the United States, and Switzerland. One of Gide's primary responsibilities is to manage Millau's currency exposure. She has the flexibility to take tactical positions in foreign exchange markets if these positions are justified by her research. Gide and her assistant, Albert Darc, are meeting to discuss how best to deal with Millau's currency exposure over the next 12 months.

Specifically, Gide is concerned about the following:

1 Millau has just sold a Japanese subsidiary for 65 billion yen (JPY65,000,000,000). Because of an impending tax law change, Gide wishes to wait six months before repatriating these funds. Gide plans to invest the sale proceeds in six-month Japanese government securities and hedge the currency risk by using forward contracts. Gide's research indicates that the yen will depreciate against the euro (EUR) over the next six months. Darc has gathered the exchange rate and interest rate information given in Exhibit 1. The day-count convention is 30/360.

2 Millau has a contract to deliver computerized machine tools to a US buyer in three months. A payment of 50 million US dollars (USD50,000,000) is due from the buyer at that time. Gide is concerned about the dollar weakening relative to the euro. She plans to use options to hedge this currency exposure. Specifically, Gide expects the US dollar to weaken to 1.2250USD/EUR in the next three months. Euro options quotations are given in Exhibit 2. All options are European-style and expire in three months.

3 Darc says to Gide:

> "I believe the volatility of the USD/EUR exchange rate will soon increase by more than the market expects. We may be able to profit from this volatility increase by buying an equal number of at-the-money call and put options on the euro at the same strike price and expiration date."

4 Millau needs 100 million Swiss francs (CHF100,000,000) for a period of one year. Millau can issue at par a 2.8 percent one-year euro-denominated note with semiannual coupons and swap the proceeds into Swiss francs. The euro swap fixed rate is 2.3 percent and the Swiss franc swap fixed rate is 0.8 percent.

Darc tells Gide that he expects interest rates in both the euro currency zone and Switzerland to rise in the near future. Exchange rate and interest rate information is given in Exhibit 1.

Exhibit 1 Exchange Rate and Interest Rate Information

Currency Exchange Rates	Spot	3-Month Forward	6-Month Forward	1-Year Forward
US dollars per euro (USD/EUR)	1.1930	1.1970	1.2030	1.2140
Japanese yen per euro (JPY/EUR)	133.83	133.14	132.46	131.13
Swiss francs per euro (CHF/EUR)	1.5540	1.5490	1.5440	1.5340

Annualized Risk-Free Interest Rates (%)	1 Month	3 Month	6 Month	1 Year
Euro area	2.110	2.120	2.130	2.150
United States	3.340	3.560	3.770	3.990
Japan	0.040	0.056	0.066	0.090
Switzerland	0.730	0.750	0.760	0.780

Exhibit 2 Euro Options Quotations (Options Expire in 3 Months)

Strike (USD/EUR)	Calls on Euro (USD/EUR)	Puts on Euro (USD/EUR)
1.1800	0.0275	0.0125
1.1900	0.0216	0.0161
1.2000	0.0169	0.0211
1.2100	0.0127	0.0278

10 If Gide uses a six-month forward currency contract to convert the yen received from the sale of the Japanese subsidiary into euros, the total amount Millau will receive is *closest* to:

A EUR490,714,000.

B EUR490,876,000.

C EUR491,038,000.

11 If Gide uses a six-month forward currency contract to convert the yen received from the sale of the Japanese subsidiary into euros, the annualized return in euros that Millau will realize is *closest* to:

A 0.066%.

B 2.130%.

C 2.196%.

12 Darc's statement to Gide (in concern #3) about the option strategy to use in order to profit from a volatility increase of the euro/US dollar exchange rate is:

A correct.

B incorrect, because he is describing a strategy that benefits only from a weakening euro.

C incorrect, because he is describing a strategy that benefits from low volatility in the exchange rate.

13 If Millau issues euro-denominated debt and enters into a fixed-rate currency swap (in concern #4), which of the following *best* describes transactions between Millau and the swap counterparty in six months? Millau pays the swap counterparty:

A EUR740,026 and receives CHF400,000.

B CHF400,000 and receives EUR740,026.

C CHF800,000 and receives EUR900,901.

14 Based on Darc's interest rate expectations for the euro currency zone and Switzerland, Gide's *best* choice is to structure the currency swap so that Millau pays interest at a:

A fixed rate and receives it at a fixed rate.

B fixed rate and receives it at a floating rate.

C floating rate and receives it at a floating rate.

The following information relates to Questions 15–20 and is based on the readings on Risk Management Applications of Derivatives

Hadley Elbridge, managing director for Humber Wealth Managers, LLC, is concerned about the risk level of a client's equity portfolio. The client, Pat Cassidy, has 60 percent of this portfolio invested in two equity positions: Hop Industries and Sure Securities. Cassidy refuses to sell his shares in either company, but has agreed to use option strategies to manage these concentrated equity positions. Elbridge recommends either a collar strategy or a protective put strategy on the Hop position, and a covered call strategy on the Sure position. The options available to construct the positions are shown in Exhibit 1.

Exhibit 1 Equity Positions and Options Available

Stock	Shares	Stock Price	Options	Option Price
Hop	375,000	$26.20	September 25.00 put	$0.80
			September 27.50 call	$0.65
Sure	300,000	$34.00	September 32.50 put	$0.85
			September 35.00 call	$1.20

Cassidy makes the following comments:

Comment #1 "The Hop protective put position provides a maximum per share loss of $2.00 and a breakeven underlying price at expiration of $27.00."

Comment #2 "The Sure covered call position provides a maximum per share gain of $2.20 and a breakeven underlying price at expiration of $32.80."

Comment #3 "The general shape of a profit-and-loss graph for the protective put closely resembles the general shape of the graph for another common option position."

Elbridge also investigates whether a privately negotiated equity swap could be used to reduce the risk of the Hop and Sure holdings. A swap dealer offers Elbridge the following:

- The dealer will receive the return on 250,000 shares of Hop and 200,000 shares of Sure from Cassidy.
- The dealer will pay Cassidy the return on an equivalent dollar amount on the Russell 3000 Index.

The dealer demonstrates the quarterly cash flows of this transaction under the assumptions that Hop is up 2 percent, Sure is up 4 percent, and the Russell 3000 is up 5 percent for the quarter.

The remaining 40 percent of Cassidy's equity portfolio is invested in a diversified portfolio of equities valued at $13,350,000. Elbridge believes this portfolio is too risky, so he recommends lowering the beta of this portfolio from its current level of 1.20 to a target beta of 0.80. To accomplish this, he will use a two-month futures contract with a price (including multiplier) of $275,000 and a beta of 0.97.

15 Disregarding the initial cost of the Hop collar strategy, the value per share of the strategy at expiration with the stock at $26.90 is:

A $26.05.

B $26.20.

C $26.90.

16 Cassidy's Comments #1 and #2 about the Hop protective put and Sure covered call positions, respectively, are:

	Protective Put	Covered Call
A	Correct	Correct
B	Correct	Incorrect
C	Incorrect	Incorrect

17 The general shape of the profit-and-loss graph in Cassidy's Comment #3 is *most* similar to the general shape of the profit-and-loss graph for:

A buying a call.

B selling a call.

C buying a put.

18 If an options dealer takes the other side of the Sure option position, the dealer's initial option delta and hedging transaction, respectively, will be:

	Dealer's Initial Option Delta	Dealer's Hedging Transaction
A	Negative	Buy the underlying
B	Positive	Buy the underlying
C	Positive	Sell the underlying

19 What is the payoff to Cassidy in the equity swap example?

A –$269,500.

B $264,500.

C $269,500.

20 To achieve the target beta on Cassidy's diversified stock portfolio, Elbridge would sell the following number of futures contracts (rounded to the nearest whole contract):

A 13.

B 20.

C 27.

Questions 21 through 26 relate to the Westfield Tool Company

The Westfield Machine Tool and Die Company (WMTC) is a US-based manufacturer of cutting tools that operates production plants in the United States and Spain. WMTC's CEO has received an economic report forecasting that interest rates in the future will likely increase worldwide. He has asked WMTC's CFO, Yolanda Lopez, to examine ways by which different kinds of swaps could be used as a means of reducing the company's interest rate and currency risks.

Lopez has identified the following areas where swaps might be an attractive tool for managing risk:

- WMTC's employee pension plan portfolio
- WMTC's existing five-year bank loan
- Foreign exchange risk associated with cash flows repatriated from the operations in Spain
- New debt issue associated with upcoming expansion projects

Information regarding WMTC's pension plan portfolio is shown in Exhibit 1. Within the WMTC pension plan portfolio, the allocation within equities is heavily weighted towards the company's own stock. WMTC would like to retain these shares for corporate control purposes.

Exhibit 1 Pension Plan Portfolio of Westfield Machine Tool Company (in millions of US dollars)

Equities	
Diversified Equities	$200
WMTC Common Stock	$400
Equities Total	$600

(continued)

Exhibit 1 (Continued)

Fixed Income (Bonds)*	
Treasuries	$200
Corporates	$300
Fixed Income Total	$500
Bond Portfolio Duration	6 years
Total Portfolio Value	$1,100

*All bonds are fixed rate, and pay interest semiannually and on the same date.

Lopez recommends the allocation to WMTC equity be reduced to 20% of the overall equity portfolio. Lopez determines that WTMC can achieve this reallocation objective by executing an equity swap that would enable it to alter the allocation more easily and less expensively than by executing transactions in the underlying securities. Furthermore, using the equity swap would allow WMTC to retain the company shares held in the WMTC pension portfolio.

Lopez also recommends that WMTC reduce the duration of the bond portfolio by 50%. She states that, in order to achieve this duration target, WMTC should use a 6-year interest rate swap with semiannual payments. Lopez estimates the duration of the swap's fixed payments to be 75% of the swap maturity.

Lopez is also concerned about WMTC's five-year variable rate loan given the forecast of rising interest rates. Additionally, Lopez would like to use a currency swap to lock in the exchange rate when WMTC repatriates Euro cash flows from Spain into US dollars over the next two years. Additional pertinent facts regarding WMTC's existing debt obligation and cash flows from Spain are provided in Exhibit 2.

Exhibit 2 Relevant Debt and Cash Flow Information

Debt:	Five-year variable rate loan. Principal amount: $10,000,000. Rate: Libor + 200 basis points, paid semiannually, reset every six months. Loan rate was reset today at a Libor of 5%.
Cash Flows:	Estimated €12 million annually to be repatriated to US from operations in Spain, in equal semiannual installments. Current spot exchange rate: 1.4 USD/EUR

To hedge the interest rate risk on the five-year variable rate loan, Lopez recommends that WMTC enter into a contract with Swap Traders International (STI), who offers an interest rate swap with a notional principal of $10 million that provides a fixed rate of 6% in exchange for Libor, with semiannual payments.

To hedge the currency risk associated with the cash flows to be repatriated from its operations in Spain. Lopez recommends that WMTC enter into a currency swap with semiannual payments, where the fixed swap rate in Euros is 4.5%, and the fixed swap rate in US dollars is 5.00%.

WMTC also has some major expansion plans for its Spanish operations. In two years, Lopez expects that WMTC will need to raise €50 million. Lopez expects that WMTC will raise the funds using a floating interest rate loan at the prevailing Libor

rate in 2 years with annual interest payments. Lopez is considering hedging the interest rate risk relating to the future borrowing, so she contacts STI, who offers a swaption expiring in 2 years with Libor as the underlying floating rate and an exercise rate of 6%.

21 Lopez will *most likely* achieve the pension plan's equity reallocation objective by entering into an equity swap whereby WMTC receives a return on:

A $320 million of the S&P 500 index and pays a return on $320 million of WMTC common stock.

B $280 million of the S&P 500 index and pays a return on $280 million of WMTC common stock.

C $280 million of WMTC common stock and pays a return on $280 million of the S&P 500 index.

22 To achieve the target duration for the pension plan's bond portfolio, WMTC should enter into an interest rate swap with a modified duration that is:

A negative, requiring WTMC to make fixed rate payments and receive floating rate payments.

B negative, requiring WTMC to make floating rate payments and receive fixed rate payments.

C positive, requiring WTMC to make fixed rate payments and receive floating rate payments.

23 WMTC can achieve the bond portfolio duration target by using an interest rate swap with a notional principal *closest* to:

A $343 million.

B $353 million.

C $375 million.

24 If WMTC hedges the interest rate risk on the five-year variable rate loan by using the interest rate swap recommended by Lopez, the net interest payment at the first settlement date in six months would be *closest* to:

A $300,000.

B $400,000.

C $800,000.

25 If WMTC hedges the currency risk relating to the cash flows from its Spanish operations using the currency swap recommended by Lopez, WMTC would generate semiannual cash inflows from the swap *closest* to:

A $4.8 million.

B $8.4 million.

C $9.3 million.

26 If Lopez decides to use a swaption with STI to hedge the interest rate risk relating to the expansion loan, then Lopez should:

A sell a payer swaption.

B buy a payer swaption.

C buy a receiver swaption.

SOLUTIONS

1 The company can enter into a swap to pay a fixed rate of 6.5 percent and receive a floating rate. The first floating payment will be at 5 percent.

Interest payment on the floating rate note = \$50,000,000(0.05 + 0.0125)(90/360) = \$781,250

Swap fixed payment = \$50,000,000(0.065)(90/360) = \$812,500

Swap floating receipts = \$50,000,000(0.05)(90/360) = \$625,000

The overall cash payment made by the company is \$812,500 + \$781,250 – \$625,000 = \$968,750.

2 **A** The value of the bond portfolio is inversely related to interest rates. To increase the duration, it would be necessary to hold a position that moves inversely with the interest rates. Hence the swap should be pay floating, receive fixed.

B Duration of a four-year pay-floating, receive-fixed swap with quarterly payments = (0.75)(4) – 0.125 = 2.875

Duration of a three-year pay-floating, receive-fixed swap with semiannual payments = (0.75)(3) – 0.25 = 2.0

Because the objective is to increase the duration of the bond portfolio, the four-year pay-floating, receive-fixed swap is the better choice.

C The notional principal is

$$NP = B\left(\frac{MDUR_T - MDUR_B}{MDUR_S}\right)$$

$$NP = \$100{,}000{,}000\left(\frac{3.5 - 1.5}{2.875}\right) = \$69{,}565{,}217$$

3 Because the company has a floating-rate obligation on the floating-rate note, it should enter into a swap involving receiving a floating rate. Accordingly, the appropriate swap to hedge the risk and earn a profit would be a pay-fixed, receive-floating swap. Let Libor be L. Cash flows generated at each step are as follows:

A Issue leveraged floating-rate notes and pay coupon =

L(2.5)(\$5,000,000) = \$12,500,000L

B Buy bonds with a face value = (2.5)(\$5,000,000) = \$12,500,000

Receive a coupon = (0.07)(\$12,500,000) = \$875,000

C Enter into a pay-fixed, receive-floating swap:

Pay = (0.06)(2.5)(\$5,000,000) = \$750,000

Receive = L(2.5)(\$5,000,000) = \$12,500,000L

D Net cash flow = –\$12,500,000L + \$875,000 – \$750,000 + \$12,500,000L = \$125,000

In addition to the risk of default by the bond issuer, the company is taking the credit risk of the dealer by entering into a swap. The profit of \$125,000 may be compensation for taking on this additional risk.

4 **A** The US company would pay the interest rate in euros. Because it expects that the interest rate in the eurozone will fall in the future, it should choose a swap with a floating rate on the interest paid in euros to let the interest rate on its debt float down.

B The US company would receive the interest rate in dollars. Because it expects that the interest rate in the United States will fall in the future, it should choose a swap with a fixed rate on the interest received in dollars to prevent the interest rate it receives from going down.

5 **A** The semiannual cash flow that must be converted into pounds is €15,000,000/2 = €7,500,000. In order to create a swap to convert €7,500,000, the equivalent notional principals are:

- Euro notional principal = €7,500,000/(0.065/2) = €230,769,231
- Pound notional principal = €230,769,231/€1.5/£ = £153,846,154

B The cash flows from the swap will now be:

- Company makes swap payment = €230,769,231(0.065/2) = €7,500,000
- Company receives swap payment = £153,846,154(0.075/2) = £5,769,231

The company has effectively converted euro cash receipts to pounds.

6 **A** The portfolio manager can reduce exposure to JK stock by entering into an equity swap in which the manager:

- pays or sells the return on $30,000,000 of JK stock.
- receives or buys the return on $30,000,000 worth of the S&P 500.

B On the equity swap, at the end of each year, the manager will:

Pay (0.04)($30,000,000) = $1,200,000

Receive (–0.03)($30,000,000) = –$900,000

(Note: Receiving a negative value means paying.)

Net cash flow = –$1,200,000 – $900,000 = –$2,100,000

Notice here that because the return on the index is significantly lower than the return on the stock, the swap has created a large cash flow problem.

7 **A** The manager needs to reduce the allocation to domestic stocks by 10 percent and increase the allocation to international stocks by 10 percent. So the manager needs to reduce the allocation to domestic stocks by (0.10)($750,000,000) = $75,000,000 and increase the allocation to international stocks by $75,000,000. This can be done by entering into an equity swap in which the manager:

- pays or sells the return on the Russell 3000 on notional principal of $75,000,000.
- receives or buys the return on the MSCI EAFE index on notional principal of $75,000,000.

B On the equity swap, at the end of the first year, the manager will:

Pay (0.05)($75,000,000) = $3,750,000

Receive (0.06)($75,000,000) = $4,500,000

Net cash flow = –$3,750,000 + $4,500,000 = $750,000

8 The following are the current allocations, the desired new allocations, and the transactions needed to go from the current positions to the new positions.

Stock	Current ($640 Million, 80%)	New ($600 Million, 75%)	Transaction
Large cap	$448 million (70%)	$450 million (75%)	Buy $2 million
International	$192 million (30%)	$150 million (25%)	Sell $42 million

Bonds	Current ($160 Million, 20%)	New ($200 Million, 25%)	Transaction
Government	$128 million (80%)	$150 million (75%)	Buy $22 million
Corporate	$ 32 million (20%)	$ 50 million (25%)	Buy $18 million

The following swap transactions would achieve the desired allocations:

Equity Swaps

Receive return on US large-cap index on $2,000,000
Pay Libor on $2,000,000
Pay return on international stock index on $42,000,000
Receive Libor on $42,000,000

Fixed-Income Swaps

Receive return on US government bond index on $22,000,000
Pay Libor on $22,000,000
Receive return on US corporate bond index on $18,000,000
Pay Libor on $18,000,000

The overall position involves no Libor payments or receipts. The portfolio receives Libor on $42 million on equity swaps. It pays Libor on $2 million on equity swaps, and $22 million and $18 million on fixed-income swaps, for a total payment of Libor on $42 million. Thus, overall, there are no Libor payments or receipts.

9 **A** If FS(2,5) is above the exercise rate, it will be worth exercising the swaption to enter a three-year swap to pay a fixed rate of 5 percent and receive Libor of 6.5 percent.

Swap payments on first quarterly settlement date:

Pay $20,000,000(90/360)(0.05) = $250,000
Receive $20,000,000(90/360)(0.065) = $325,000
Loan payment = $20,000,000(90/360)(0.065) = $325,000

Net cash flow = –$250,000

B If FS(2,5) is below the exercise rate, it will not be worth exercising the swaption. However, the company can enter a three-year swap to pay a fixed rate of 4 percent, for example, and receive Libor of 6.5 percent.

Swap payments on first quarterly settlement date:

Pay $20,000,000(90/360)(0.04) = $200,000
Receive $20,000,000(90/360)(0.065) = $325,000
Loan payment = $20,000,000(90/360)(0.065) = $325,000

Net cash flow = –$200,000

10 B is correct. Gide will invest the 65 billion yen for six months at 0.066% (refer to Exhibit 1). She will convert the yen to euros using the 6-month forward rate of 132.46. Solve 65,000,000,000 × [1 + (0.00066 × (180/360))]/132.46 = 490,876,114.

11 B is correct. Assuming that interest parity holds, if Gide uses a six-month forward to convert the yen, she should expect to earn the six-month euro rate of 2.13% as shown in Exhibit 1. As a check, you can convert 65 billion yen to euros at the spot exchange rate. Then, calculate the return associated with this number and the answer in the previous question. Converting at the spot gives 65,000,000,000/133.83 = 485,690,802. According to the previous question she actually ended up with 490,876,114. The return is (490,876,114 – 485,690,802)/485,690,802 = 0.01067616. Annualizing this six-month HPR provides the answer of 2.13%.

12 A is correct. Darc's statement in concern #3 describes buying a straddle. A long straddle is one way to profit from an increase in volatility as the increase in volatility will, ceteris paribus, increase the values of both the put and the call.

13 B is correct. In order to raise 100 million Swiss francs, Millau needs to issue bonds totaling 100,000,000 SF/1.554 = €64,350,064. To convert the euros into Swiss francs, Millau could enter into a currency swap. In a currency swap, notional amounts are exchanged at initiation. In this case, Millau will pay €64,350,064 and receive 100 million in Swiss francs. Subsequent payments do not net as they are denominated in different currencies. Remembering to adjust the given swap rates for semi-annual payments, in six months Millau will pay (0.008/2) × 100,000,000 = 400,000 Swiss francs and receive 64,350,064 × (0.023/2) = 740,026 euros.

14 B is correct. Darc expects interest rates in the euro zone and in Switzerland to increase. Given such an expectation, the best swap would be to pay fixed and receive floating. If the expected increases come about, the amount paid remains fixed while the amount received increases.

15 C is correct. If the stock price at expiration of the options is $26.90, the put will expire worthless, the call will expire worthless, and the value of the strategy will reflect solely the value of the stock.

16 A is correct. The protective put combines a long stock position with a long put position. The stock price of $26.20 plus the cost of the put, $0.80, provides the breakeven point for the combination, which is $27.00. If the stock price declines below $25.00, the value of the put at expiration will increase dollar-for-dollar with the stock decline. Thus, Cassidy effectively locks in a sales price of at least $25.00. At that $25.00 stock price, Cassidy loses $1.20 per share on his stock as well as the $0.80 put premium. Thus, his maximum loss is $2.00. Regarding the Sure covered call, if the Sure stock price increases above $35.00, the value of the call at expiration will increase dollar-for-dollar with increases in the share price. As Cassidy is short the call, this represents a dollar-for-dollar loss to him. Thus, the maximum gain of the covered call is the difference between today's stock price and the strike ($1.00) plus the premium received ($1.20) equals $2.20. If the stock price falls, the $1.20 premium offsets, in part, the loss. At $32.80, the $1.20 premium exactly offsets the loss on the stock. Thus, $32.80 is the breakeven point for the strategy.

17 A is correct. A protective put combines a long stock position with a long put. The put effectively "clips" the downside risk of the stock while allowing upside potential. A long call also exhibits a truncated downside and upside potential.

18 C is correct. Initially, the dealer will be long the call. Long calls have positive deltas. If stock prices fall, the value of the call will decrease, harming the dealer. To hedge the risk of a price decline, the dealer will sell the underlying.

19 B is correct. Multiply 250,000 shares times the price per share of Hop: 250,000 × $26.20 = $6,550,000. Multiply 200,000 shares times the price per share of Sure: 200,000 × $34.00 = $6,800,000. The total notional value of the

swap is the sum of these two amounts: \$6,550,000 + \$6,800,000 = \$13,350,000. If Hop is up 2%, Sure is up 4%, and the Russell 3000 is up 5%, the swap cash flows will be 0.02 × \$6,550,000 plus 0.04 × \$6,800,000 equals \$403,000 from Eldridge to the dealer and 0.05 × \$13,350,000 = \$667,500 from the dealer to Eldridge. Only the net payment, \$264,500 from the dealer to Cassidy, is actually paid.

20 B is correct. The target beta is 0.80 and the dollar value of the portfolio is \$13,350,000. Multiply 0.80 × \$13,350,000 = \$10,680,000. This is the desired result. Currently, the beta of the portfolio is 1.20. Multiplying the current beta by the portfolio value generates a value of \$16,020,000 (1.20 × \$13,350,000). The short futures position must reduce the beta-times-dollar amount by \$5,340,000 (\$16,020,000 – \$10,680,000). Given that the beta of the futures contract is 0.97, the dollar amount of futures contracts needed is \$5,505,155 (\$5,340,000/0.97). Divide this number by the per contract value of the futures contract to calculate the needed number of contracts: \$5,505,155/\$275,000 = 20.018 contracts. Round to 20 contracts.

21 B is correct. 20% of the \$600 million equity portfolio is \$120 million, and 80% is \$480 million. WMTC needs to reduce its WMTC equity holding from it current value of \$400 million to \$120 million, a decrease of \$280 million. This result implies an increase of \$320 million in diversified equities. Hence, WMTC needs to pay a return on \$280 million of WMTC equity and receive a return on \$280 million of the S&P 500 index, which is a proxy for diversified equities.

22 A is correct. To achieve the lower target duration using an interest rate swap, Lopez needs to use an interest rate swap that has a negative modified duration, which requires a pay fixed, receive floating swap. The pay-fixed, receive-floating swap has a negative duration, because the duration of a fixed-rate bond is positive and larger than the duration of a floating-rate bond, which is near zero.

23 B is correct. Lopez would like to reduce the duration of the bond portfolio by 50% from 6 years to 3 years. The notional principal of the swap is calculated as:

[\$500,000,000 x (6)] + [notional principal x ($MDUR_s$)] = [\$500,000,000 x (3)]

Solving for notional principal:

Notional Principal = \$500,000,000 x (3 – 6 / $MDUR_s$)

To estimate the modified duration of the swap ($MDUR_s$), note that the swap's floating-rate payments are semiannual payments, which implies an average duration of 0.25 years. So, given Lopez's estimate of the duration of the swap's fixed payments to be 75% of the swap maturity, the modified duration of the swap ($MDUR_s$) is -4.25 years, calculated as:

0.25 – (0.75 × 6) = –4.25 years;

Solving for notional principal:

Notional principal = \$500,000,000 × [(3 – 6) / – 4.25] = \$352,941,177, or \$353 million.

24 B is correct. WMTC would enter the interest rate swap as the pay-fixed, receive-floating party, and the net interest payment would be \$400,000. This net interest payment is calculated as:

First, the loan interest payment that WMTC owes on the loan would be calculated as:

Libor of 5% + 200 basis points = 7%

$10,000,000 × (0.07 / 2) = $350,000.

On the swap, the company pays a fixed rate of 6%: $10,000,000 (0.06 / 2) = $300,000, and receives a floating payment equal to Libor: $10,000,000 (0.05 / 2) = $250,000.

So, the net interest payment would be: $250,000 – $350,000 – $300,000 = –$400,000, implying a net payment of $400,000.

25 C is correct. The notional principals for the swap, based upon the prevailing given rates, are calculated as:

WMTC receives €6 million from Spanish operations semiannually.

To make a swap payment equal to €6 million at the given 4.5% Euro fixed rate, the Euro notional principal would need to be €266,666,667, calculated as:

€6 million / (0.045 / 2) = €266,666,667.

Consequently, at the given spot rate of 1.4 USD/EUR, the USD notional principal would be $373,333,333. The given fixed rate in the US is 5%.

So, WMTC would make a swap payment in Euros equal to €266,666,666 × 0.0225 = €6 million and receive a swap payment in US dollars of $373,333,333 × 0.025 = $9,333,333, or approximately $9.3 million.

26 B is correct. The buyer of a payer swaption holds the right to become the pay-fixed, receive-floating party in an interest rate swap. This arrangement would allow WMTC to hedge unknown Libor in two years when WMTC will need to borrow to fund the expansion.

CUSTOMER SERVICE

68

Glossary

Absolute return benchmark A minimum target return that an investment manager is expected to beat.

Absolute return vehicles Investments that have no direct benchmark portfolio.

Accounting defeasance Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

Accounting risk The risk associated with accounting standards that vary from country to country or with any uncertainty about how certain transactions should be recorded.

Accumulated benefit obligation (ABO) The present value of pension benefits, assuming the pension plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date.

Accumulated service Years of service of a pension plan participant as of a specified date.

Active investment strategies An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active-lives The portion of a pension fund's liabilities associated with active workers.

Active management An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active return The portfolio's return in excess of the return on the portfolio's benchmark.

Active risk The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

Active risk budgeting Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

Actual extreme events A type of scenario analysis used in stress testing. It involves evaluating how a portfolio would have performed given movements in interest rates, exchange rates, stock prices, or commodity prices at magnitudes such as occurred during past extreme market events (e.g., the stock market crash of October 1987).

Ad valorem fees Fees that are calculated by multiplying a percentage by the value of assets managed; also called assets under management (AUM) fees.

Adaptive markets hypothesis (AMH) A hypothesis that applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives.

Adverse selection risk The risk associated with information asymmetry; in the context of trading, the risk of trading with a more informed trader.

Algorithmic trading Automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints.

Allocation/selection interaction return A measure of the joint effect of weights assigned to both sectors and individual securities; the difference between the weight of the portfolio in a given sector and the portfolio's benchmark for that sector, times the difference between the portfolio's and the benchmark's returns in that sector, summed across all sectors.

Alpha Excess risk-adjusted return.

Alpha and beta separation An approach to portfolio construction that views investing to earn alpha and investing to establish systematic risk exposures as tasks that can and should be pursued separately.

Alpha research Research related to capturing excess risk-adjusted returns by a particular strategy; a way investment research is organized in some investment management firms.

Alternative investments Groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments.

Anchoring and adjustment An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring and adjustment bias An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring trap The tendency of the mind to give disproportionate weight to the first information it receives on a topic.

Angel investor An accredited individual investing chiefly in seed- and early-stage companies.

Anomalies Apparent deviations from market efficiency.

Ask price The price at which a dealer will sell a specified quantity of a security. Also called *ask*, *offer price*, or *offer*.

Ask size The quantity associated with the ask price.

Aspirational risk bucket In goal-based portfolio planning, that part of wealth allocated to investments that have the potential to increase a client's wealth substantially.

Asset covariance matrix The covariance matrix for the asset classes or markets under consideration.

Asset/liability management The management of financial risks created by the interaction of assets and liabilities.

Asset location The type of account an asset is held within, e.g., taxable or tax deferred.

Asset-only With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

Assurity of completion In the context of trading, confidence that trades will settle without problems under all market conditions.

Assurity of the contract In the context of trading, confidence that the parties to trades will be held to fulfilling their obligations.

Asynchronism A discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

AUM fee A fee based on assets under management; an *ad valorem* fee.

Authorized participants Broker/dealers who enter into an agreement with the distributor of the fund.

Automated trading Any form of trading that is not manual, including trading based on algorithms.

Availability bias An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

Average effective spread A measure of the liquidity of a security's market. The mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study.

Back office Administrative functions at an investment firm such as those pertaining to transaction processing, record keeping, and regulatory compliance.

Backtesting A method for gaining information about a model using past data. As used in reference to VaR, it is the process of comparing the number of violations of VaR thresholds over a time period with the figure implied by the user-selected probability level.

Backwardation With respect to the futures curve in a commodity futures market, the condition of being downward sloping.

Balance of payments An accounting of all cash flows between residents and nonresidents of a country.

Bancassurance The sale of insurance by banks.

Barbell A fixed income portfolio combining securities concentrated in short and long maturities relative to the benchmark.

Base With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in "one unit of a currency."

Base-rate neglect A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

Basis point value (BPV) The change in the bond price for a 1 basis point change in yield. Also called *present value of a basis point* or *price value of a basis point (PVBP)*.

Basis risk The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

Batch auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Bayes' formula A mathematical rule explaining how existing probability beliefs should be changed given new information; it is essentially an application of conditional probabilities.

Bear spread An option strategy that involves selling a put with a lower exercise price and buying a put with a higher exercise price. It can also be executed with calls.

Behavioral finance An approach to finance based on the observation that psychological variables affect and often distort individuals' investment decision making.

Behavioral finance macro A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

Behavioral finance micro A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

Benchmark In an investments context, a standard or point of reference for evaluating the performance of an investment portfolio.

Benchmark spread The yield on a credit security over the yield on a security with little or no credit risk (benchmark bond) and with a similar duration.

Best efforts order A type of order that gives the trader's agent discretion to execute the order only when the agent judges market conditions to be favorable.

Beta A measure of the sensitivity of a given investment or portfolio to movements in the overall market.

Beta research Research related to systematic (market) risk and return; a way investment research is organized in some investment management firms.

Bid The price at which a dealer will buy a specified quantity of a security. Also called *bid price*.

Bid–ask spread The difference between the current bid price and the current ask price of a security.

Bid price In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

Bid size The quantity associated with the bid price.

Block order An order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets.

Bond-yield-plus-risk-premium method An approach to estimating the required return on equity which specifies that required return as a bond yield plus a risk premium.

Bottom-up Focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development.

Bottom-up approach A credit strategy approach that involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features.

Bounded rationality The notion that people have informational and cognitive limitations when making decisions and do not necessarily optimize when arriving at their decisions.

Box spread An option strategy that combines a bull spread and a bear spread having two different exercise prices, which produces a risk-free payoff of the difference in the exercise prices.

Broad market indexes An index that is intended to measure the performance of an entire asset class. For example, the S&P 500 Index, Wilshire 5000, and Russell 3000 indexes for US common stocks.

Broker An agent of a trader in executing trades.

Brokered markets Markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.

Bubbles Episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value.

Buffering With respect to style index construction, rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style.

Build-up approach Synonym for the risk premium approach.

Bull spread An option strategy that involves buying a call with a lower exercise price and selling a call with a higher exercise price. It can also be executed with puts.

Bullet A fixed income portfolio made up of securities targeting a single segment of the curve.

Business cycle Fluctuations in GDP in relation to long-term trend growth, usually lasting 9–11 years.

Business risk The equity risk that comes from the nature of the firm's operating activities.

Butterfly spread An option strategy that combines two bull or bear spreads and has three exercise prices, or, a measure of yield curve curvature.

Buy side Investment management companies and other investors that use the services of brokerages.

Buy-side traders Professional traders that are employed by investment managers and institutional investors.

Calendar-and-percentage-of-portfolio rebalancing Monitoring a portfolio at regular frequencies, such as quarterly. Rebalancing decisions are then made based upon percentage-of-portfolio principles.

Calendar rebalancing Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

Calmar ratio The compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period.

Cap A combination of interest rate call options designed to hedge a borrower against rate increases on a floating-rate loan.

Cap weighting See *capitalization weighting*.

Capital adequacy ratio A measure of the adequacy of capital in relation to assets.

Capital flows forecasting approach An exchange rate forecasting approach that focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment.

Capital market expectations (CME) Expectations concerning the risk and return prospects of asset classes.

Capitalization weighting The most common security weighting scheme in which constituents are held in proportion to their market capitalizations, calculated as price times available shares. Also known as *market value*, *market cap*, or *cap weighting*.

Caplet Each component call option in a cap.

Carried interest A private equity fund manager's incentive fee; the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital.

Carry trade A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

Cash balance plan A defined-benefit plan whose benefits are displayed in individual recordkeeping accounts.

Cash flow at risk A variation of VaR that measures the risk to a company's cash flow, instead of its market value; the minimum cash flow loss expected to be exceeded with a given probability over a specified time period.

Cash flow matching Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps.

Cell approach See *stratified sampling*.

Certainty equivalent The maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in an opportunity.

Chain-linking A process for combining periodic returns to produce an overall time-weighted rate of return.

Cheapest-to-deliver A bond in which the amount received for delivering the bond is largest compared with the amount paid in the market for the bond.

Civil law A legal system derived from Roman law, in which judges apply general, abstract rules or concepts to particular cases. In civil systems, law is developed primarily through legislative statutes or executive action.

Clawback provision With respect to the compensation of private equity fund managers, a provision that specifies that money paid to the fund manager be returned to the investors if, at the end of a fund's life, the investors have not received back their capital contributions and contractual share of profits.

Closed-book markets Markets in which a trader does not have real-time access to all quotes in a security.

Closeout netting In a bankruptcy, a process by which multiple obligations between two counterparties are consolidated into a single overall value owed by one of the counterparties to the other.

Cobb-Douglas model A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cobb-Douglas production function A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cognitive dissonance The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

Cognitive errors Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

Collar An option strategy involving the purchase of a put and sale of a call in which the holder of an asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. Collars also can be used to provide protection against rising interest rates on a floating-rate loan by giving up gains from lower interest rates.

Commingled real estate funds (CREFs) Professionally managed vehicles for substantial commingled (i.e., pooled) investment in real estate properties.

Commitment period The period of time over which committed funds are advanced to a private equity fund.

Commodities Articles of commerce such as agricultural goods, metals, and petroleum; tangible assets that are typically relatively homogeneous in nature.

Commodity trading advisers (CTAs) Registered advisers who manage futures funds.

Common law A legal system which draws abstract rules from specific cases. In common law systems, law is developed primarily through decisions of the courts.

Community property regime A marital property regime under which each spouse has an indivisible one-half interest in property received during marriage.

Company-specific risk The non-systematic or idiosyncratic risk specific to a particular company's operations, reputation, and business environment.

Completeness fund A portfolio that, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.

Confidence band With reference to a quality control chart for performance evaluation, a range in which the manager's value-added returns are anticipated to fall a specified percentage of the time.

Confirmation bias A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

Confirming evidence trap The bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it.

Conjunction fallacy An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

Conservatism bias A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

Consistent growth A growth investment substyle that focuses on companies with consistent growth having a long history of unit-sales growth, superior profitability, and predictable earnings.

Constant returns to scale A characteristic of a production function such that a given percentage increase in capital stock and labor input results in an equal percentage increase in output.

Contingent immunization Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

Continuous auction markets Auction markets where orders can be executed at any time during the trading day.

Contrarian A value investment substyle focusing on stocks that have been beset by problems.

Controlled foreign corporation A company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law.

Convexity A measure of how interest rate sensitivity changes with a change in interest rates.

Core capital The amount of capital required to fund spending to maintain a given lifestyle, fund goals, and provide adequate reserves for unexpected commitments.

Core–satellite A way of thinking about allocating money that seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles.

Core-satellite portfolio A portfolio in which certain investments (often indexed or semi-active) are viewed as the core and the balance are viewed as satellite investments fulfilling specific roles.

Corporate governance The system of internal controls and procedures used to define and protect the rights and responsibilities of various stakeholders.

Corporate venturing Investments by companies in promising young companies in the same or a related industry.

Covered call An option strategy involving the holding of an asset and sale of a call on the asset.

Creation units Large blocks of ETF shares often traded against a basket of underlying securities.

Credit default swap A swap used to transfer credit risk to another party. A protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event.

Credit derivative A contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

Credit method When the residence country reduces its taxpayers' domestic tax liability by the amount of taxes paid to a foreign country that exercises source jurisdiction.

Credit risk The risk of loss caused by a counterparty's or debtor's failure to make a timely payment or by the change in value of a financial instrument based on changes in default risk. Also called *default risk*.

Credit spread forward A forward contract used to transfer credit risk to another party; a forward contract on a yield spread.

Credit spread option An option based on the yield spread between two securities that is used to transfer credit risk.

Credit VaR A variation of VaR related to credit risk; it reflects the minimum loss due to credit exposure with a given probability during a period of time.

Credited rates Rates of interest credited to a policyholder's reserve account.

Cross-default provision A provision stipulating that if a borrower defaults on any outstanding credit obligations, the borrower is considered to be in default on all obligations.

Cross hedge A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

Currency overlay programs A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

Current credit risk The risk of credit-related events happening in the immediate future; it relates to the risk that a payment currently due will not be paid. Also called *jump-to-default risk*.

Custom security-based benchmark Benchmarks that are custom built to accurately reflect the investment discipline of a particular investment manager. Also called *strategy benchmarks* because they reflect a manager's particular strategy.

Cyclical stocks The shares of companies whose earnings have above-average sensitivity to the business cycle.

Cyclically Adjusted P/E Ratio (CAPE) A price-to-earnings ratio in which the numerator (in a US context) is defined as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings on the S&P 500.

Day traders Traders that rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are prepared to hold a position. Day traders hold a position open somewhat longer than a scalper but closing all positions at the end of the day.

Dealer A business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order. Also called *market maker*.

Decision price The prevailing price when the decision to trade is made. Also called *arrival price* or *strike price*.

Decision-reversal risk The risk of reversing a chosen course of action at the point of maximum loss.

Decision risk The risk of changing strategies at the point of maximum loss.

Deduction method When the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income.

Deemed dispositions Tax treatment that assumes property is sold. It is sometimes seen as an alternative to estate or inheritance tax.

Deemed distribution When shareholders of a controlled foreign corporation are taxed as if the earnings were distributed to shareholders, even though no distribution has been made.

Default risk The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.

Default risk premium Compensation for the possibility that the issue of a debt instrument will fail to make a promised payment at the contracted time and in the contracted amount.

Defaultable debt Debt with some meaningful amount of credit risk.

Deferred annuity An annuity that enables an individual to purchase an income stream that will begin at a later date.

Defined-benefit plan A pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants.

Defined-contribution plan A pension plan that specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants.

Deflation A decrease in the general level of prices; an increase in the purchasing power of a unit of currency.

Delay costs Implicit trading costs that arise from the inability to complete desired trades immediately due to order size or market liquidity. Also called *slippage*.

Delta The relationship between the option price and the underlying price, which reflects the sensitivity of the price of the option to changes in the price of the underlying.

Delta hedge An option strategy in which a position in an asset is converted to a risk-free position with a position in a specific number of options. The number of options per unit of the underlying changes through time, and the position must be revised to maintain the hedge.

Delta hedging Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

Delta-normal method A measure of VaR equivalent to the analytical method but that refers to the use of delta to estimate the option's price sensitivity.

Demand deposit A deposit that can be drawn upon without prior notice, such as a checking account.

Demutualizing The process of converting an insurance company from mutual form to stock.

Descriptive statistics Methods for effectively summarizing data to describe important aspects of a dataset.

Differential returns Returns that deviate from a manager's benchmark.

Diffusion index An index that measures how many indicators are pointing up and how many are pointing down.

Direct commodity investment Commodity investment that involves the cash market purchase of physical commodities or exposure to changes in spot market values via derivatives, such as futures.

Direct market access Platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker.

Disability income insurance A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

Discounted cash flow models (DCF models) Valuation models that express the idea that an asset's value is the present value of its (expected) cash flows.

Discretionary trust A trust structure in which the trustee determines whether and how much to distribute in the sole discretion of the trustee.

Disintermediation To withdraw funds from financial intermediaries for placement with other financial intermediaries offering a higher return or yield. Or, to withdraw funds from a financial intermediary for the purposes of direct investment, such as withdrawing from a mutual fund to make direct stock investments.

Dispersion The weighted *variance* of the times to receipt of cash flow; it measures the extent to which the payments are spread out around the duration.

Disposition effect As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

Distressed debt arbitrage A distressed securities investment discipline that involves purchasing the traded bonds of bankrupt companies and selling the common equity short.

Distressed securities Securities of companies that are in financial distress or near bankruptcy; the name given to various investment disciplines employing the securities of companies in distress.

Diversification effect In reference to VaR across several portfolios (for example, across an entire firm), this effect equals the difference between the sum of the individual VaRs and total VaR.

Dividend recapitalization A method by which a buyout fund can realize the value of a holding; involves the issuance of debt by the holding to finance a special dividend to owners.

Domestic asset An asset that trades in the investor's domestic currency (or home currency).

Domestic currency The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

Domestic-currency return A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

Donor-advised fund A fund administered by a tax-exempt entity in which the donor advises on where to grant the money that he or she has donated.

Double inflection utility function A utility function that changes based on levels of wealth.

Downside deviation A measure of volatility using only rate of return data points below the investor's minimum acceptable return.

Due diligence Investigation and analysis in support of an investment action or recommendation, such as the scrutiny of operations and management and the verification of material facts.

Duration A measure of the approximate sensitivity of a security to a change in interest rates (i.e., a measure of interest rate risk).

Duration matching Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

Dynamic asset allocation A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

Dynamic hedge A hedge requiring adjustment as the price of the hedged asset changes.

Earnings at risk (EAR) A variation of VaR that reflects the risk of a company's earnings instead of its market value.

Earnings momentum A growth investment substyle that focuses on companies with earnings momentum (high quarterly year-over-year earnings growth).

Earnings risk The risk associated with the earning potential of an individual.

Econometrics The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

Economic balance sheet A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet.*

Economic exposure The risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.

Economic indicators Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

Effective convexity A second-order effect that describes how a bond's interest rate sensitivity changes with changes in yield. Effective convexity is used when the bond has cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities).

Effective duration Duration adjusted to account for embedded options.

Effective spread Two times the distance between the actual execution price and the midpoint of the market quote at the time an order is entered; a measure of execution costs that captures the effects of price improvement and market impact.

Electronic communications networks (ECNs) Computer-based auctions that operate continuously within the day using a specified set of rules to execute orders.

Emerging market debt The sovereign debt of nondeveloped countries.

Emotional biases Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Empirical duration A measure of interest rate sensitivity that is determined from market data.

Endogenous variable A variable whose values are determined within the system.

Endowment bias An emotional bias in which people value an asset more when they hold rights to it than when they do not.

Endowments Long-term funds generally owned by operating nonprofit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Enhanced derivatives products companies A type of subsidiary separate from an entity's other activities and not liable for the parent's debts. They are often used by derivatives dealers to control exposure to ratings downgrades. Also called *special purpose vehicles.*

Enhanced indexing strategy Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

Enterprise risk management An overall assessment of a company's risk position. A centralized approach to risk management sometimes called firmwide risk management.

Environmental, social, and corporate governance (ESG) Also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.

Equal probability rebalancing Rebalancing in which the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor.

Equal weighted In an equal-weighted index, each stock in the index is weighted equally.

Equal weighting Security weighting scheme in which all constituents are held at equal weights at specified rebalancing times.

Equitized Given equity market systematic risk exposure.

Equity forward sale contract A private contract for the forward sale of an equity position.

Equity monetization The realization of cash for an equity position through a manner other than an outright sale.

Equity *q* The ratio of a company's equity market capitalization divided by net worth measured at replacement cost.

Equity risk premium Compensation for the additional risk of equity compared with debt.

ESG risk The risk to a company's market valuation resulting from environmental, social, and governance factors.

Estate All of the property a person owns or controls; may consist of financial assets, tangible personal assets, immovable property, or intellectual property.

Estate planning The process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime.

Estate tax freeze A plan usually involving a corporation, partnership, or limited liability company with the goal to transfer *future* appreciation to the next generation at little or no gift or estate tax cost.

Eurozone The region of countries using the euro as a currency.

Evaluated pricing See *matrix pricing.*

***Ex post* alpha** (or Jensen's alpha) The average return achieved in a portfolio in excess of what would have been predicted by CAPM given the portfolio's risk level; an after-the-fact measure of excess risk-adjusted return.

Excess capital An investor's capital over and above that which is necessary to fund their lifestyle and reserves.

Excess return The difference between the benchmark return and the portfolio return, which may be either positive or negative.

Exchange A regulated venue for the trading of investment instruments.

Exchange fund A fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself.

Exchange-traded funds Exchange-traded Funds or ETFs are hybrid investment products with many features of mutual funds combined with the trading features of common stocks or bonds. Essentially, ETFs are typically portfolios of stocks or bonds or commodities that trade throughout the day like common stocks.

Execution uncertainty Uncertainty pertaining to the timing of execution, or if execution will even occur at all.

Exemption method When the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, in effect having only one jurisdiction impose tax.

Exogenous shocks Events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example.

Exogenous variable A variable whose values are determined outside the system.

Extended portfolio assets and liabilities Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

Externality Those consequences of a transaction (or process) that do not fall on the parties to the transaction (or process).

Factor covariance matrix The covariance matrix of factors.

Factor-model-based benchmark Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

Factor push A simple stress test that involves pushing prices and risk factors of an underlying model in the most disadvantageous way to estimate the impact of factor extremes on the portfolio's value.

Factor sensitivities In a multifactor model, the responsiveness of the dependent variable to factor movements. Also called *factor betas* or *factor loadings*.

Fallen angels Debt that has crossed the threshold from investment grade to high yield.

Fed model An equity valuation model that relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds.

Federal funds rate The interest rate on overnight loans of reserves (deposits) between US Federal Reserve System member banks.

Fee cap A limit on the total fee paid regardless of performance.

Fiduciary A person or entity standing in a special relation of trust and responsibility with respect to other parties.

Financial buyers Buyers who lack a strategic motive.

Financial capital The tangible and intangible assets (excluding human capital) owned by an individual or household.

Financial equilibrium models Models describing relationships between expected return and risk in which supply and demand are in balance.

Financial risk Risks derived from events in the external financial markets, such as changes in equity prices, interest rates, or currency exchange rates.

Fiscal policy Government activity concerning taxation and governmental spending.

Fixed trust A trust structure in which distributions to beneficiaries are prescribed in the trust document to occur at certain times or in certain amounts.

Flexible-premium variable life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *variable universal life*.

Floating supply of shares The number of shares outstanding that are actually available to investors. Also called *free float*.

Floor A combination of interest rate options designed to provide protection against interest rate decreases.

Floor broker An agent of the broker who, for certain exchanges, physically represents the trade on the exchange floor.

Floorlet Each component put option in a floor.

Forced heirship rules Legal ownership principles whereby children have the right to a fixed share of a parent's estate.

Foreign assets Assets denominated in currencies other than the investor's home currency.

Foreign currency Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

Foreign-currency return The return of the foreign asset measured in foreign-currency terms.

Formal tools Established research methods amenable to precise definition and independent replication of results.

Forward conversion with options The construction of a synthetic short forward position against the asset held long.

Forward rate bias Persistent violation of uncovered interest rate parity that is exploited by the carry trade.

Foundations Typically, grant-making institutions funded by gifts and investment assets.

Fourth market A term occasionally used for direct trading of securities between institutional investors; the fourth market would include trading on electronic crossing networks.

Framing An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Framing bias An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Front office The revenue generating functions at an investment firm such as those pertaining to trading and sales.

Front-run To trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions.

Full replication When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Full replication approach When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Fully funded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is 100 percent or greater.

Fund manager The professional manager of separate accounts or pooled assets structured in a variety of ways.

Fund of funds A fund that invests in a number of underlying funds.

Fundamental law of active management The relation that the information ratio of a portfolio manager is approximately equal to the information coefficient multiplied by the square root of the investment discipline's breadth (the number of independent, active investment decisions made each year).

Fundamental weighting Patented by Research Affiliates LLC, this scheme uses company characteristics such as sales, cash flow, book value, and dividends to weight securities.

Funded status The relationship between the value of a plan's assets and the present value of its liabilities.

Funding currencies The low-yield currencies in which borrowing occurs in a carry trade.

Funding risk The risk that liabilities funding long asset positions cannot be rolled over at reasonable cost.

G-spread The yield on a credit security over the yield of an actual or interpolated government bond.

Gain-to-loss ratio The ratio of positive returns to negative returns over a specified period of time.

Gamblers' fallacy A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

Gamma A numerical measure of the sensitivity of delta to a change in the underlying's value.

Global custodian An entity that effects trade settlement, safekeeping of assets, and the allocation of trades to individual custody accounts.

Global investable market A practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.

Goals-based With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

Goals-based investing An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

Gordon (constant) growth model A version of the dividend discount model for common share value that assumes a constant growth rate in dividends.

Government structural policies Government policies that affect the limits of economic growth and incentives within the private sector.

Grinold–Kroner model An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

Growth in total factor productivity A component of trend growth in GDP that results from increased efficiency in using capital inputs; also known as technical progress.

H-model A variant of the two-stage dividend discount model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate that holds in perpetuity.

Hague Conference on Private International Law An intergovernmental organization working toward the convergence of private international law. Its 69 members consist of countries and regional economic integration organizations.

Halo effect An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

Health insurance A type of insurance used to cover health care and medical costs.

Health risk The risk associated with illness or injury.

Hedge funds A historically loosely regulated, pooled investment vehicle that may implement various investment strategies.

Hedge ratio The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

Hedging A general strategy usually thought of as reducing, if not eliminating, risk.

Herding When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

High-water mark A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

High yield A value investment substyle that focuses on stocks offering high dividend yield with prospects of maintaining or increasing the dividend.

High-yield investing A distressed securities investment discipline that involves investment in high-yield bonds perceived to be undervalued.

Hindsight bias A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

Historical simulation method The application of historical price changes to the current portfolio.

Holdings-based style analysis An approach to style analysis that categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time.

Holistic balance sheet See *economic balance sheet.*

Home bias A preference for securities listed on the exchanges of one's home country.

Home-country bias The favoring of domestic over non-domestic investments relative to global market value weights.

Home currency See *domestic currency.*

Horizon matching Hybrid approach that combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short-and long-term liabilities.

Human capital An implied asset; the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital.*

Hybrid markets Combinations of market types, which offer elements of batch auction markets and continuous auction markets, as well as quote-driven markets.

Hypothetical events A type of scenario analysis used in stress testing that involves the evaluation of performance given events that have never happened in the markets or market outcomes to which we attach a small probability.

I-spread The yield on a credit security over the swap rate (denominated in the same currency as the credit security). Also known as interpolated spread.

Illiquidity premium Compensation for the risk of loss relative to an investment's fair value if an investment needs to be converted to cash quickly.

Illusion of control A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Illusion of control bias A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Immediate annuity An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

Immunization An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

Implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return.

Implementation shortfall strategy A strategy that attempts to minimize trading costs as measured by the implementation shortfall method. Also called *arrival price strategy*.

Implied yield A measure of the yield on the underlying bond of a futures contract implied by pricing it as though the underlying will be delivered at the futures expiration.

Incremental VaR A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.

Indexing A common passive approach to investing that involves holding a portfolio of securities designed to replicate the returns on a specified index of securities.

Indifference curve analysis A decision-making approach whereby curves of consumption bundles, among which the decision-maker is indifferent, are constructed to identify and choose the curve within budget constraints that generates the highest utility.

Indirect commodity investment Commodity investment that involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production.

Inferential statistics Methods for making estimates or forecasts about a larger group from a smaller group actually observed.

Inflation An increase in the general level of prices; a decrease in the purchasing power of a unit of currency.

Inflation hedge An asset whose returns are sufficient on average to preserve purchasing power during periods of inflation.

Inflation premium Compensation for expected inflation.

Information coefficient The correlation between forecast and actual returns.

Information-motivated traders Traders that seek to trade on information that has limited value if not quickly acted upon.

Information ratio The mean excess return of the account over the benchmark (i.e., mean active return) relative to the variability of that excess return (i.e., tracking risk); a measure of risk-adjusted performance.

Infrastructure funds Funds that make private investment in public infrastructure projects in return for rights to specified revenue streams over a contracted period.

Initial public offering The initial issuance of common stock registered for public trading by a formerly private corporation.

Input uncertainty Uncertainty concerning whether the inputs are correct.

Inside ask The lowest available ask price. Also called *market ask*.

Inside bid The highest available bid price. Also called *market bid*.

Inside bid–ask spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *market spread*.

Inside quote Combination of the highest available bid price with the lowest available ask price. Also called *market quote*.

Inside spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside bid–ask spread*, or *market spread*.

Institutional investors Corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets.

Interest rate management effect With respect to fixed-income attribution analysis, a return component reflecting how well a manager predicts interest rate changes.

Interest spread With respect to banks, the average yield on earning assets minus the average percent cost of interest-bearing liabilities.

Internal rate of return The growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows; money-weighted rate of return is a synonym.

Intestate Having made no valid will; a decedent without a valid will or with a will that does not dispose of their property is considered to have died intestate.

Intrinsic value The difference between the spot exchange rate and the strike price of a currency option.

Inventory cycle A cycle measured in terms of fluctuations in inventories, typically lasting 2–4 years.

Inverse floater A floating-rate note or bond in which the coupon is adjusted to move opposite to a benchmark interest rate.

Investment currencies The high-yielding currencies in a carry trade.

Investment skill The ability to outperform an appropriate benchmark consistently over time.

Investment style A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

Investment style indexes Indexes that represent specific portions of an asset category. For example, subgroups within the US common stock asset category such as large-capitalization growth stocks.

Investment universe The set of assets that may be considered for investment.

Investor's benchmark The benchmark an investor uses to evaluate performance of a given portfolio or asset class.

Irrevocable trust A trust arrangement wherein the settlor has no ability to revoke the trust relationship.

J factor risk The risk associated with a judge's track record in adjudicating bankruptcies and restructurings.

Joint ownership with right of survivorship Jointly owned; assets held in joint ownership with right of survivorship automatically transfer to the surviving joint owner or owners outside the probate process.

Justified P/E The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.

Key rate duration A method of measuring the interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

Knock-in/knock-out Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

Lagging economic indicators A set of economic variables whose values correlate with recent past economic activity.

Leading economic indicators A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

Legal/contract risk The possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake; for example, if a contract is voided through litigation.

Leverage-adjusted duration gap A leverage-adjusted measure of the difference between the durations of assets and liabilities which measures a bank's overall interest rate exposure.

Leveraged floating-rate note (leveraged floater) A floating-rate note or bond in which the coupon is adjusted at a multiple of a benchmark interest rate.

Leveraged recapitalization A leveraging of a company's balance sheet, usually accomplished by working with a private equity firm.

Liability-based benchmark A benchmark structured to accurately reflect the return required to meet the future obligations of an investor and to mimic the volatility of the liabilities.

Liability-driven investing An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

Liability glide path A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

Liability insurance A type of insurance used to manage liability risk.

Liability-relative With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

Liability risk The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

Life-cycle finance A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

Life insurance A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

Lifetime gratuitous transfer A lifetime gift made during the lifetime of the donor; also known as *inter vivos* transfers.

Limit order An instruction to execute an order when the best price available is at least as good as the limit price specified in the order.

Liquidity The ability to trade without delay at relatively low cost and in relatively large quantities.

Liquidity-motivated traders Traders that are motivated to trade based upon reasons other than an information advantage. For example, to release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs.

Liquidity risk Any risk of economic loss because of the need to sell relatively less liquid assets to meet liquidity requirements; the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.

Lock-up period A minimum initial holding period for investments during which no part of the investment can be withdrawn.

Locked up Said of investments that cannot be traded at all for some time.

Logical participation strategies Protocols for breaking up an order for execution over time. Typically used by institutional traders to participate in overall market volumes without being unduly visible.

Longevity risk The risk associated with living to an advanced age in retirement, including the uncertainty surrounding how long retirement will last; the risk of outliving one's financial resources.

Loss-aversion bias A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

Loss given default See *loss severity*.

Loss severity The amount of loss if a default occurs. Also called *loss given default*.

Low P/E A value investment substyle that focuses on shares selling at low prices relative to current or normal earnings.

M^2 A measure of what a portfolio would have returned if it had taken on the same total risk as the market index.

Macaulay duration The percentage change in price for a percentage change in yield. The term, named for one of the economists who first derived it, is used to distinguish the calculation from modified duration. (See also *modified duration*).

Macro attribution Performance attribution analysis conducted on the fund sponsor level.

Macro expectations Expectations concerning classes of assets.

Managed futures Pooled investment vehicles, frequently structured as limited partnerships, that invest in futures and options on futures and other instruments.

Managed futures funds Pools of private capital managed by commodity trading advisers.

Manager continuation policies Policies adopted to guide the manager evaluations conducted by fund sponsors. The goal of manager continuation policies is to reduce the costs of manager turnover while systematically acting on indications of future poor performance.

Manager monitoring A formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations; used to identify warning signs of adverse changes in existing managers' organizations.

Manager peer group See *manager universe*.

Manager review A detailed examination of a manager that currently exists within a plan sponsor's program. The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired.

Manager universe A broad group of managers with similar investment disciplines. Also called *manager peer group*.

Market-adjusted implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return, adjusted using beta to remove the effect of the return on the market.

Market ask The lowest available ask price.

Market bid The best available bid; highest price any buyer is currently willing to pay.

Market bid–ask spread Market ask price minus market bid price. Also called *inside bid–ask spread*, *inside spread*, or *market spread*.

Market cap weighting See *capitalization weighting*.

Market fragmentation A condition whereby a market contains no dominant group of sellers (or buyers) that are large enough to unduly influence the market.

Market impact The effect of the trade on transaction prices. Also called *price impact*.

Market index Represents the performance of a specified security market, market segment, or asset class.

Market integration The degree to which there are no impediments or barriers to capital mobility across markets.

Market microstructure The market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Market model A regression equation that specifies a linear relationship between the return on a security (or portfolio) and the return on a broad market index.

Market-not-held order A variation of the market order designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the floor broker is not required to trade at any specific price or in any specific time interval.

Market on close order A market order to be executed at the closing of the market.

Market on open order A market order to be executed at the opening of the market.

Market order An instruction to execute an order as soon as possible in the public markets at the best price available.

Market oriented With reference to equity investing, an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth.

Market quote Combination of the highest available bid price with the lowest available ask price. Also called *inside quote*.

Market risk The risk associated with interest rates, exchange rates, and equity prices.

Market risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to maintain the client's current standard of living.

Market segmentation The degree to which there are some meaningful impediments to capital movement across markets.

Market spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *inside bid–ask spread*.

Market value weighting See *capitalization weighting*.

Marking to market A procedure used primarily in futures markets in which the parties to a contract settle the amount owed daily. Also known as the *daily settlement*.

Mass affluent An industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services.

Matrix prices Prices determined by comparisons to other securities of similar credit risk and maturity; the result of matrix pricing.

Matrix pricing An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

Maturity premium Compensation for the increased sensitivity of the market value of debt to a change in market interest rates as maturity is extended.

Maximum loss optimization A stress test in which we would try to optimize mathematically the risk variable that would produce the maximum loss.

Mega-cap buyout funds A class of buyout funds that take public companies private.

Mental accounting bias An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

Micro attribution Performance attribution analysis carried out on the investment manager level.

Micro expectations Expectations concerning individual assets.

Middle-market buyout funds A class of buyout funds that purchase private companies whose revenues and profits are too small for them to access capital from the public equity markets.

Midquote The halfway point between the market bid and ask prices.

Minimum-variance hedge ratio A mathematical approach to determining the optimal cross hedging ratio.

Mismatch in character The potential tax inefficiency that can result if the instrument being hedged, and the tool that is being used to hedge it, produce income and loss of a different character.

Missed trade opportunity costs Unrealized profit/loss arising from the failure to execute a trade in a timely manner.

Model risk The risk that a model is incorrect or misapplied; in investments, it often refers to valuation models.

Model uncertainty Uncertainty concerning whether a selected model is correct.

Modified duration An adjustment of the duration for the level of the yield. Contrast with *Macaulay duration*.

Monetary policy Government activity concerning interest rates and the money supply.

Monetize To access an item's cash value without transferring ownership of it.

Money duration A measure of the price change in units of the currency in which the bond is denominated given a change in its yield-to-maturity.

Money markets Markets for fixed-income securities with maturities of one year or less.

Money-weighted rate of return Same as the internal rate of return; the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows.

Multifactor model A model that explains a variable in terms of the values of a set of factors.

Multiperiod Sharpe ratio A Sharpe ratio based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment.

Mutual funds A professionally managed investment pool in which investors in the fund typically each have a pro-rata claim on the income and value of the fund.

Mutuals With respect to insurance companies, companies that are owned by their policyholders, who share in the company's surplus earnings.

Natural liquidity An extensive pool of investors who are aware of and have a potential interest in buying and/or selling a security.

Net asset value Value established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.

Net employment capital See *human capital*.

Net interest margin With respect to banks, net interest income (interest income minus interest expense) divided by average earning assets.

Net interest spread With respect to the operations of insurers, the difference between interest earned and interest credited to policyholders.

Net wealth The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

Net worth tax or net wealth tax A tax based on a person's assets, less liabilities.

Nominal default-free bonds Conventional bonds that have no (or minimal) default risk.

Nominal gross domestic product A money measure of the goods and services produced within a country's borders. Also called *nominal GDP*.

Nominal risk-free interest rate The sum of the real risk-free interest rate and the inflation premium.

Non-deliverable forwards Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

Nonfinancial risk Risks that arise from sources other than the external financial markets, such as changes in accounting rules, legal environment, or tax rates.

Nonparametric Involving minimal probability-distribution assumptions.

Nonstationarity A property of a data series that reflects more than one set of underlying statistical properties.

Normal portfolio A portfolio with exposure to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Objective function A quantitative expression of the objective or goal of a process.

Offer price The price at which a counterparty is willing to sell one unit of the base currency.

Open market operations The purchase or sale by a central bank of government securities, which are settled using reserves, to influence interest rates and the supply of credit by banks.

Open outcry auction market Public auction where representatives of buyers and sellers meet at a specified location and place verbal bids and offers.

Operational risk The risk of loss from failures in a company's systems and procedures (for example, due to computer failures or human failures) or events completely outside of the control of organizations (which would include "acts of God" and terrorist actions).

Opportunistic participation strategies Passive trading combined with the opportunistic seizing of liquidity.

Optimization With respect to portfolio construction, a procedure for determining the best portfolios according to some criterion.

Option-adjusted spread The constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price.

Order-driven markets Markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices.

Ordinary life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *whole life insurance*.

Orphan equities investing A distressed securities investment discipline that involves investment in orphan equities that are perceived to be undervalued.

Orphan equity The newly issued equity of a company emerging from reorganization.

Output gap The difference between the value of GDP estimated as if the economy were on its trend growth path (potential output) and the actual value of GDP.

Overall trade balance The sum of the current account (reflecting exports and imports) and the financial account (consisting of portfolio flows).

Overbought When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

Overconfidence bias A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

Overconfidence trap The tendency of individuals to overestimate the accuracy of their forecasts.

Oversold The opposite of overbought; see *overbought*.

Pairs trade A basic long–short trade in which an investor is long and short equal currency amounts of two common stocks in a single industry. Also called *pairs arbitrage*.

Panel method A method of capital market expectations setting that involves using the viewpoints of a panel of experts.

Partial correlation In multivariate problems, the correlation between two variables after controlling for the effects of the other variables in the system.

Partial fill Execution of a purchase or sale for fewer shares than was stipulated in the order.

Participate (do not initiate) order A variant of the market-not-held order. The broker is deliberately low-key and waits for and responds to the initiatives of more active traders.

Passive investment Investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

Passive investment strategies A buy-and-hold strategy to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive management A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive traders Traders that seek liquidity in their rebalancing transactions, but are much more concerned with the cost of trading.

Payment netting A means of settling payments in which the amount owed by the first party to the second is netted with the amount owed by the second party to the first; only the net difference is paid.

Pension funds Funds consisting of assets set aside to support a promise of retirement income.

Pension surplus Pension assets at market value minus the present value of pension liabilities.

Percent-range rebalancing An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

Percentage-of-portfolio rebalancing Rebalancing is triggered based on set thresholds stated as a percentage of the portfolio's value.

Percentage-of-volume strategy A logical participation strategy in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Perfect markets Markets without any frictional costs.

Performance appraisal The evaluation of portfolio performance; a quantitative assessment of a manager's investment skill.

Performance attribution A comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns.

Performance-based fee Fees specified by a combination of a base fee plus an incentive fee for performance in excess of a benchmark's.

Performance evaluation The measurement and assessment of the outcomes of investment management decisions.

Performance measurement A component of performance evaluation; the relatively simple procedure of calculating an asset's or portfolio's rate of return.

Performance netting risk For entities that fund more than one strategy and have asymmetric incentive fee arrangements with the portfolio managers, the potential for loss in cases where the net performance of the group of managers generates insufficient fee revenue to fully cover contractual payout obligations to all portfolio managers with positive performance.

Periodic auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Permanent income hypothesis The hypothesis that consumers' spending behavior is largely determined by their long-run income expectations.

Permanent life insurance A type of life insurance that provides lifetime coverage.

Personal risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to protect the client from a drastic decrease in lifestyle.

Plan sponsor The trustee, company, or employer responsible for a public or private institutional investment plan.

Pledging requirement With respect to banks, a required collateral use of assets.

Point estimate A single-valued estimate of a quantity, as opposed to an estimate in terms of a range of values.

Policyholder reserves With respect to an insurance company, an amount representing the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Political risk The risk of war, government collapse, political instability, expropriation, confiscation, or adverse changes in taxation. Also called *geopolitical risk*.

Portable Moveable. With reference to a pension plan, one in which a plan participant can move his or her share of plan assets to a new plan, subject to certain rules, vesting schedules, and possible tax penalties and payments.

Portable alpha A strategy involving the combining of multiple positions (e.g., long and short positions) so as to separate the alpha (unsystematic risk) from beta (systematic risk) in an investment.

Portfolio trade A trade in which a number of securities are traded as a single unit. Also called *program trade* or *basket trade*.

Position a trade To take the other side of a trade, acting as a principal with capital at risk.

Post-trade transparency Degree to which completed trades are quickly and accurately reported to the public.

Potential output The value of GDP if the economy were on its trend growth path.

Preferred return With respect to the compensation of private equity fund managers, a hurdle rate.

Premature death risk The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

Premium Regarding life insurance, the asset paid by the policy holder to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy.

Prepackaged bankruptcy A bankruptcy in which the debtor seeks agreement from creditors on the terms of a reorganization before the reorganization filing.

Prepaid variable forward A collar and loan combined within a single instrument.

Present value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Present value of distribution of cash flows methodology Method used to address a portfolio's sensitivity to rate changes along the yield curve, this approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

Pretrade transparency Ability of individuals to quickly, easily, and inexpensively obtain accurate information about quotes and trades.

Price discovery Adjustment of transaction prices to balance supply and demand.

Price improvement Execution at a price that is better than the price quoted at the time of order placement.

Price uncertainty Uncertainty about the price at which an order will execute.

Price value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Price weighted With respect to index construction, an index in which each security in the index is weighted according to its absolute share price.

Price weighting Security weighting scheme in which constituents are weighted in proportion to their prices.

Priced risk Risk for which investors demand compensation.

Primary capital Assets held outside a concentrated position that are at least sufficient to provide for the owner's lifetime spending needs.

Prime brokerage A suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

Principal trade A trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell.

Private equity Ownership interests in non-publicly traded companies.

Private equity funds Pooled investment vehicles that generally invest in highly illiquid assets; include venture capital funds and buyout funds.

Private exchange A method for handling undiversified positions with built-in capital gains in which shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.

Private placement memorandum A document used to raise venture capital financing when funds are raised through an agent.

Probate The legal process to confirm the validity of a will so that executors, heirs, and other interested parties can rely on its authenticity.

Profit-sharing plans A defined-contribution plan in which contributions are based, at least in part, on the plan sponsor's profits.

Projected benefit obligation (PBO) A measure of a pension plan's liability that reflects accumulated service in the same manner as the ABO but also projects future variables, such as compensation increases.

Property insurance A type of insurance used by individuals to manage property risk.

Property risk The possibility that a person's property may be damaged, destroyed, stolen, or lost.

Prospect theory An alternative to expected utility theory, it assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses.

Protective put An option strategy in which a long position in an asset is combined with a long position in a put.

Proxy hedge See *cross hedge*.

Prudence trap The tendency to temper forecasts so that they do not appear extreme; the tendency to be overly cautious in forecasting.

Public good A good that is not divisible and not excludable (a consumer cannot be denied it).

Purchasing power parity The theory that movements in an exchange rate should offset any difference in the inflation rates between two countries.

Pure indexing Method investors use to match an underlying market index in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk.

Pure sector allocation return A component of attribution analysis that relates relative returns to the manager's sector-weighting decisions. Calculated as the difference between the allocation (weight) of the portfolio to a given sector and the portfolio's benchmark weight for that sector, multiplied by the difference between the sector benchmark's return and the overall portfolio's benchmark return, summed across all sectors.

Put spread A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

Quality control charts A graphical means of presenting performance appraisal data; charts illustrating the performance of an actively managed account versus a selected benchmark.

Quantitative easing A policy measure in which a central bank buys financial assets to inject a predetermined quantity of money in the financial system.

Quote-driven markets Markets that rely on dealers to establish firm prices at which securities can be bought and sold. Also called *dealer markets*.

Quoted depth The number of shares available for purchase or sale at the quoted bid and ask prices.

Ratio spread An option strategy in which a long position in a certain number of options is offset by a short position in a certain number of other options on the same underlying, resulting in a risk-free position.

Rational economic man A self-interested, risk-averse individual who has the ability to make judgments using all available information in order to maximize his/her expected utility.

Re-base With reference to index construction, to change the time period used as the base of the index.

Real estate Interests in land or structures attached to land.

Real estate investment trusts (REITs) Publicly traded equities representing pools of money invested in real estate properties and/or real estate debt.

Real option An option involving decisions related to tangible assets or processes.

Real risk-free interest rate The single-period interest rate for a completely risk-free security if no inflation were expected.

Rebalancing In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

Rebalancing range A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

Rebate rate The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

Recallability trap The tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory.

Recession A broad-based economic downturn, conventionally defined as two successive quarterly declines in GDP.

Regime A distinct governing set of relationships.

Regret The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

Regret-aversion bias An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

Regulatory risk The risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change.

Reinvestment risk The risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate.

Relative economic strength forecasting approach An exchange rate forecasting approach that suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate.

Relative strength indicators A price momentum indicator that involves comparing a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.

Remaindermen Beneficiaries of a trust; having a claim on the residue.

Repo rate The interest rate on a repurchase agreement.

Representativeness bias A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

Repurchase agreements (repos) In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount, while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

Repurchase yield The negative of the expected percent change in number of shares outstanding, in the Grinold–Kroner model.

Residence jurisdiction A framework used by a country to determine the basis for taxing income, based on residency.

Residence–residence conflict When two countries claim residence of the same individual, subjecting the individual's income to taxation by both countries.

Residence–source conflict When tax jurisdiction is claimed by an individual's country of residence and the country where some of their assets are sourced; the most common source of double taxation.

Residue With respect to trusts, the funds remaining in a trust when the last income beneficiary dies.

Resistance levels Price points on dealers' order boards where one would expect to see a clustering of offers.

Retired-lives The portion of a pension fund's liabilities associated with retired workers.

Returns-based benchmarks Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

Returns-based style analysis An approach to style analysis that focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns.

Reverse repos Repurchase agreement from the standpoint of the lender.

Revocable trust A trust arrangement wherein the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets.

Risk budgeting The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

Risk exposure A source of risk. Also, the state of being exposed or vulnerable to a risk.

Risk premium approach An approach to forecasting the return of a risky asset that views its expected return as the sum of the risk-free rate of interest and one or more risk premiums.

Risk reversal With respect to foreign exchange option strategies, one involving a long position in a call option and a short position in a put option.

Risk tolerance The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

Rolling return The moving average of the holding-period returns for a specified period (e.g., a calendar year) that matches the investor's time horizon.

Sale and leaseback A transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rate and term acceptable to the new owner and on financial terms consistent with the marketplace.

Sample estimator A formula for assigning a unique value (a point estimate) to a population parameter.

Sample-size neglect A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or "real" data).

Sandwich spread An option strategy that is equivalent to a short butterfly spread.

Satisfice A combination of "satisfy" and "suffice" describing decisions, actions, and outcomes that may not be optimal, but are adequate.

Savings–investment imbalances forecasting approach An exchange rate forecasting approach that explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate.

Scenario analysis A risk assessment technique involving the examination of the performance of a portfolio under specified situations.

Seagull spread An extension of the risk reversal foreign exchange option strategy that limits downside risk.

Secondary offering An offering after the initial public offering of securities.

Sector/quality effect In a fixed-income attribution analysis, a measure of a manager's ability to select the "right" issuing sector and quality group.

Security selection effect In a fixed-income attribution analysis, the residual of the security's total return after other effects are accounted for; a measure of the return due to ability in security selection.

Segmentation With respect to the management of insurance company portfolios, the notional subdivision of the overall portfolio into sub-portfolios each of which is associated with a specified group of insurance contracts.

Self-attribution bias A bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control.

Self-control bias A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

Sell side Broker/dealers that sell securities and make recommendations for various customers, such as investment managers and institutional investors.

Semi-active management A variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark with tightly controlled risk relative to the benchmark. Also called *enhanced indexing* or *risk-controlled active management.*

Separate property regime A marital property regime under which each spouse is able to own and control property as an individual.

Settlement netting risk The risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.

Settlement risk When settling a contract, the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.

Settlor (or grantor) An entity that transfers assets to a trustee, to be held and managed for the benefit of the trust beneficiaries.

Shari'a The law of Islam. In addition to the law of the land, some follow guidance provided by Shari'a or Islamic law.

Sharpe ratio A measure of risk-adjusted performance that compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. Also called *reward-to-variability*.

Short sale against the box Shorting a security that is held long.

Shortfall probability The probability of failing to meet a specific liability or goal.

Shortfall risk The risk that portfolio value will fall below some minimum acceptable level during a stated time horizon; the risk of not achieving a specified return target.

Shrinkage estimation Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

Shrinkage estimator The formula used in shrinkage estimation of a parameter.

Smart beta Involves the use of simple, transparent, rules-based strategies as a basis for investment decisions.

Smart routing The use of algorithms to intelligently route an order to the most liquid venue.

Smoothing rule With respect to spending rates, a rule that averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

Social proof A bias in which individuals tend to follow the beliefs of a group.

Socially responsible investing An approach to investing that integrates ethical values and societal concerns with investment decisions. Also called *ethical investing*.

Soft dollars The use of commissions to buy services other than execution services. Also called *soft dollar arrangements* or *soft commissions*.

Sole ownership Owned by one person; assets held in sole ownership are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will through the probate process.

Solow residual A measure of the growth in total factor productivity that is based on an economic growth model developed by economist Robert M. Solow.

Sortino ratio A performance appraisal ratio that divides the difference between a portfolio's return and a minimum acceptable return by downside deviation.

Source jurisdiction A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Source–source conflict When two countries claim source jurisdiction of the same asset; both countries may claim that the income is derived from their jurisdiction.

Sovereign risk A form of credit risk in which the borrower is the government of a sovereign nation.

Spread curve The fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Spread duration A measure used in determining a portfolio's sensitivity to changes in credit spreads.

Stale price bias Bias that arises from using prices that are stale because of infrequent trading.

Static hedge A hedge that is not sensitive to changes in the price of the asset hedged.

Stationary A series of data for which the parameters that describe a return-generating process are stable.

Status quo bias An emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change.

Status quo trap The tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past.

Sterling ratio The compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%.

Stock companies With respect to insurance companies, companies that have issued common equity shares.

Stock index futures Futures contracts on a specified stock index.

Stops Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

Straddle An option strategy involving the purchase of a put and a call on the same underlying with the same exercise price and expiration date. If the put and call are held long, it is a long straddle; if they are held short, it is a short straddle.

Straight-through processing Systems that simplify transaction processing through the minimization of manual and/or duplicative intervention in the process from trade placement to settlement.

Strangle A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

Strap An option strategy involving the purchase of two calls and one put.

Strategic asset allocation 1) The process of allocating money to IPS-permissible asset classes that integrates the investor's return objectives, risk tolerance, and investment constraints with long-run capital market expectations. 2) The result of the above process, also known as the policy portfolio.

Strategic buyers Buyers who have a strategic motive (e.g., realization of synergies) for seeking to buy a company.

Strategy benchmarks See custom security-based benchmarks.

Stratified sampling A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

Strip An option strategy involving the purchase of two puts and one call.

Structural level of unemployment The level of unemployment resulting from scarcity of a factor of production.

Structural risk Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

Structured note A variation of a floating-rate note that has some type of unusual characteristic such as a leverage factor or in which the rate moves opposite to interest rates.

Style drift Inconsistency in style.

Style index A securities index intended to reflect the average returns to a given style.

Stylized scenario A type of analysis often used in stress testing. It involves simulating the movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio.

Sunshine trades Public display of a transaction (usually high-volume) in advance of the actual order.

Support levels Price points on dealers' order boards where one would expect to see a clustering of bids.

Surplus The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

Surplus capital Capital that is in excess of primary capital.

Survey method A method of capital market expectations setting that involves surveying experts.

Survival probability The probability an individual survives in a given year; used to determine expected cash flow required in retirement.

Survivorship bias Bias that arises in a data series when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain; when a data series as of a given date reflects only entities that have survived to that date.

Swap rate The interest rate applicable to the pay-fixed-rate side of an interest rate swap.

Tactical asset allocation Asset allocation that involves making short-term adjustments to asset class weights based on short-term predictions of relative performance among asset classes.

Tactical rebalancing A variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals.

Tail risk The risk that there are more actual events in the tail of a probability distribution than would be predicted by probability models.

Tail value at risk (or conditional tail expectation) The VaR plus the expected loss in excess of VaR, when such excess loss occurs.

Target covariance matrix A component of shrinkage estimation; allows the analyst to model factors that are believed to influence the data over periods longer than observed in the historical sample.

Tax avoidance Developing strategies that minimize tax, while conforming to both the spirit and the letter of the tax codes of jurisdictions with taxing authority.

Tax efficiency The proportion of the expected pretax total return that will be retained after taxes.

Tax evasion The practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

Tax premium Compensation for the effect of taxes on the after-tax return of an asset.

Tax risk The uncertainty associated with tax laws.

Taylor rule A rule linking a central bank's target short-term interest rate to the rate of growth of the economy and inflation.

Temporary life insurance A type of life insurance that covers a certain period of time, specified at purchase. Commonly referred to as "term" life insurance.

Term life insurance A type of life insurance policy that provides coverage for a specified length of time and accumulates little or no cash values.

Territorial tax system A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Testamentary gratuitous transfer The bequeathing or transfer of assets upon one's death. From a recipient's perspective, it is called an inheritance.

Testator A person who makes a will.

Theta The change in price of an option associated with a one-day reduction in its time to expiration; the rate at which an option's time value decays.

Tick The smallest possible price movement of a security.

Time deposit A deposit requiring advance notice prior to a withdrawal.

Time-series estimators Estimators that are based on lagged values of the variable being forecast; often consist of lagged values of other selected variables.

Time to expiration The time remaining in the life of a derivative, typically expressed in years.

Time value The difference between the market price of an option and its intrinsic value, determined by the uncertainty of the underlying over the remaining life of the option.

Time-weighted average price (TWAP) strategy A logical participation strategy that assumes a flat volume profile and trades in proportion to time.

Time-weighted rate of return The compound rate of growth over a stated evaluation period of one unit of money initially invested in the account.

Tobin's *q* An asset-based valuation measure that is equal to the ratio of the market value of debt and equity to the replacement cost of total assets.

Top-down Proceeding from the macroeconomy, to the economic sector level, to the industry level, to the firm level.

Top-down approach A credit strategy approach that involves formulating a view on major macroeconomic trends and then selecting the bonds that the investor expects to perform best in the expected environment.

Total factor productivity (TFP) A variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

Total future liability With respect to defined-benefit pension plans, the present value of accumulated and projected future service benefits, including the effects of projected future compensation increases.

Total rate of return A measure of the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized).

Total return equity swap A swap contract that involves a series of exchanges of the total return on a specified asset or equity index in return for specified fixed or floating rate payments.

Total return payer Party responsible for paying the reference obligation cash flows and return to the receiver, but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Total return receiver Party receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread.

Total return swap A swap in which one party agrees to pay the total return on a security. Often used as a credit derivative, in which the underlying is a bond.

Tracking error The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking risk*.

Tracking risk The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking error*.

Trade blotter A device for entering and tracking trade executions and orders to trade.

Trade settlement Completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller.

Trading activity In fixed-income attribution analysis, the effect of sales and purchases of bonds over a given period; the total portfolio return minus the other components determining the management effect in an attribution analysis.

Transaction exposure The risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale.

Translation exposure The risk associated with the conversion of foreign financial statements into domestic currency.

Transparency Availability of timely and accurate market and trade information.

Trigger points In the context of portfolio rebalancing, the endpoints of a rebalancing range (corridor).

Twist With respect to the yield curve, a movement in contrary directions of interest rates at two maturities; a nonparallel movement in the yield curve.

Type I error With respect to manager selection, keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct).

Type II error With respect to manager selection, firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect).

Underfunded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is less than 100 percent.

Underwriting (profitability) cycle A cycle affecting the profitability of insurance companies' underwriting operations.

Unit-linked life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *variable life insurance*.

Universal life insurance A type of life insurance policy that provides for premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element.

Unrelated business income With respect to the US tax code, income that is not substantially related to a foundation's charitable purposes.

Unstructured modeling Modeling without a theory on the underlying structure.

Uptick rules Trading rules that specify that a short sale must not be on a downtick relative to the last trade at a different price.

Urgency of the trade The importance of certainty of execution.

Utility The level of relative satisfaction received from the consumption of goods and services.

Utility theory Theory whereby people maximize the present value of utility subject to a present value budget constraint.

Valuation reserve With respect to insurance companies, an allowance, created by a charge against earnings, to provide for losses in the value of the assets.

Value The amount for which one can sell something, or the amount one must pay to acquire something.

Value at risk (VaR) A probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy over a specified period of time.

Value-motivated traders Traders that act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range.

Value weighted With respect to index construction, an index in which each security in the index is weighted according to its market capitalization. Also called *market-capitalization weighted*.

Variable life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *unit-linked life insurance*.

Variable prepaid forward A monetization strategy that involves the combination of a collar with a loan against the value of the underlying shares. When the loan comes due, shares are sold to pay off the loan and part of any appreciation is shared with the lender.

Variable universal life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *flexible-premium variable life*.

Vega A measure of the sensitivity of an option's price to changes in the underlying's volatility.

Venture capital The equity financing of new or growing private companies.

Venture capital firms Firms representing dedicated pools of capital for providing equity or equity-linked financing to privately held companies.

Venture capital fund A pooled investment vehicle for venture capital investing.

Venture capital trust An exchange-traded, closed-end vehicle for venture capital investing.

Venture capitalists Specialists who seek to identify companies that have good business opportunities but need financial, managerial, and strategic support.

Vested With respect to pension benefits or assets, said of an unconditional ownership interest.

Vintage year With reference to a private equity fund, the year it closed.

Vintage year effects The effects on returns shared by private equity funds closed in the same year.

Volatility Represented by the Greek letter sigma (σ), the standard deviation of price outcomes associated with an underlying asset.

Volatility clustering The tendency for large (small) swings in prices to be followed by large (small) swings of random direction.

Volume-weighted average price (VWAP) The average price at which a security is traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade.

Volume-weighted average price (VWAP) strategy A logical participation strategy that involves breaking up an order over time according to a prespecified volume profile.

Wealth relative The ending value of one unit of money invested at specified rates of return.

Whole life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *ordinary life insurance*.

Will A document associated with estate planning that outlines the rights others will have over one's property after death. Also called *testament*.

Within-sector selection return In attribution analysis, a measure of the impact of a manager's security selection decisions relative to the holdings of the sector benchmark.

Worst-case scenario analysis A stress test in which we examine the worst case that we actually expect to occur.

Yardeni model An equity valuation model, more complex than the Fed model, that incorporates the expected growth rate in earnings.

Yield beta A measure of the sensitivity of a bond's yield to a general measure of bond yields in the market that is used to refine the hedge ratio.

Yield curve The relationship between yield and time to maturity.

Yield to worst The yield on a callable bond that assumes a bond is called at the earliest opportunity.

Z-spread The yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. Also known as zero-volatility spread.

Zero-cost collar A transaction in which a position in the underlying is protected by buying a put and selling a call with the premium from the sale of the call offsetting the premium from the purchase of the put. It can also be used to protect a floating-rate borrower against interest rate increases with the premium on a long cap offsetting the premium on a short floor.

Zero-premium collar A hedging strategy involving the simultaneous purchase of puts and sale of call options on a stock. The puts are struck below and the calls are struck above the underlying's market price.

CUSTOMER SERVICE

68

Index

A
absolute priority rule, 102
absolute-return vehicles, 62
accounting risk, 148–149
active managers, selecting, 10–11
active risk, 152
actual extreme events, scenario analysis with, 172
age effects, hedge fund, 76
AIMA. *see* Alternative Investments Management Association
Aktiengesellschaft (AG), 35
alpha, 13, 62
Alphabet Inc., 33
alpha core, 13
alternative investments, 5–129
  commodities, 45–55
    benchmarks, 47–48
    historical performance, 48–50
    interpretation issues, 51
    investment characteristics, 51–53
    market for, 46–47
    in portfolios, 53–55
  common features, 7
  defined, 7
  distressed securities, 94–103
    bankruptcy process, 100–102
    benchmarks, 95
    example, 102–103
    historical performance, 95–97
    interpretation issues, 97
    investment characteristics, 97–98
    market for, 94–95
    in portfolios, 98–100
  evaluation of, 10–11
  hedge funds, 55–84
    about, 55–56
    benchmarks, 60–62, 70–71
    due diligence, 76–78
    fund effects, 74–76
    historical performance, 62–67
    interpretation issues, 67–71
    investment characteristics, 71–72
    market for, 56–60
    performance evaluations, 78–84
    in portfolios, 72–74
  investors' goals for, 6
  low-return environments, 9
  managed futures, 85–93
    benchmarks, 86–87
    historical performance, 87–89
    interpretation issues, 89
    investment characteristics, 90
    market for, 85–86
    performance persistence, 92
    in portfolios, 90–92
    strategic asset allocation, 92–93
  practice problems, 108–120
  private equity, 27–45
    about, 27–29
    benchmarks, 37
    due diligence, 43–45
    historical performance, 38
    interpretation issues, 38
    investment characteristics, 38–42
    market for, 29–37
    in portfolios, 42–43
  real estate, 13–27
    benchmarks, 15–17
    due diligence, 27
    historical performance, 17–18
    interpretation issues, 19
    investment characteristics, 20–21
    market for, 13–15
    in portfolios, 21–27
  solutions to problems, 121–129
  traditional vs., 7–13
Alternative Investments Management Association (AIMA), 76–77
Altman-NYU Salomon Center Defaulted Public Bond and Bank Loan Index, 95
AMC Entertainment, 99
American options, 178, 276
American Stock Exchange (AMEX)
  and NAREIT Index, 17
  NASDAQ 100 Trust Shares, 277n.3
American style swaptions, 389, 394, 396
analytical method, 155–160
angel investors, 31–32
Apple Computers, 39
arbitrage
  defined, 214
  distressed debt, 98
Asia, real estate allocations in, 21, 22
AsiaHedge, 60, 61
asset allocation
  adjusting, 241–248
  and equity market risk, 384–387
  and futures, 241–250
    adjusting asset allocation, 241–248
    pre-investing in asset classes, 248–250
  strategic, 26–27, 92–93
asset classes, pre-investing in, 248–250
asset under management (AUM) fees, 58–59
Australia
  real estate market, 16, 22, 25
  REITs, 14

B
backfill bias, of hedge funds, 70
back office, 139
backtesting, 169
Bank for International Settlements (BIS), 359n.4
Bank Herstatt, 146
bankruptcy process, 100–102
  absolute priority rule, 102
  Chapter 7 and Chapter 11, 102
  netting in, 187–188
  prepackaged filings, 102
  in United States vs. other countries, 101
Bankruptcy Reform Act (1978), 101
Barclay CTA Asset Weighted Currency Index, 88
Barclay CTA Asset Weighted Discretionary Index, 88
Barclay CTA Asset Weighted Diversified Index, 88
Barclay CTA Asset Weighted Financials Index, 88
Barclay CTA Asset Weighted Systematic Index, 88
BarclayHedge, 60, 86
Barclay Systematic Traders Index, 86
Barclay Traders indexes, 86
Basel Committee on Banking Supervision, 181
Basel I. *see* Capital Accord of 1988
Basel II. *see* New Basel Capital Accord
basis point value (BPV), 220
BB Holdings, 230–231
BCOM. *see* Bloomberg Commodity Index
bear spreads, 296–299
behavioral considerations, of risk management, 193
Belgium, 14
benchmarks
  for commodities, 47–48
  for distressed securities, 95
  for hedge funds, 60–62, 70–71
    alpha determination and absolute-return investing, 62
    comparison of manager-based hedge fund indexes, 61–62
  for managed futures, 86–87
  for private equity, 37
  for real estate, 15–17
beta
  changing, 240–241
  defined, 152
  measuring and managing, 228–229
biases
  backfill, 70
  for hedge funds, 67–70
  in index creation, 67–68
  stale price, 69–70
  survivorship, 69
bid–ask spread, credit risk and, 144
binomial model
  and box spreads, 310
  volatility in, 343
BIS. *see* Bank for International Settlements
Black–Scholes–Merton pricing option
  and box spreads, 310
  and delta hedging, 335
  formula for, 304
  and model risk, 145
  prices from, 277n.4, 291
  volatility in, 152, 343

Bloomberg Barclays Aggregate Bond Index
commodities correlations, 53
real estate correlations, 108
Bloomberg Barclays Global Bond Index
commodities correlations, 109–110
hedge fund correlations, 111
Bloomberg Barclays Government/Credit Bond Index
commodities correlations, 109–110, 123
hedge fund correlations, 110–111, 124
Bloomberg Barclays US Aggregate Bond Index, 116
commodities correlations, 48, 50, 53–55
distressed securities correlations, 96–97
hedge fund correlations, 62–66, 73
managed futures correlations, 87–89, 91
real estate correlations, 17–18
Bloomberg Barclays US Corporate High Yield Bond Index, 88
commodities correlations, 48, 50, 53
distressed securities correlations, 96–97
hedge fund correlations, 64–66
managed futures correlations, 89
Bloomberg Barclays US Government Bond Index, 48–50, 53–55
Bloomberg Commodity Index (BCOM), 47, 51
bond futures, risk of, 221–223
bond portfolio risk, 219–227
balancing types of risks, 221–223
of government bond portfolios, 223–226
risk of bond futures, 221–223
risk of bond portfolio, 219–221
variations and problems, 226–227
bond portfolios, risk of, 219–221
bond price, yield and, 219–221
bonds
adjusting allocation between, 244–245
adjusting allocation between stocks and, 241–243, 246–247
cheapest to deliver, 221
dual currency, 377–380
borrowing
calls with, 313–318
swaptions in anticipation of, 390–394
box spreads, 310–312
BPV. *see* basis point value
breakeven point
bear spread, 298
box spread, 311
bull spread, 295
butterfly spread, 301, 302
call options, 280, 281, 285
collars, 305, 306
covered calls, 287
protected puts, 291
put options, 283–285
straddles, 308–309
Brightman, Christopher J., 10
Brin, Sergey, 32
British pound, 370–373
budgeting, risk, 183–185
bull spreads, 293–296
business risk, 141n.5
butterfly spreads, 299–303
buyout funds, VC funds vs., 40

C

callable debt, removing calls from, 398–400
call features
adding calls to noncallable debt, 400–403
removing calls from callable debt, 398–400
call options (calls)
adding to noncallable debt, 400–403
with borrowing, 313–318
in equity portfolios
combinations of puts and, 304–312
covered, 286–290
long/short positions for, 279–282
premiums, 159
removing from callable debt, 398–400
call payoffs, 312–316
Calmar ratio, 82n.107
Cambridge Associates, 37, 38
Canada
bankruptcy, 101
pension funds, 9
real estate allocations in, 21
real estate benchmarks, 16
REITs, 14, 25
Canadian dollar, 376–377
Capellas, Michael D., 99
Capital Accord of 1988 (Basel I), 181
capital adequacy ratio, 181n.49
capital allocation, risk management in, 191–193
caplet payoff, 323–325, 330, 331
caplets, 323, 324
caps, floating-rate loan, 323–327
carried interest, 35
cash
equitizing, 236–237
from equity, 237–241
equity from, 232–237
invested in private equity, 44
synthetic index funds from, 233–236
cash flow at risk (CFAR), 170
cash flows, from VC and buy-out funds, 40–41
cash receipts, foreign, 252, 375–377
CBOT. *see* Chicago Board of Trade
CCAA. *see* Companies' Creditors Arrangement Act
Center for International Securities and Derivatives Markets (CISDM)
benchmark indexes, 60
distressed securities subindex, 95
HFRX indexes vs., 68
and subclassifications, 61
CFAR. *see* cash flow at risk
Chapter 7 bankruptcy, 94, 101, 102
Chapter 11 bankruptcy, 94, 101, 102
cheapest to deliver bond, 221
Chicago Board of Trade (CBOT)
municipal bond futures, 226n.16
US Treasury bond futures, 221
Chicago Mercantile Exchange (CME), 171
China, 14
CISDM. *see* Center for International Securities and Derivatives Markets
CISDM Convertible Arbitrage Index, 64–66, 68
CISDM CTA EW Index
commodities correlations, 48, 50
hedge fund correlations, 62–63
managed futures correlations, 87–89, 91
CISDM CTA trading strategy benchmarks, 86–89
CISDM Distressed Securities Index, 64–66, 68
CISDM Equal Weighted Hedge Fund Index
as benchmark, 60
commodities correlations, 48, 50
correlations, 65
HFRX indexes vs., 68
historical performance, 64
real estate correlations, 17–18
CISDM Equity Long/Short Index, 64–66, 68
CISDM Equity Market Neutral Index, 64–66, 68
CISDM Event Driven Multi-Strategy Index, 64–66, 68
CISDM Global Macro Index, 64–66
CISDM Hedge Funds, 66
CISDM Merger Arbitrage Index, 64–66, 68
claw-back provision, 35
closed-end funds, 14
closeout netting, 188
CLS. *see* continuously linked settlements
CME. *see* Chicago Mercantile Exchange
collars
defined, 292, 304
in equity portfolios, 304–307
with floating-rate loans, 329–333
collateral, managing credit risk with, 187
commingled real estate funds (CREFs), 14–15
commitment, for private equity investments, 34–35, 39, 43
commitment period, 43
Committee of Sponsoring Organizations of the Treadway Commission, 139n.3
commodities, 45–55
benchmarks, 47–48
defined, 7, 45
historical performance, 48–50
interpretation issues, 51
investment characteristics, 51–53
market for, 46–47
size of market, 47
types of commodity investments, 46–47
in portfolios, 53–55
types of, 46–47
Commodity Futures Trading Commission, 226n.16
commodity market, 46–47
size of, 47
types of commodity investments, 46–47
commodity pool operators (CPOs), 85

commodity trading advisors (CTAs), 45
and characteristics of managed futures, 90
historical performance of, 87–89
performance persistence, 92
registration of, 85
communication, with client, 11
Companies' Creditors Arrangement Act (CCAA), 101
competition, in private equity evaluation, 43
concentrated portfolios, diversifying, 380–382
consistency, of performance evaluations, 82–84
continuously linked settlements (CLS), 146
contract risk, 147–148
convenience yield, commodity, 52
convertible arbitrage hedge fund strategies, 57
convexity (term), 152
core-satellite investing, 13
corporate form (private equity funds), 35
corporate governance, 139
corporate venturing, 32
correlations, as performance appraisal measures, 82
covariance, risk of equities and, 228
covered calls
and bull spreads, 294
in equity portfolios, 286–290
CPOs. *see* commodity pool operators
cram down, 101
credit default swaps, 189
credit derivatives
defined, 142n.7
managing credit risk with, 189
credit risk
identifying, 142–143
managing, 186–189
with collateral, 187
with credit derivatives, 189
by limiting exposure to credit risk, 186
by marking to market, 186, 187
with netting, 187–188
reducing, 186–189
with standards and enhanced derivative product companies, 188
transferring, 189
measuring, 173–180
calculating exposures, 178–179
of forward contracts, 176
option-pricing theory, 174–176
of options, 178–180
of swaps, 177
credit spread forwards, 189
credit spread options, 189
credit standards, 188
Credit Suisse, 60, 95
Credit Suisse First Boston, 32
Credit Suisse Hedge Fund Index, 60, 61
Credit Suisse/Tremont Investable Managed Futures Index, 89
credit VaR, 174
CREFs. *see* commingled real estate funds
cross-default provisions, 173–174
CTA managed accounts. *see* managed futures
CTAs. *see* commodity trading advisors
currency conversions
and exchange rate risk, 370–377
of foreign cash receipts, 375–377
of loans, 370–375
currency hedging, 362
currency managed futures, 86
currency risk. *see* foreign currency risk
currency swaps. *see also* interest rate swaps
interest rate vs., 374
notional principal in, 179–180
current credit risk, 173
customers, opinions of, 44

D

days in underlying, 313
DB pension plans. *see* defined-benefit pension plans
debt
callable, 398–400
distressed, 98 (*see also* distressed securities)
noncallable, 400–403
Debt Management Associates, 225–226
debtor-in-possession, 101
decision risk, for alternative investments, 11–12
defined-benefit (DB) pension plans, 142
delta
defined, 152
gamma and risk of, 342–343
and option portfolio risk management, 333–335
and option price sensitivity, 336
and time, 336–337
delta hedge, 333–343
delta-normal method, 160
demand
business-cycle related, 51–52
for venture capital, 30–31
derivative contracts, accounting risk with, 148–149
derivative product companies, 188
derivatives. *see also specific types, e.g.:* options
credit, 142n.7, 189
OTC, 143, 146–147, 187
Derivatives Policy Group, 171
Deutsche Bank, 9
dilution, of interest, 45
direct commodity investment, 46
direct venture capital investment, 34
discretionary trading strategies, 86
Disney World, 251
distressed debt arbitrage, 98
distressed securities, 94–103
bankruptcy process, 100–102
absolute priority rule, 102
Chapter 7 and Chapter 11, 102
prepackaged filings, 102
in United States vs. other countries, 101
benchmarks, 95
defined, 8
example, 102–103
historical performance, 95–97
interpretation issues, 97
investment characteristics, 97–98
market for, 94–95
in portfolios, 98–100
distressed debt arbitrage, 98
long-only value investing, 98
private equity, 98–100
private equity of, 98–100
types of, 94–95
distressed securities hedge fund strategies, 57–58
distressed securities market, 94–95
size of, 95
types of distressed securities, 94–95
diversification
of concentrated portfolios, 380–382
with hedge funds, 72–73
international, 382–384
with private equity, 42, 43
with real estate, 22–25
with swap strategies, 380–384
diversification effect, for VaR, 162
diversified managed futures, 86
dividend recapitalization, 33
dividends
and stock index futures trade, 230
in synthetic index funds, 235–236
dollar, Canadian, 376–377
dollar, US
converting yen into, 375–376
dual-currency bonds in, 377–380
Dow Jones Euro STOXX 50, 384
Dow Jones Industrial Average, 161
Dow Jones REIT Indexes, 17
downside deviation, 79–80, 191
downside volatility, 79–80
drawdown, 80, 190
dual currency bonds, 377–380
due diligence
for alternative investments, 9–12
defined, 7
for hedge funds, 76–78
for private equity, 43–45
for real estate, 27
duration
of bonds, 152, 219
ex post, 224, 225
of fixed-income portfolios, 363–366
Macaulay, 220n.7
modified, 220, 364–365
of swaps, 363–366
target dollar, 222–223

E

early-stage financing, 30–31
earnings at risk (EAR), 170
economic exposure, 251
EDPCs. *see* enhanced derivative product companies
effective interest
with call, 314, 316
with cap, 324–326
with collar, 331, 332
with floor, 328, 329
with put, 319–321
effective loan rate
with call, 314, 316–317
with cap, 325, 326
with put, 319, 321

effectiveness, of risk governance, 138
efficiency, of risk governance, 138
emerging markets, in hedge fund strategies, 58
employment contracts, 44
enhanced derivative product companies (EDPCs), 188
enterprise risk management (ERM), 138–140, 183
equities. *see also specific types*
  adjusting allocation between, 245–246
  orphan, 95, 98
  risk of, 228–230
equity
  cash from, 237–241
  equitizing cash, 236–237
  synthetic index funds, 233–236
Equity Analysts, Inc., 232
equity long–short hedge fund strategies, 67
equity market-neutral hedge fund strategies, 57
equity market risk
  forward and futures strategies for managing, 227–241
    cash from equity, 237–241
    equity from cash, 232–237
    risk of equities, 228–230
    risk of equity portfolios, 230–232
  swap strategies for managing, 380–389
    and allocation of stocks and bonds, 384–387
    diversifying concentrated portfolios, 380–382
    insider exposure, 387–389
    international diversification, 382–384
equity portfolios
  options strategies for managing, 277–312
    combinations of calls and puts, 304–312
    money spreads, 293–303
    standard long and short positions, 279–286
    and the underlying, 286–292
  risk of, 230–232
equity REITs, 14
equity swaps, 380–389
ERM. *see* enterprise risk management
ESG risk, 150
Euribor. *see* Euro Interbank Offered Rate
Eurodollar futures
  controlling risk with, 218–219
  hedging floating-rate loans with, 259
EuroHedge, 60–61
Euro Interbank Offered Rate (Euribor), 390–392
Europe
  private equity activity, 36–37
  real estate allocations in, 21
  real estate returns in, 20
European options, 178, 276
European Private Equity and Venture Capital Association, 36
European style swaptions, 389
European Union, 35
euros
  converting
    to British pounds, 370–373
    to Canadian dollars, 376–377
  dual-currency bonds in, 377–379
  forward contracts on, 254–255
event-driven hedge fund strategies, 67
event risk, of distressed securities, 99
exchange rate risk
  and currency conversions, 370–377
  and foreign cash receipts, 375–377
  and loans, 370–375
  risk of dual currency bonds, 377–380
  swap strategies for managing, 370–380
executives, equity swaps involving, 389
exercise rate, of swaptions, 390
exits, from private equity investments, 31
expansion-stage companies, venture capital for, 30
ex post duration, 224, 225
exposure. *see* risk exposure
extensions of VaR, 170–171

F
Fabozzi, Frank J., 219n.3
factor push models, 172
fallen angels, 97
Federal Reserve, 229
Financial Accounting Standards Board (FASB), 148, 149
Financial Instruments: Recognition and Measurement (IAS 39), 149
financial managed futures, 86
financial ownership, 14
financial review, of private equity, 44–45
financial risk, 141
financial statements, 45
Financial Times Stock Exchange 100 Index. *see* FTSE 100 Index
first-stage financing, 31
fixed-income arbitrage hedge fund strategies, 57
fixed-income portfolios, duration of, 363–366
fixed-income swaps, equity vs., 384–389
fixed-rate loans, converting floating- and, 359–363
floating-rate loans
  with caps, 323–327
  with collars, 329–333
  converting fixed- and, 359–363
  with floors, 327–329
  with FRAs, 218–219
  inverse, 368–370
  leveraged floating-rate notes, 366–368
floorlet payoff, 327, 328, 330, 331
floorlets, 327
floors, 327–329
FOFs. *see* funds of funds
Ford Credit, 197–198, 205
Ford Motor Company, 196, 197, 204
foreign cash receipts, 252, 375–377
foreign currency payments, 252–254
foreign currency risk
  forward and futures strategies for managing, 250–258
  risk of foreign currency payments, 252–254
  risk of foreign currency receipts, 252
  risk of foreign-market asset portfolio, 254–258
foreign exchange risk budgeting, 183–184
foreign-market asset portfolio, risk of, 254–258
formative-stage companies, venture capital for, 30
forward contracts (forwards)
  futures vs., 258–260
  measuring credit risk of, 176
  repricing, 186–187
  risk management applications of (*see* risk management applications of forward and futures strategies)
  and swaps, 358
forward rate agreements (FRAs)
  hedging with, 214–215
  loans with, 215–219
    floating-rate loans, 218–219
    single-payment loans, 215–218
forward swaps, swaptions and, 404
franc, Swiss, 379–380
France
  corporate form of publicly-traded companies, 35
  real estate market, 16, 25
FRAs. *see* forward rate agreements
front office, 139
FTSE 100 Index, 233, 235, 236
FTSE EPRA/NAREIT Global Real Estate Index, 17–18, 48, 50
FTSE Industry Classification Benchmark (ICB), 14
fund effects, hedge fund, 74–76
funding risk, 143n.10
fund management companies, risk budgeting by, 184–185
funds of funds (FOFs), 58
  fund effects for, 74–75
  roles of, 72
futures. *see also* managed futures; risk management applications of forward and futures strategies
  asset allocation with, 241–250
    adjusting asset allocation, 241–248
    pre-investing in asset classes, 248–250
  forwards vs., 258–260

G
gain-to-loss ratio, hedge fund, 82
gamma
  defined, 152, 341
  and risk of delta, 342–343
GARP. *see* Global Association of Risk Professionals
Germany, 35
GICS. *see* Global Industrial Classification System
Global Association of Risk Professionals (GARP), 182
global custodian, 140
Global Industrial Classification System (GICS), 14
global macro hedge fund strategies, 58, 74
Goldman Sachs Commodity Index (GSCI), 109–110, 114, 123. *see also* Standard & Poor's Goldman Sachs Commodity Index
Goldman Sachs Group, Inc., 162–166
Google, Inc., 32–33, 39
governance, risk, 138–140

government bond futures contracts, 226
government bond portfolios, 223–226
GSCI. *see* Goldman Sachs Commodity Index

H
hedged equity strategies, 58
Hedge Fund Composite Index (HFCI), 66, 110–111
Hedge Fund Intelligence, 60, 61
hedge fund market, 56–60
  size of, 60
  types of hedge fund investments, 57–59
HedgeFund.net, 61
Hedge Fund Research (HFR), 60, 61, 95
hedge funds, 55–84
  about, 55–56
  benchmarks, 60–62, 70–71
  defined, 7
  due diligence, 76–78
  fund effects, 74–76
  historical performance, 62–67
  interpretation issues, 67–71
    backfill bias, 70
    biases in index creation, 67–68
    relevance of past data on performance, 69
    stale price bias, 69–70
    survivorship bias, 69
  investment characteristics, 71–72
  performance evaluations, 78–84
    consistency, 82–84
    correlations, 82
    performance appraisal measures, 80–82
    skewness and kurtosis, 82
    volatility and downside volatility, 79–80
  in portfolios, 72–74
    hedge funds as diversifiers, 72–73
    historical performance, 73–74
    skewness and hedge funds, 74
  types of investments, 57–59
hedge fund structure, distressed securities with, 94
hedges
  delta, 333–343
  inflation, 20, 53–54
hedging. *see also* currency hedging
  defined, 214
  delta hedging over time, 335–342
  with swaps, 362
Heine, Max L., 94
Herstatt risk, 146
HFCI. *see* Hedge Fund Composite Index
HFR. *see* Hedge Fund Research
HFRX Convertible Arbitrage Index, 68
HFRX Distressed/Restructuring Index, 68, 95–97
HFRX Equal Weighted Strategies Index, 68
HFRX Equity Hedge Index, 68
HFRX Equity Market Neutral Index, 68
HFRX Event Driven Index, 68
HFRX Fixed Income-Credit Index, 96
HFRX indexes, 61, 68
HFRX Merger Arbitrage Index, 68
high-water mark (HWM), 59
high-yield investing, 98
historical method, 160–166
historical simulation method, 161–162
Hong Kong, 14
hurdle rate, 35
HWM. *see* high-water mark
hypothetical events, scenario analysis with, 172

I
IAS 39. *see* International Accounting Standard 39
IASB. *see* International Accounting Standards Board
IBM, 161–162
idiosyncratic risk, 229n.19
illiquidity, of private equity investments, 39
implied yield, bond, 221
inclusion bias, 70
incremental VaR, 170
index funds, synthetic, 233–236
indirect investment
  in commodities, 46–47
  of venture capital, 34–35
inflation hedges
  commodities as, 53–54
  real estate as, 20
information ratio (IR), portfolio managers', 184
infrastructure funds, 14, 15
initial public offerings (IPOs)
  Google, Inc., 32–33
  private equity for, 30
insider exposure, 387–389
insurance, protective puts as, 292
Intel Corporation, 39
intellectual property, 44
interest rate calls, loans with, 315–318
interest rate options
  and options on futures, 344
  risk management applications, 312–333
    calls with borrowing, 313–318
    caps with floating-rate loans, 323–327
    collars with floating-rate loan, 329–333
    floor with floating-rate loan, 327–329
    puts with lending, 318–323
interest rate risk
  forward and futures strategies for managing, 215–227
  swap strategies for managing, 359–370
    converting floating- and fixed-rate loans, 359–363
    duration of fixed-income portfolios, 363–366
    risk of structured notes, 366–370
interest rate swaps, 374
interest rate swaptions, 390–397
  in anticipation of future borrowing, 390–394
  terminating swaps with, 394–397
internal capital requirements, in capital allocation, 192
internal rate of return (IRR), of private equity, 39
International Accounting Standard 39 (IAS 39), 149
International Accounting Standards Board (IASB), 148, 149
international diversification, 382–384
International Monetary Fund, 149
inverse floaters, 368–370
investability, of manager-based hedge fund indexes, 62
investable hedge fund indexes, 68
Investment Company Act (1940), 65
Investment Property Databank (IPD), 16
investments, traditional vs. alternative, 7–13
investors
  goals of, 6
  identity of, 44
IPD. *see* Investment Property Databank
IPD France Annual Property Index, 16
IPOs. *see* initial public offerings
IR. *see* information ratio
Ireland, 20
IRR. *see* internal rate of return

J
Japan
  commodity market, 46
  corporate form of publicly-traded companies, 35
  foreign cash receipts, 375–376
  foreign currency payments, 253
  interest rate swaptions, 394–397
  REITs, 14
  risk governance, 138
Japanese yen, 375–376
J factor risk, 100
JPMorgan Chase, 153

K
kabushiki kaisha (K.K.), 35
kurtosis, 12n.9, 82

L
later-stage financing, 31
legal review, of private equity, 44–45
legal risk, 147–148
Lehman Brothers Government Bond Index (LGB), 388
Lehman Long Treasury Bond (LLTB) index, 385
Leibowitz-Bova approach, 13
lending, puts with, 318–323
leverage, VC vs. buy-out fund, 40
leveraged floating-rate notes (leveraged floaters), 366–368
leverage limits, fund management company, 185
LGB. *see* Lehman Brothers Government Bond Index
Libor. *see* London Interbank Offered Rate
limited liability company form (private equity funds), 34–35
limit setting, 193
Lipper, 60
liquid alternatives, 65, 67
liquidity, of private equity, 42–43
liquidity limits, fund management company, 185
liquidity risk
  identifying, 143–144
  measuring, 180

LLTB index. *see* Lehman Long Treasury Bond index
loans
and currency conversions, 370–375
and exchange rate risk, 370–375
fixed-rate, 359–363
floating-rate (*see* floating-rate loans)
with FRAs, 215–219
floating-rate loans, 218–219
single-payment loans, 215–218
protected with interest rate calls, 315–318
lock-up period, 59, 75
Loews Cineplex Entertainment Corporation, 99
London Interbank Offered Rate (Libor)
credit risk exposures, 179
credit risk of swaps, 177
currency swaps, 371n.14
equity swaps, 385
interest rate compounding, 257
interest rate swaps, 360–361, 364, 366–370
loan interest rate
calls, 313, 314, 316, 317
caps, 323–326
collars, 330–333
floors, 327–329
forward and futures strategies, 215–218, 259
options, 312, 313
puts, 318–322
as underlying rate, 259, 312, 313
swaptions, 390, 393–402
long-only value investing, 98
long positions
for call options, 279–282
for put options, 282–286
Long-Term Capital Management (LTCM), 180
loss
gain-to-loss ratio, 82
maximum (*see* maximum loss)
low-return environments, 9
LPX, 37
LTCM. *see* Long-Term Capital Management

M
Macaulay duration, 220n.7
macro hedge fund strategies, 67
managed futures, 85–93
benchmarks, 86–87
defined, 7, 85
historical performance, 87–89
interpretation issues, 89
investment characteristics, 90
market for, 85–86
performance persistence, 92
in portfolios, 90–92
and skewness of hedge funds, 74
strategic asset allocation, 92–93
types of investments, 85–86
managed futures market, 85–86
management
commitment of, 44
experience of, 43–44
manager-based hedge fund indexes, 61–62
MAR. *see* minimum acceptable return
market liquidity risk, distressed securities', 100
market risk. *see also* equity market risk
of distressed securities, 100
identifying, 142
managing, 182–185
measuring, 151–152
markets
commodity, 46–47
distressed securities, 94–95
in evaluation of private equity investments, 43
hedge fund, 56–60
managed futures, 85–86
private equity, 29–37
demand for venture capital, 30–31
exit from investment, 31
size of market, 36–37
supply of venture capital, 31–34
types of private equity investments, 34–35
marking to market, 186, 187
mass affluent, 9n.3
maximum drawdown, 80, 190
maximum loss
bear spread, 297, 298
box spread, 311
bull spread, 295
butterfly spread, 302
call options, 280, 281
collars, 305, 306
covered calls, 287
protective puts, 291
put options, 283, 284
straddles, 308, 309
maximum loss limits, in capital allocation, 192
maximum loss optimization, 172
maximum profit
bear spread, 297, 298
box spread, 311
bull spread, 295
butterfly spread, 301, 302
call options, 280, 281
collars, 305, 306
covered calls, 287
protective puts, 291
put options, 283, 284
straddles, 308, 309
MCI, 99
mean-variance optimization (MVO), 72
measurement errors, for returns of VC, 41
mega-cap buy-out funds, 33
merger arbitrage hedge fund strategies, 58
Merrill Lynch Corporate Bond (MLCB) index, 385
mezzanine financing, 31
Microsoft, 39
middle-market buy-out funds, 33
minimum acceptable return (MAR), 191
minimum credit standards, 188
minority interests, nonmarketable, 39, 40
MLCB index. *see* Merrill Lynch Corporate Bond index
MLM Index. *see* Mount Lucas Management Index
model risk, 145
modified duration, 220, 364–365
monetary position limits, 191–192
monetizing a call, 398n.33
money spreads
bear spreads, 296–299
bull spreads, 293–296
butterfly spreads, 299–303
in equity portfolios, 293–303
Monte Carlo simulation method, 167–168
Moody's Investors Service, 188
Morgan Stanley, 32
Morgan Stanley REITs Index, 17
Morningstar, 60
Morningstar MSCI, 61
mortgage REITs, 14
Mount Lucas Management (MLM) Index, 86, 89
MSCI Asset Owner survey, 21–22
MSCI Europe/Australia/Far East (EAFE) Index, 383, 408
MSCI US REIT Index, 16
MSCI World Index, 109–111
municipal bond futures contracts, 226
MVO. *see* mean-variance optimization

N
NAREIT. *see* National Association of Real Estate Investment Trusts
NASDAQ, 38, 277
NASDAQ 100 Trust Shares, 277n.3
NASDAQ Composite Index, 156, 160, 161n.39, 167–168
National Association of Real Estate Investment Trusts (NAREIT), 15
National Association of Real Estate Investment Trusts (NAREIT) Index, 108, 116, 122, 123, 128
as benchmark, 16, 19
correlation of S&P 500 and, 25
historical performance, 17–18
unsmoothed performance, 23–24
National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index, 108, 114, 116, 121–123, 128
as benchmark, 16, 19
historical performance, 17–18
unsmoothed performance, 23–24
National Futures Association (NFA), 85
National Venture Capital Association (NVCA), 36, 38
National Westminster Bank, 196
NatWest Markets, 196–197
NCREIF Property Index. *see* National Council of Real Estate Investment Fiduciaries Property Index
net asset value (NAV), high-water mark and, 59
Netherlands, 14, 25
netting, 187–188
netting risk (settlement netting risk), 151
New Basel Capital Accord (Basel II), 181
New York Federal Reserve, 180
New York Stock Exchange (NYSE)
and NAREIT Index, 17
operational risk management by, 145

New York Times, 32
NFA. *see* National Futures Association
nominal position limits, 191–192
noncallable debt, adding calls to, 400–403
nonfinancial risks
  Basel II requirements, 181
  defined, 141
  measuring, 180–181
  operational risk, 180–181
non-investable hedge fund indexes, 68
nonparametric (term), 161
nonsystematic risk, 229
North America, 20, 22
notional position limits, 191–192
notional principal, 179, 364–365, 374–375
Novatel Wireless, Inc., 28
NVCA. *see* National Venture Capital Association
NYSE. *see* New York Stock Exchange

O
off-market swaps, 358n.1
Operational Due Diligence Survey, 9–10
operational review, private equity, 44
operational risk
  identifying, 144–145
  measuring, 180–181
opinions, customer, 44
option portfolio risk management strategies, 333–343
  delta hedging over time, 335–342
  gamma and risk of delta, 342–343
  interest rate options and options on futures, 344
  vega and volatility risk, 343
option-pricing theory, 174–176
options. *see also specific types, e.g.:* call options (calls)
  on futures, 344
  measuring credit risk of, 178–180
  risk management with (*see* risk management applications of option strategies)
orphan equities, 95, 98
OTC derivatives. *see* over-the-counter derivatives
overnight Fed funds rate, 222n.9
over-the-counter (OTC) derivatives
  collateral in, 187
  credit risk with, 143
  marking to market in, 186–187
  regulatory risk, 146–147
  settlement risk, 146
ownership, 12

P
Page, Larry, 32
payment netting, 187
payments, foreign currency, 252–254
pension funds, 9
  adjusting asset allocation of, 241–243, 245–246
  application of VaR to, 168
  creating synthetic cash for, 238–240
pension plans, defined-benefit, 142
performance appraisal measures, hedge fund, 80–82
performance evaluation
  for hedge funds, 78–84
    consistency, 82–84
    performance appraisal measures, 80–82
    returns, 79
    skewness and kurtosis, 82
    volatility and downside volatility, 79–80
  and risk management, 189–191
performance fees, hedge fund, 75
performance netting risk, 150–151
performance persistence, 92
performance stopouts, 185
PIPE. *see* private investment in public entity
PLC. *see* public limited company
political risk, 150
portfolio managers, allocation of funds to, 184
portfolios
  bond, 219–227
  commodities' roles in, 53–55
  distressed securities' roles in, 98–100
    distressed debt arbitrage, 98
    long-only value investing, 98
    private equity, 98–100
  equity, 230–232
  fixed-income, 363–366
  foreign-market asset, 254–258
  government bond, 223–226
  hedge funds' roles in, 72–74
    hedge funds as diversifiers, 72–73
    historical performance, 73–74
    skewness and hedge funds, 74
  managed futures' roles in, 90–92
  private equity's roles in, 42–43
  real estate's roles in, 21–27
    diversification within real estate, 23–25
    real estate as diversifier, 22–23
    worldwide investment in real estate, 25
position concentration limits, fund management company, 185
pound, British, 370–373
preferred return, 35
pre-investing in asset classes, 248–250
premiums
  of call options, 159
  for caps vs. floors, 327n.24
  of put options, 159
prepackaged bankruptcy, 99, 102
Preqin, 37
present value of a basis point (PVBP), 220
price value of a basis point (PVBP), 220
PricewaterhouseCoopers, 36
PRIMA. *see* Professional Risk Managers' International Association
prime brokerage, 55
private equity, 27–45
  about, 27–29
  benchmarks, 37
  defined, 7
  of distressed securities, 98–100
  due diligence, 43–45
  historical performance, 38
  interpretation issues, 38
  investment characteristics, 38–42
  investment in publicly-traded equity vs., 29
  market for, 29–37
    demand for venture capital, 30–31
    exit from investment, 31
    size of market, 36–37
    supply of venture capital, 31–34
    types of private equity investments, 34–35
  in portfolios, 42–43
  types of investments, 34–35
private equity funds, 28
private equity fund structure, distressed securities with, 94
private equity market, 29–37
  demand for venture capital, 30–31
  exit from investment, 31
  size of, 36–37
  supply of venture capital, 31–34
  types of private equity investments, 34–35
Private Financing Initiative (United Kingdom), 15
private investment in public entity (PIPE), 28
private placement memorandum, 30
probability levels, VaR, 158–159
Professional Risk Managers' International Association (PRIMA), 182
profit. *see also* maximum profit
  bear spread, 296–298
  box spread, 311
  bull spread, 293–295
  butterfly spread, 300–302
  call options, 279–280
  collars, 305, 306
  covered calls, 286–288
  protective puts, 290, 291
  put options, 282–284
  straddles, 308, 309
Property Council/IPD Australia All Property Index, 16
protective puts, 290–292
psychological considerations, of risk management, 193
public limited company (PLC), 35
publicly traded equity, investment in private equity vs., 29
put–call parity, 175–176
put options (puts)
  in equity portfolios
    combinations of calls and, 304–312
    long/short positions, 282–286
    protective, 290–292
  with lending, 318–323
  premiums, 159
  protective, 290–292
put payoffs, 313, 318–321
PVBP. *see* present value of a basis point; price value of a basis point

R
range forwards. *see* collars
RAROC. *see* risk-adjusted return on capital
ratio spreads, delta hedges of, 339n.32

real estate, 13–27
benchmarks, 15–17
defined, 7
direct equity investing in, 21
due diligence, 27
historical performance, 17–18
interpretation issues, 19
investment characteristics, 20–21
market for, 13–15
in portfolios, 21–27
diversification within real estate, 23–25
real estate as diversifier, 22–23
for strategic asset allocation, 26–27
worldwide investment in real estate, 25
types of investments, 14–15
real estate investment trusts (REITs), 14–15
real estate market, 13–15
real options, 52
REAL.pac/IPD Canada Quarterly Property Index, 16
rebalancing scheme, for manager-based hedge fund indexes, 62
receipts, foreign cash, 252, 375–377
receiver swaptions, 398–403
regulatory capital requirements, 192–193
regulatory risk, 146–147
REITs. *see* real estate investment trusts
relative value hedge fund strategies, 67
reorganization plans, bankruptcy, 101–102
responsiveness, bond, 221
return over maximum drawdown (RoMAD), 190
returns
low-return environments, 9
minimum acceptable, 191
and performance evaluations of hedge funds, 79
preferred, 35
risk-adjusted return on capital, 190
rolling, 79
Reuters Jefferies/Commodity Research Bureau (RJ/CRB) Index, 47, 51
risk. *see also specific types, e.g.:* market equity risk
of bond futures, 221–223
of bond portfolios, 219–227
of delta, 342–343
of dual currency bonds, 377–380
of equities, 228–230
of equity portfolios, 230–232
of foreign currency payments, 252–254
of foreign currency receipts, 252
of foreign-market asset portfolio, 254–258
identifying, 140–151
accounting risk, 148–149
analysis of risk exposures, 141–142
credit risk, 142–143
ESG, performance netting, and settlement netting risk, 150–151
legal/contract risk, 147–148
liquidity risk, 143–144
market risk, 142
model risk, 145
operational risk, 144–145
regulatory risk, 146–147
settlement risk, 146
sovereign and political risks, 149–150
tax risk, 148
measuring, 151–181
credit risk, 173–180
liquidity risk, 180
market risk, 151–152
nonfinancial risks, 180–181
stress testing, 171–172
value at risk, 153–171
of private equity investments, 39
of structured notes, 366–370
inverse floaters, 368–370
leveraged floating-rate notes, 366–368
risk-adjusted return on capital (RAROC), 190
risk budgeting, 183–185
risk exposure
analysis of, 141–142
credit risk, 178–179, 186
defined, 135n.1
insider risk, 387–389
risk factor limits, fund management company, 185
risk management, 133–209
about, 134–135
identifying risk, 140–151
accounting risk, 148–149
analysis of risk exposures, 141–142
credit risk, 142–143
ESG, performance netting, and settlement netting risk, 150–151
legal/contract risk, 147–148
liquidity risk, 143–144
market risk, 142
model risk, 145
operational risk, 144–145
regulatory risk, 146–147
settlement risk, 146
sovereign and political risks, 149–150
tax risk, 148
managing risk, 182–193
in capital allocation, 191–193
credit risk, 186–189
market risk, 182–185
and performance evaluation, 189–191
psychological and behavioral considerations of, 193
measuring risk, 151–181
credit risk, 173–180
liquidity risk, 180
market risk, 151–152
nonfinancial risks, 180–181
stress testing, 171–172
value at risk, 153–171
practice problems, 196–203
as process, 135–138
risk governance, 138–140
solutions to problems, 204–209
risk management applications of forward and futures strategies, 213–274
about, 213–215
asset allocation with futures, 241–250
adjusting asset allocation, 241–248
pre-investing in asset classes, 248–250
equity market risk, 227–241
cash from equity, 237–241
equity from cash, 232–237
risk of equities, 228–230
risk of equity portfolios, 230–232
foreign currency risk, 250–258
risk of foreign currency payments, 252–254
risk of foreign currency receipts, 252
risk of foreign-market asset portfolio, 254–258
futures vs. forwards, 258–260
interest rate risk, 215–227
risk for bond portfolios, 219–227
risk for loans, 215–219
practice problems, 264–268
solutions to problems, 269–274
risk management applications of option strategies, 275–356
about, 275–277
for equity portfolios, 277–312
combinations of calls and puts, 304–312
money spreads, 293–303
standard long and short positions, 279–286
and the underlying, 286–292
interest rate option strategies, 312–333
calls with borrowing, 313–318
caps with floating-rate loans, 323–327
collars with floating-rate loan, 329–333
floor with floating-rate loan, 327–329
puts with lending, 318–323
option portfolio risk management strategies, 333–343
delta hedging over time, 335–342
gamma and risk of delta, 342–343
interest rate options and options on futures, 344
vega and volatility risk, 343
practice problems, 348–351
solutions to problems, 352–356
risk management applications of swap strategies, 357–421
about, 358–359
equity market risk, 380–389
and allocation of stocks and bonds, 384–387
diversifying concentrated portfolios, 380–382
insider exposure, 387–389
international diversification, 382–384
exchange rate risk, 370–380
and currency conversions, 370–377
and foreign cash receipts, 375–377
and loans, 370–375
risk of dual currency bonds, 377–380
interest rate risk, 359–370
converting floating- and fixed-rate loans, 359–363
duration of fixed-income portfolios, 363–366
risk of structured notes, 366–370
practice problems, 407–415
solutions to problems, 416–421
swaptions, 389–404
and forward swaps, 404
for future borrowing, 390–394

interest rate swaptions, 390–397
synthetically removing/adding call features, 398–403
terminating swaps with swaptions, 394–397
RiskMetrics Group, 153n.27, 182
risk reversals. *see* collars
risk tolerance, in ERM, 183
RJ/CRB Index. *see* Reuters Jefferies/Commodity Research Bureau Index
rogue traders, 145
rolling return (RR), 79
RoMAD. *see* return over maximum drawdown
RR. *see* rolling return
Russell 3000 Index, 383, 408
Russia, 150

S

sales prospects, in evaluation of private equity investments, 43
sandwich spread, 302n.14
scenario analysis
limits of fund management companies, 185
for stress testing, 171–172
SE. *see socíetas Europaea*
SEC. *see* Securities and Exchange Commission
second-stage financing, 31
securities, distressed. *see* distressed securities
Securities and Exchange Commission (SEC), 169
seed money, 30, 31
settlement netting risk, 151
settlement (Herstatt) risk, 146
SFAS 133. *see* Statement of Financial Accounting Standard 133
Sharpe ratio
for hedge funds, 80–81
and risk management, 190
short positions
for call options, 279–282
delta hedges of, 338–339
for put options, 282–286
Singapore, 14
single-payment loans, 215–218
skewness, 12n.9
and performance evaluations, 82
and roles in portfolios, 74
sociedad anónima, 35
socíetas Europaea (SE), 35
société anonyme, 35
Sortino ratio
for hedge funds, 82
and risk management, 191
South Korea, 14
sovereign risk, 149–150
S&P. *see* Standard & Poor's
Spain, 35
SPAN system, 171
special purpose vehicles (SPVs), 188
S&P GSCI Agricultural TR Index, 49
S&P GSCI Energy TR Index, 49
S&P GSCI Grains TR Index, 49
S&P GSCI Industrial Metals TR Index, 49
S&P GSCI Livestock TR Index, 49
S&P GSCI Petroleum TR Index, 49
S&P GSCI Precious Metals TR Index, 49
spreads, 289n.8
bear, 296–299
bid–ask, 144
box, 310–312
bull, 293–296
butterfly, 299–303
defined, 293
money, 293–303
ratio, 339n.32
sandwich, 302n.14
SPSC. *see* Standard & Poor's Small Cap 600 Index
SPVs. *see* special purpose vehicles
stale price bias, of hedge funds, 69–70
Standard & Poor's, 188
Standard & Poor's 500 Index
commodities correlations, 48, 53, 109–110, 123
commodities performance in portfolios, 54–55
distressed debt hedge funds and, 74
distressed securities correlations, 96–97
in equity swaps, 381, 382, 385
futures price of, 230
Google's inclusion in, 32
hedge fund correlations, 62–66, 73, 110–111, 124
managed futures correlations, 87–89, 91
private equity correlations, 38
as proxy for true market portfolio, 228
real estate correlations, 17–18, 25, 108, 116
VaR analysis, 156, 160, 161n.39, 167–168
Standard & Poor's 500 Total Return Index, 64
Standard & Poor's BMI US REIT Index, 16
Standard & Poor's Goldman Sachs Commodity Index (S&P GSCI), 17–18, 47–55
Standard & Poor's REIT Composite Index, 17
Standard & Poor's Small Cap 600 Index (SPSC), 385
start-up financing, 31
Statement of Financial Accounting Standard 133 (SFAS 133), 149
Sterling ratio, 82n.107
stock index futures, 230, 232
stocks, adjusting allocation between bonds and, 241–243, 246–247
STP systems. *see* straight-through processing systems
straddles, 307–310
straight-through processing (STP) systems, 140
strangles, 309
straps, 309
strategic asset allocation
with managed futures, 92–93
with real estate, 26–27
Strategic Money Management, 235
strategic partners, 31, 32
stress testing, 171–172
strips, 309
structured notes, 359, 366–370
style classification, manager-based hedge fund index, 61
style drift, 75
stylized scenarios, analysis of, 171
suitability, of alternative investments, 11
supplements, VaR, 170–171
supply
business-cycle related, 51–52
of venture capital, 31–34
surplus, 168
surplus at risk, 168
survivorship bias, hedge fund, 69
swap rate, 143n.8
swaps. *see also* risk management applications of swap strategies
measuring credit risk of, 177
terminating, 394–397
swaptions, 389–404
defined, 359
and forward swaps, 404
for future borrowing, 390–394
interest rate swaptions, 390–397
removing/adding call features with, 398–403
strategies for managing, 389–404
terminating swaps with, 394–397
Sweden, 25
Switzerland, 25
synthetic index funds, 233–236
systematic risk, 229
systematic trading strategies, 86

T

tail value at risk (TVaR), 170
target dollar duration of portfolio, 222–223
target semideviation, 191n.55
tax issues, with alternative investments, 11
tax risk, 148
TBI for Institutional Commercial Property Performance. *see* Transaction-Based Index for Institutional Commercial Property Performance
technology, validation of, 44
theta, 152
third-stage financing, 31
Thomson Venture Economics, 36
timberland investment management organizations (TIMOs), 19
time, delta and, 336–337
time horizons, VaR, 158–159
timeline, venture capital, 31
time to expiration, 52
TIMOs. *see* timberland investment management organizations
Toronto 300 Composite, 384
total return swaps, 189
tracking risk, 152
trade settlement, 140
Transaction-Based Index (TBI) for Institutional Commercial Property Performance, 16
transaction exposure, 251
translation exposure, 251
turnaround partners, 99
TVaR. *see* tail value at risk
twist, 171n.45

U
underlying
for covered calls, 286–290
for equity portfolios, 286–292
for protective puts, 290–292
United Energy Services, 223–225
United Kingdom
corporate form of publicly-traded companies, 35
equity in residential property in, 20
foreign currency payments, 253–254
inflation hedging by real estate, 20
infrastructure funds in, 15
private equity activity, 36–37
private equity in, 29
real estate investment in, 21, 22
real estate market, 16, 19, 25
United States
bankruptcy process in other countries vs., 101
commodity market, 47
corporate form of publicly-traded companies, 35
distressed securities in, 94, 95
formative-stage companies, 30
hedge fund market, 60
investors in private equity funds, 33–34
managed futures market, 86
municipal bond futures contracts in, 226
pension funds in, 9
private equity capacity in, 29
private equity returns, 38
real estate investment in, 12–25
registration of CTAs and CPOs, 85
venture capital activity in, 36
US Commodity Futures Trading Commission, 85
US dollar
converting yen into, 375–376
dual-currency bonds in, 377–380
US Treasury bills, 190
US Treasury bond futures, 221
US Treasury strips, 219n.4
University of Virginia Investment Management Company (UVIMCO), 10–11

V
value at expiration
bear spread, 296–298
box spread, 310, 311
bull spread, 293, 295
butterfly spread, 299–300, 302
call options, 279–281, 285
collars, 306
covered calls, 286, 287
protective puts, 290, 291
put options, 282–285
straddles, 307–309
value at risk (VaR)
advantages and limitations, 168–170
credit, 174
elements, 154–155
extensions and supplements, 170–171
measuring, 153–171
analytical method, 155–160
historical method, 160–166
Monte Carlo simulation method, 167–168
probability levels and time horizons, 158–159
and risk budgeting, 183
surplus at risk, 168
value investing, long-only, 98
Vanguard mutual funds, 184–185
VaR. *see* value at risk
VaR-based position limits, 192
variance–covariance method, 155–160
VC. *see* venture capital
VC funds. *see* venture capital funds
VCTs. *see* venture capital trusts
vega
and market risk, 152
and volatility risk, 343
venture capital (VC). *see also* private equity
defined, 28, 32
demand for, 30–31
for IPOs, 30
supply of, 31–34
venture capital firms, 30n.41
venture capital funds (VC funds), 32, 40–41
venture capitalists, 32
venture capital trusts (VCTs), 32
vintage effects, hedge fund, 76
vintage year, 38
volatility
in binomial model, 343
in Black–Scholes–Merton pricing option, 152, 343
downside, 79–80
of hedge fund performance, 79–80
and market risk, 151–152
volatility risk, 343
volatility smile, 196
vulture capital, 99
vulture funds, 99
vulture investors, 99

W
Wall Street Reform and Consumer Protection Act (2010), 56
weighting scheme, for manager-based hedge fund indexes, 62
Wilshire 5000 Index, 382
Wilshire Associates, 16, 17
working capital allocations, 185
WorldCom, Inc., 99
World Trade Center bombing (1993), 145
worst-case scenario analysis, 172
Wright, Christopher, 9n.2

Y
yen, Japanese, 375–376
yield, bond, 219–221
yield beta, 222, 228n.17

Z
zero-cost collars, 304
zero risk investments, 190
zero-sum derivatives markets, 90

CFA Institute®
CFA Program

TRADING AND REBALANCING, PERFORMANCE EVALUATION, AND GLOBAL INVESTMENT PERFORMANCE STANDARDS

CFA® Program Curriculum
2018 • LEVEL III • VOLUME 6

WILEY

CONTENTS

How to Use the CFA Program Curriculum v

Curriculum Development Process v
Organization of the Curriculum vi
Features of the Curriculum vi
Designing Your Personal Study Program viii
Feedback ix

Portfolio Management

Study Session 16 **Trading, Monitoring, and Rebalancing** 3

Reading 31 **Execution of Portfolio Decisions** 5
Introduction 6
The Context of Trading: Market Microstructure 7
Order Types 7
Types of Markets 9
The Roles of Brokers and Dealers 18
Evaluating Market Quality 19
The Costs of Trading 21
Transaction Cost Components 22
Pretrade Analysis: Econometric Models for Costs 30
Types of Traders and Their Preferred Order Types 33
The Types of Traders 33
Traders' Selection of Order Types 35
Trade Execution Decisions and Tactics 36
Decisions Related to the Handling of a Trade 36
Objectives in Trading and Trading Tactics 37
Automated Trading 40
Serving the Client's Interests 47
CFA Institute Trade Management Guidelines 48
The Importance of an Ethical Focus 49
Concluding Remarks 50
Summary 50
Practice Problems 52
Solutions 58

Reading 32 **Monitoring and Rebalancing** 65
Introduction 66
Monitoring 67
Monitoring Changes in Investor Circumstances and Constraints 67
Monitoring Market and Economic Changes 79
Monitoring the Portfolio 82
Rebalancing the Portfolio 84
The Benefits and Costs of Rebalancing 85
Rebalancing Disciplines 90

◘ indicates an optional segment

The Perold–Sharpe Analysis of Rebalancing Strategies 94
Execution Choices in Rebalancing 99
Concluding Remarks 100
Summary 100
Practice Problems 102
Solutions 112

Study Session 17 **Performance Evaluation** 117

Reading 33 **Evaluating Portfolio Performance** 119
Introduction 120
The Importance of Performance Evaluation 121
The Fund Sponsor's Perspective 121
The Investment Manager's Perspective 122
The Three Components of Performance Evaluation 122
Performance Measurement 123
Performance Measurement without Intraperiod External Cash Flows 123
Total Rate of Return 126
The Time-Weighted Rate of Return 126
The Money-Weighted Rate of Return 128
TWR versus MWR 129
The Linked Internal Rate of Return 131
Annualized Return 132
Data Quality Issues 133
Benchmarks 133
Concept of a Benchmark 134
Properties of a Valid Benchmark 135
Types of Benchmarks 136
Building Custom Security-Based Benchmarks 139
Critique of Manager Universes as Benchmarks 140
Tests of Benchmark Quality 142
Hedge Funds and Hedge Fund Benchmarks 143
Performance Attribution 146
Impact Equals Weight Times Return 147
Macro Attribution Overview 148
Macro Attribution Inputs 148
Conducting a Macro Attribution Analysis 150
Micro Attribution Overview 154
Sector Weighting/Stock Selection Micro Attribution 156
Fundamental Factor Model Micro Attribution 160
Fixed-Income Attribution 161
Performance Appraisal 167
Risk-Adjusted Performance Appraisal Measures 168
Quality Control Charts 171
Interpreting the Quality Control Chart 174
The Practice of Performance Evaluation 175
Noisiness of Performance Data 177
Manager Continuation Policy 178
Manager Continuation Policy as a Filter 181

Summary 183
Practice Problems 186
Solutions 193

Study Session 18 **Global Investment Performance Standards** 203

Reading 34 **Overview of the Global Investment Performance Standards** 205
Introduction 206
Background of the GIPS Standards 207
The Need for Global Investment Performance Standards 207
The Development of Performance Presentation Standards 210
Governance of the GIPS Standards 212
Overview of the GIPS Standards 212
Provisions of the GIPS Standards 215
Fundamentals of Compliance 217
Input Data 220
Calculation Methodology: Time-Weighted Total Return 223
Return Calculations: External Cash Flows 226
Additional Portfolio Return Calculation Provisions 229
Composite Return Calculation Provisions 232
Constructing Composites I—Qualifying Portfolios 235
Constructing Composites II—Defining Investment Strategies 238
Constructing Composites III—Including and Excluding Portfolios 241
Constructing Composites IV—Carve-Out Segments 244
Disclosure 245
Presentation and Reporting Requirements 251
Presentation and Reporting Recommendations 257
Introduction to the Real Estate and Private Equity Provisions 259
Real Estate Provisions 260
Private Equity Provisions 266
Wrap Fee/Separately Managed Account (SMA) Provisions 268
GIPS Valuation Principles 270
GIPS Advertising Guidelines 273
Verification 275
Other Issues 280
After-Tax Return Calculation Challenges 280
Keeping Current with the GIPS Standards 283
Summary 284
Appendix: GIPS Glossary 287
Practice Problems 294
Solutions 305

Glossary G-1
Index I-1

CUSTOMER SERVICE

68

How to Use the CFA Program Curriculum

Congratulations on reaching Level III of the Chartered Financial Analyst® (CFA®) Program. This exciting and rewarding program of study reflects your desire to become a serious investment professional. You are embarking on a program noted for its high ethical standards and the breadth of knowledge, skills, and abilities it develops. Your commitment to the CFA Program should be educationally and professionally rewarding.

The credential you seek is respected around the world as a mark of accomplishment and dedication. Each level of the program represents a distinct achievement in professional development. Successful completion of the program is rewarded with membership in a prestigious global community of investment professionals. CFA charterholders are dedicated to life-long learning and maintaining currency with the ever-changing dynamics of a challenging profession. The CFA Program represents the first step toward a career-long commitment to professional education.

The CFA examination measures your mastery of the core skills required to succeed as an investment professional. These core skills are the basis for the Candidate Body of Knowledge (CBOK™). The CBOK consists of four components:

- A broad outline that lists the major topic areas covered in the CFA Program (www.cfainstitute.org/cbok);
- Topic area weights that indicate the relative exam weightings of the top-level topic areas (www.cfainstitute.org/level_III);
- Learning outcome statements (LOS) that advise candidates about the specific knowledge, skills, and abilities they should acquire from readings covering a topic area (LOS are provided in candidate study sessions and at the beginning of each reading); and
- The CFA Program curriculum, which contains the readings and end-of-reading questions, that candidates receive upon exam registration.

Therefore, the key to your success on the CFA examinations is studying and understanding the CBOK. The following sections provide background on the CBOK, the organization of the curriculum, and tips for developing an effective study program.

CURRICULUM DEVELOPMENT PROCESS

The CFA Program is grounded in the practice of the investment profession. Beginning with the Global Body of Investment Knowledge (GBIK), CFA Institute performs a continuous practice analysis with investment professionals around the world to determine the knowledge, skills, and abilities (competencies) that are relevant to the profession. Regional expert panels and targeted surveys are conducted annually to verify and reinforce the continuous feedback from the GBIK collaborative website. The practice analysis process ultimately defines the CBOK. The CBOK reflects the competencies that are generally accepted and applied by investment professionals. These competencies are used in practice in a generalist context and are expected to be demonstrated by a recently qualified CFA charterholder.

© 2017 CFA Institute. All rights reserved.

The Education Advisory Committee, consisting of practicing charterholders, in conjunction with CFA Institute staff, designs the CFA Program curriculum in order to deliver the CBOK to candidates. The examinations, also written by charterholders, are designed to allow you to demonstrate your mastery of the CBOK as set forth in the CFA Program curriculum. As you structure your personal study program, you should emphasize mastery of the CBOK and the practical application of that knowledge. For more information on the practice analysis, CBOK, and development of the CFA Program curriculum, please visit www.cfainstitute.org.

ORGANIZATION OF THE CURRICULUM

The Level III CFA Program curriculum is organized into 10 topic areas. Each topic area begins with a brief statement of the material and the depth of knowledge expected.

Each topic area is then divided into one or more study sessions. These study sessions—18 sessions in the Level III curriculum—should form the basic structure of your reading and preparation.

Each study session includes a statement of its structure and objective and is further divided into specific reading assignments. An outline illustrating the organization of these 18 study sessions can be found at the front of each volume of the curriculum.

The readings and end-of-reading questions are the basis for all examination questions and are selected or developed specifically to teach the knowledge, skills, and abilities reflected in the CBOK. These readings are drawn from content commissioned by CFA Institute, textbook chapters, professional journal articles, research analyst reports, and cases. All readings include problems and solutions to help you understand and master the topic areas.

Reading-specific Learning Outcome Statements (LOS) are listed at the beginning of each reading. These LOS indicate what you should be able to accomplish after studying the reading. The LOS, the reading, and the end-of-reading questions are dependent on each other, with the reading and questions providing context for understanding the scope of the LOS.

You should use the LOS to guide and focus your study because each examination question is based on the assigned readings and one or more LOS. The readings provide context for the LOS and enable you to apply a principle or concept in a variety of scenarios. The candidate is responsible for the entirety of the required material in a study session, which includes the assigned readings as well as the end-of-reading questions and problems.

We encourage you to review the information about the LOS on our website (www.cfainstitute.org/programs/cfaprogram/courseofstudy/Pages/study_sessions.aspx), including the descriptions of LOS "command words" (www.cfainstitute.org/programs/Documents/cfa_and_cipm_los_command_words.pdf).

FEATURES OF THE CURRICULUM

OPTIONAL SEGMENT

Required vs. Optional Segments You should read all of an assigned reading. In some cases, though, we have reprinted an entire chapter or article and marked certain parts of the reading as "optional." The CFA examination is based only on the required segments, and the optional segments are included only when it is determined that they might help you to better understand the required segments (by seeing the required material in its full context). When an optional segment begins, you will see an icon and a dashed

vertical bar in the outside margin that will continue until the optional segment ends, accompanied by another icon. *Unless the material is specifically marked as optional, you should assume it is required.* You should rely on the required segments and the reading-specific LOS in preparing for the examination.

END OPTIONAL SEGMENT

End-of-Reading Problems/Solutions *All problems in the readings as well as their solutions (which are provided directly following the problems) are part of the curriculum and are required material for the exam.* When appropriate, we have included problems within and after the readings to demonstrate practical application and reinforce your understanding of the concepts presented. The problems are designed to help you learn these concepts and may serve as a basis for exam questions. Many of these questions are adapted from past CFA examinations.

Glossary and Index For your convenience, we have printed a comprehensive glossary in each volume. Throughout the curriculum, a **bolded** word in a reading denotes a term defined in the glossary. The curriculum eBook is searchable, but we also publish an index that can be found on the CFA Institute website with the Level III study sessions.

LOS Self-Check We have inserted checkboxes next to each LOS that you can use to track your progress in mastering the concepts in each reading.

Source Material The authorship, publisher, and copyright owners are given for each reading for your reference. We recommend that you use the CFA Institute curriculum rather than the original source materials because the curriculum may include only selected pages from outside readings, updated sections within the readings, and problems and solutions tailored to the CFA Program. Note that some readings may contain a web address or URL. The referenced sites were live at the time the reading was written but may have been deactivated since then.

Some readings in the curriculum cite articles published in the *Financial Analysts Journal*, which is the flagship publication of CFA Institute. Since its launch in 1945, the *Financial Analysts Journal* has established itself as the leading practitioner-oriented journal in the investment management community. Over the years, it has advanced the knowledge and understanding of the practice of investment management through the publication of peer-reviewed practitioner-relevant research from leading academics and practitioners. It has also featured thought-provoking opinion pieces that advance the common level of discourse within the investment management profession. Some of the most influential research in the area of investment management has appeared in the pages of the *Financial Analysts Journal*, and 11 Nobel laureates have contributed a total of 45 articles.

Candidates are not responsible for familiarity with *Financial Analysts Journal* articles that are cited in the curriculum. But, as your time and studies allow, we strongly encourage you to begin supplementing your understanding of key investment management issues by reading this practice-oriented publication. Candidates have full online access to the *Financial Analysts Journal* and associated resources. All you need is to log in on www.cfapubs.org using your candidate credentials.

DESIGNING YOUR PERSONAL STUDY PROGRAM

Create a Schedule An orderly, systematic approach to exam preparation is critical. You should dedicate a consistent block of time every week to reading and studying. Complete all reading assignments and the associated problems and solutions in each study session. Review the LOS both before and after you study each reading to ensure that you have mastered the applicable content and can demonstrate the knowledge, skill, or ability described by the LOS and the assigned reading. Use the LOS self-check to track your progress and highlight areas of weakness for later review.

As you prepare for your exam, we will e-mail you important exam updates, testing policies, and study tips. Be sure to read these carefully. Curriculum errata are periodically updated and posted on the study session page at www.cfainstitute.org.

Successful candidates report an average of more than 300 hours preparing for each exam. Your preparation time will vary based on your prior education and experience. For each level of the curriculum, there are 18 study sessions. So, a good plan is to devote 15–20 hours per week for 18 weeks to studying the material. Use the final four to six weeks before the exam to review what you have learned and practice with topic tests and mock exams. This recommendation, however, may underestimate the hours needed for appropriate examination preparation depending on your individual circumstances, relevant experience, and academic background. You will undoubtedly adjust your study time to conform to your own strengths and weaknesses and to your educational and professional background.

You will probably spend more time on some study sessions than on others, but on average you should plan on devoting 15–20 hours per study session. You should allow ample time for both in-depth study of all topic areas and additional concentration on those topic areas for which you feel the least prepared.

An interactive study planner is available in the candidate resources area of our website to help you plan your study time. The interactive study planner recommends completion dates for each topic of the curriculum. Dates are determined based on study time available, exam topic weights, and curriculum weights. As you progress through the curriculum, the interactive study planner dynamically adjusts your study plan when you are running off schedule to help you stay on track for completion prior to the examination.

CFA Institute Topic Tests The CFA Institute topic tests are intended to assess your mastery of individual topic areas as you progress through your studies. After each test, you will receive immediate feedback noting the correct responses and indicating the relevant assigned reading so you can identify areas of weakness for further study. For more information on the topic tests, please visit www.cfainstitute.org.

CFA Institute Mock Exams The three-hour mock exams simulate the morning and afternoon sessions of the actual CFA examination, and are intended to be taken after you complete your study of the full curriculum so you can test your understanding of the curriculum and your readiness for the exam. You will receive feedback at the end of the mock exam, noting the correct responses and indicating the relevant assigned readings so you can assess areas of weakness for further study during your review period. We recommend that you take mock exams during the final stages of your preparation for the actual CFA examination. For more information on the mock examinations, please visit www.cfainstitute.org.

Preparatory Providers After you enroll in the CFA Program, you may receive numerous solicitations for preparatory courses and review materials. When considering a prep course, make sure the provider is in compliance with the CFA Institute Approved

Prep Provider Program (www.cfainstitute.org/utility/examprep/Pages/index.aspx). Just remember, there are no shortcuts to success on the CFA examinations; reading and studying the CFA curriculum is the key to success on the examination. The CFA examinations reference only the CFA Institute assigned curriculum—no preparatory course or review course materials are consulted or referenced.

SUMMARY

Every question on the CFA examination is based on the content contained in the required readings and on one or more LOS. Frequently, an examination question is based on a specific example highlighted within a reading or on a specific end-of-reading question and/or problem and its solution. To make effective use of the CFA Program curriculum, please remember these key points:

1. All pages of the curriculum are required reading for the examination except for occasional sections marked as optional. You may read optional pages as background, but you will not be tested on them.
2. All questions, problems, and their solutions—found at the end of readings—are part of the curriculum and are required study material for the examination.
3. You should make appropriate use of the topic tests and mock examinations and other resources available at www.cfainstitute.org.
4. Use the interactive study planner to create a schedule and commit sufficient study time to cover the 18 study sessions, review the materials, and take topic tests and mock examinations.
5. Some of the concepts in the study sessions may be superseded by updated rulings and/or pronouncements issued after a reading was published. Candidates are expected to be familiar with the overall analytical framework contained in the assigned readings. Candidates are not responsible for changes that occur after the material was written.

FEEDBACK

At CFA Institute, we are committed to delivering a comprehensive and rigorous curriculum for the development of competent, ethically grounded investment professionals. We rely on candidate and member feedback as we work to incorporate content, design, and packaging improvements. You can be assured that we will continue to listen to your suggestions. Please send any comments or feedback to info@cfainstitute.org. Ongoing improvements in the curriculum will help you prepare for success on the upcoming examinations and for a lifetime of learning as a serious investment professional.

CUSTOMER SERVICE

68

Portfolio Management

STUDY SESSIONS

Study Session 3	Behavioral Finance
Study Session 4	Private Wealth Management (1)
Study Session 5	Private Wealth Management (2)
Study Session 6	Portfolio Management for Institutional Investors
Study Session 7	Applications of Economic Analysis to Portfolio Management
Study Session 8	Asset Allocation and Related Decisions in Portfolio Management (1)
Study Session 9	Asset Allocation and Related Decisions in Portfolio Management (2)
Study Session 10	Fixed-Income Portfolio Management (1)
Study Session 11	Fixed-Income Portfolio Management (2)
Study Session 12	Equity Portfolio Management
Study Session 13	Alternative Investments for Portfolio Management
Study Session 14	Risk Management
Study Session 15	Risk Management Applications of Derivatives
Study Session 16	Trading, Monitoring, and Rebalancing
Study Session 17	Performance Evaluation
Study Session 18	Global Investment Performance Standards

This volume includes Study Sessions 16–18.

© 2017 CFA Institute. All rights reserved.

TOPIC LEVEL LEARNING OUTCOME

The candidate should be able to prepare an appropriate investment policy statement and asset allocation; formulate strategies for managing, monitoring, and rebalancing investment portfolios; evaluate portfolio performance; and analyze a presentation of investment returns for consistency with Global Investment Performance Standards (GIPS®).

PORTFOLIO MANAGEMENT
STUDY SESSION

16

Trading, Monitoring, and Rebalancing

Because the investment process is not complete until securities are bought or sold, the quality of trade execution is an important determinant of investment results. The methods by which managers and traders interact with markets, choose appropriate trading strategies and tactics, and measure success in execution are key topics addressed in this study session. Also discussed is the ongoing monitoring and rebalancing of the investment portfolio, which are integral to the portfolio management process. Portfolio managers must understand the reasons for monitoring portfolios and be able to formulate appropriate portfolio rebalancing policies.

READING ASSIGNMENTS

Reading 31	Execution of Portfolio Decisions by Ananth Madhavan, PhD, Jack L. Treynor, and Wayne H. Wagner
Reading 32	Monitoring and Rebalancing by Robert D. Arnott, Terence E. Burns, CFA, Lisa Plaxco, CFA, and Philip Moore

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

31

Execution of Portfolio Decisions

by Ananth Madhavan, PhD, Jack L. Treynor, and Wayne H. Wagner

Ananth Madhavan, PhD, is at BlackRock (USA). Jack L. Treynor (USA). Wayne H. Wagner (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** compare market orders with limit orders, including the price and execution uncertainty of each;
☐	**b.** calculate and interpret the effective spread of a market order and contrast it to the quoted bid–ask spread as a measure of trading cost;
☐	**c.** compare alternative market structures and their relative advantages;
☐	**d.** explain the criteria of market quality and evaluate the quality of a market when given a description of its characteristics;
☐	**e.** explain the components of execution costs, including explicit and implicit costs, and evaluate a trade in terms of these costs;
☐	**f.** calculate and discuss implementation shortfall as a measure of transaction costs;
☐	**g.** contrast volume weighted average price (VWAP) and implementation shortfall as measures of transaction costs;
☐	**h.** explain the use of econometric methods in pretrade analysis to estimate implicit transaction costs;
☐	**i.** discuss the major types of traders, based on their motivation to trade, time versus price preferences, and preferred order types;
☐	**j.** describe the suitable uses of major trading tactics, evaluate their relative costs, advantages, and weaknesses, and recommend a trading tactic when given a description of the investor's motivation to trade, the size of the trade, and key market characteristics;
☐	**k.** explain the motivation for algorithmic trading and discuss the basic classes of algorithmic trading strategies;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**l.** discuss the factors that typically determine the selection of a specific algorithmic trading strategy, including order size, average daily trading volume, bid–ask spread, and the urgency of the order;
☐	**m.** explain the meaning and criteria of best execution;
☐	**n.** evaluate a firm's investment and trading procedures, including processes, disclosures, and record keeping, with respect to best execution;
☐	**o.** discuss the role of ethics in trading.

1 INTRODUCTION

The investment process has been described as a three-legged stool supported equally by securities research, portfolio management, and securities trading. Of the three, trading is often the least understood and least appreciated function. As we will show, a deeper appreciation for the trading function can be a powerful help in achieving investment success.

In this reading, we will build the knowledge and explain the concepts needed to understand how managers and traders interact with markets, choose trading strategies and tactics, and measure their success in trading. Our perspective is chiefly that of a portfolio manager (or investment advisor) whose objective is to execute portfolio decisions in the best interests of the client. The portfolio manager's agents in doing so are the firm's traders. These **buy-side traders** are the professional traders employed by investment managers or institutional investors who place the trades that execute the decisions of portfolio managers. The job of such traders is to execute the desired trades quickly, without error, and at favorable prices. Execution is the final, critical step in the interlinked investment process: *The portfolio decision is not complete until securities are bought or sold.*

A portfolio manager is not a professional trader. However, a portfolio manager does need to:

- communicate effectively with professional traders;
- evaluate the quality of the execution services being provided for the firm's clients; and
- take responsibility for achieving best execution on behalf of clients in his or her role as a fiduciary.

To accomplish those goals, the portfolio manager needs a grounding in:

- the market institutions within which traders work, including the different types of trading venues to which traders may direct orders;
- the measurement of trading costs; and
- the tactics and strategies available to the firm's traders and the counterparties with whom they deal, including important innovations in trading technology.

The reading is organized as follows. Section 2 presents essential information for the portfolio manager on the types of orders, the variety of market venues where orders are executed, the roles of dealers and brokers, and the evaluation of market quality.

Section 3 addresses the costs of trading. The next two sections discuss topics relevant to trading strategy: the types of traders and their preferred order types (Section 4) and trade execution decisions and tactics (Section 5). Section 6 discusses serving the client's interests in trading and is followed by concluding remarks (Section 7) and a summary of major points.

THE CONTEXT OF TRADING: MARKET MICROSTRUCTURE

2

The portfolio manager needs to be familiar with **market microstructure**: the market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Knowledge of market microstructure helps a portfolio manager understand how orders will be handled and executed. The formulation of trading strategies depends on accurate microstructure information. Such information can also help the practitioner understand the frictions that can cause asset prices to diverge from full-information expectations of value, possibly suggesting opportunities and pitfalls in trading.

The portfolio manager also needs to understand the characteristics of the major order types as he or she communicates with the trading desk on such matters as the emphasis to put on speed of execution versus price of execution. The next section presents some essential information on order types.

2.1 Order Types

Market orders and limit orders are the two major types of orders that traders use and that portfolio managers need to understand.

1 A **market order** is an instruction to execute an order promptly in the public markets at the best price available.

   For example, an order to buy 10,000 shares of BP p.l.c. directed to the London Stock Exchange (LSE) would execute at the best price available when the order reached that market. Suppose that when the order reaches the LSE, the lowest price at which a seller is ready to sell BP shares is 642p (pence) in quantity up to 8,000 shares (for a buyer, the lower the price, the better). The second-lowest price is 643p in quantity up to 6,000 shares. Thus, 8,000 shares of the market order would be filled (executed) at 642p and the balance of 10,000 – 8,000 = 2,000 shares would fill at 643p.

   A market order emphasizes immediacy of execution. However, a market order usually bears some degree of **price uncertainty** (uncertainty about the price at which the order will execute). In today's markets, most market orders are effectively automated from the point of origin straight through to reporting and clearing.

2 A **limit order** is an instruction to trade at the best price available but only if the price is at least as good as the limit price specified in the order. For buy orders, the trade price must not exceed the limit price, while for sell orders, the trade price must be at least as high as the limit price. An instruction always accompanies a limit order specifying when it will expire.

   Suppose that instead of the market order above, the trader places an order to buy 10,000 shares of BP p.l.c. at 641p limit (which means at a price of 641p or lower), good for one day (the order expires at the end of trading that day). Suppose that this buy order's price is higher than that of any other limit buy

order for BP shares at the time. If that is the case, then 641p becomes the best available bid, or **market bid**, for BP shares. If a market sell order for 6,000 shares of BP arrives the instant after the trader's buy limit order for 10,000 shares, it will execute against that limit order. The trader will get a fill (execution) for 6,000 shares at 641p, leaving 4,000 shares of the order unfilled. At that point, favorable news on BP might reach the market. If so, the price of BP could move up sharply and not trade at or below 641p for the remainder of the day. If that is the case, at the end of the day, the trader will have 4,000 shares of his or her order unfilled and the order, which was good for one day, will expire.

By specifying the least favorable price at which an order can execute, *a limit order emphasizes price*. However, limit orders can execute only when the market price reaches the limit price specified by the limit order. The timing of the execution, or even whether the execution happens at all, is determined by the ebb and flow of the market. Limit orders thus have **execution uncertainty**.

Each trading venue specifies the types of orders permitted and other trading protocols. The professional trader needs to know the range of order types permitted. The list of all possible kinds of orders is long, but most order types represent variations on the elemental market and limit orders.[1] Some of these order types may serve to enlist the experience, presence, and knowledge of the trader's agent (broker) in executing a trade. Others may serve to conceal the quantity of a security that the trader wants to buy or sell, or serve some other purpose. A few additional important order types are as follows:

- **Market-not-held order**. This type of order is relevant for trades placed on certain **exchanges** (regulated trading venues) where an order may be handled by an agent of the trader in executing trades (a **broker**). This variation of the market order is designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the broker is not required to trade at any specific price or in any specific time interval, as would be required with a simple market order. Discretion is placed in the hands of a representative of the broker (such as a **floor broker**—an agent of the broker who, for certain exchanges, physically represents the trade on the exchange). The broker may choose not to participate in the flow of orders on the exchange if the broker believes he or she will be able to get a better price in subsequent trading.
- **Participate (do not initiate) order**. This is a variant of the market-not-held order. The broker is to be deliberately low-key and wait for and respond to initiatives of more active traders. Buy-side traders who use this type of order hope to capture a better price in exchange for letting the other side determine the timing of the trade.
- **Best efforts order**. This type of order gives the trader's agent even more discretion to work the order only when the agent judges market conditions to be favorable. Some degree of immediacy is implied, but not immediacy at any price.
- Undisclosed limit order, also known as a reserve, hidden, or iceberg order. This is a limit order that includes an instruction not to show more than some maximum quantity of the unfilled order. For example, a trader might want to buy 200,000 shares of an issue traded on Euronext Amsterdam. The order size would represent a substantial fraction of average daily volume in the issue, and the trader is concerned that share price might move up if the full extent of his

1 See Harris (2003) for an in-depth treatment of order types.

or her interest were known. The trader places an undisclosed limit order to buy the 200,000 shares, specifying that no more than 20,000 shares of the unfilled order be shown to the public at a time.

- **Market on open order**. This is a market order to be executed at the opening of the market. Similarly, a **market on close order** is a market order to be executed at the market close. These are examples of orders with an instruction for execution at a specific time. The rationale for using these two types of orders is that the opening and close in many markets provide good liquidity.

The above types of orders describe how an order to buy or sell will be presented to the market. The following describe special types of trades:

- **Principal trade**. A principal trade is a trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell. Principal trades are used most frequently when the order is larger and/or more urgent than can be accommodated within the normal ebb and flow of exchange trading. A price concession provides an incentive for the broker acting as a principal in the trade.
- **Portfolio trade** (or program trade or basket trade). A portfolio trade involves an order that requires the execution of purchases (or sales) in a specified basket (list) of securities at as close to the same time as possible. For example, an S&P 500 index fund manager with new cash to invest could execute a portfolio trade to buy the S&P 500 (the shares in the S&P 500 in their index weights). Portfolio trades are often relatively low cost because the diversification implied by multiple security issues reduces the risk to the other side of the trade.

With some essential information on order types in hand, we can discuss market structures for trading.

2.2 Types of Markets

Markets are organized to provide **liquidity** (the ability to trade without delay at relatively low cost and in relatively large quantities), **transparency** (availability of timely and accurate market and trade information), and **assurity of completion** (trades settle without problems under all market conditions—**trade settlement** involves the buyer's payment for the asset purchased and the transfer of formal ownership of that asset).

In what follows, we describe the chief ways trading is organized:

- Quote-driven (or dealer) markets, in which members of the public trade with dealers rather than directly with one another.
- Order-driven markets, in which members of the public trade with one another without the intermediation of dealers.
- Brokered markets, in which the trader relies on a broker to find the other side of a desired trade.

These distinctions are valuable in understanding the dynamics of trading and price formation, although, as we discuss later, the lines between the categories are often blurry. Furthermore, markets evolve, and the portfolio manager needs to keep abreast of important new developments.

Fixed-income and equity markets have evolved very rapidly over the 1990s and 2000s. There are many more choices as to where to trade such bonds and equities than was the case historically—a phenomenon that has been called **market fragmentation**. Another trend is the increasing amount of trading that is partly or fully automated, in the sense that the execution of a trader's order after entry requires minimal or no human intervention or trader-to-trader communication. Reflecting the concern

to minimize settlement errors and costs in security markets, the settlement of the trade after execution may also be automated within a given trading system or venue (**straight-through processing**, or STP).

Forward and futures markets are also in transition. For example, at the Chicago Board of Trade (a US commodities exchange), an automated trading system (e-cbot) operates alongside a type of market dating back centuries (an **open outcry auction market**). In an open outcry auction market, representatives of buyers and sellers meet at a specified location on the floor of an exchange, with voices raised ("open outcry") so they can be heard, to conduct auctions to fill customers' orders.

Alternative investment markets have also been affected by changes. For example, hedge funds (loosely regulated pooled investment vehicles) have been aggressive in exploiting advances in trading technology.

All the above developments are better understood when the structures by which trading is organized are grasped. The first type of market that we will discuss is called a quote-driven or dealer market.

2.2.1 *Quote-Driven (Dealer) Markets*

Quote-driven markets rely on dealers to establish firm prices at which securities can be bought and sold. These markets are therefore also called dealer markets, as trades are executed with a dealer. A **dealer** (sometimes referred to as a market maker) is a business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order to buy or sell the asset.

In the traditional view, market makers or dealers passively provide immediacy or bridge liquidity, the price of which is the **bid–ask spread** (the ask price minus the bid price). A dealer's (or any trader's) **bid price** (or **bid**) is the price at which he or she will buy a specified quantity of a security. A dealer's (or any trader's) **ask price** (or ask, or offer price, or offer) is the price at which he or she will sell a specified quantity of a security. On the principle of buying low and selling high, a dealer's ask price is greater than his bid price. The quantity associated with the bid price is often referred to as the **bid size**; the quantity associated with the ask price is known as the **ask size**. From the perspective of a trader executing an order to *buy* a security from a dealer, a *lower ask* from the dealer is favorable to the trader. If the trader is executing an order to *sell* a security to a dealer, a *higher bid* from the dealer is favorable to the trader.

Suppose that a portfolio manager gives the firm's trading desk an order to buy 1,000 shares of Economical Chemical Systems, Inc. (ECSI), which is traded in a dealer market, and that three dealers (coded A, B, and C) make a market in those shares. At the time the trader views the market in ECSI on his computer screen, 10:22 a.m., the three dealers have put in the following quotes:

- Dealer A: *bid*: 98.85 for 600 shares; *ask*: 100.51 for 1,000 shares
- Dealer B: *bid*: 98.84 for 500 shares; *ask*: 100.55 for 500 shares
- Dealer C: *bid*: 98.82 for 700 shares; *ask*: 100.49 for 800 shares

Thus, the bid–ask spreads of Dealers A, B, and C are, respectively,

- 100.51 – 98.85 = 1.66
- 100.55 – 98.84 = 1.71
- 100.49 – 98.82 = 1.67

The trader might see the quote information organized on his screen as shown in Exhibit 1. In Exhibit 1, the bids and asks are ordered from best to worst and time-stamped. These are actually limit orders because the prices at which the dealers are ready to trade are specified. Because Exhibit 1 lists limit orders, it is called a **limit order** book. The **inside bid**, or **market bid**, which is the highest and best bid, is 98.85 from Dealer A. However, Dealer C is quoting the **inside ask**, or **market ask**, which

is the lowest ask, at 100.49. The **inside quote**, or **market quote**, is therefore 98.85 bid, 100.49 ask. The **inside bid–ask spread**, or **market bid–ask spread** (or **inside spread** or **market spread** for short), is 100.49 − 98.85 = 1.64, which in this case is lower than any individual dealer's spread. (Prevailing is also used for *inside* or *market* in all these expressions.) The trader also notes that the **midquote** (halfway between the market bid and ask prices) is (100.49 + 98.85)/2 = 99.67.

Exhibit 1 The Limit Order Book for Economical Chemical Systems, Inc.

Bid				Ask			
Dealer	Time Entered	Price	Size	Dealer	Time Entered	Price	Size
A	10:21 a.m.	98.85	600	C	10:21 a.m.	100.49	800
B	10:21 a.m.	98.84	500	A	10:21 a.m.	100.51	1,000
C	10:19 a.m.	98.82	700	B	10:19 a.m.	100.55	500

Note: The bids are ordered from highest to lowest, while the asks are ordered from lowest to highest. These orderings are from best bid or ask to worst bid or ask.

If the trader executes a market buy order for 1,000 shares, the trader would purchase 800 shares from Dealer C at 100.49 per share and 200 shares from Dealer A at 100.51 per share. However, in some markets, it is also possible for the trader to direct the buy order to a specific dealer—for example, Dealer A. The trader may do so for a variety of reasons. For example, the trader may believe that Dealer A is reliable in standing behind quotes but that Dealer C is not. As one example, currency markets are dealer markets, and institutions active in those markets may screen counterparties on credit criteria.

In some dealer markets, a public trader might not have real-time access to all quotes in the security as in our example; that is, the limit order book is not "open," meaning visible in real time to the public. In such **closed-book markets**, the trader would rely on a broker to locate the best ask price, paying the broker a commission. Another notable point concerns limit orders. Historically, in dealer markets, rules would restrict a limit order from a public trader from competing with dealers' bids and asks for other public trades. In a "pure" dealer market, a dealer is a counterparty to every trade. However, in some quote-driven markets, such as the US NASDAQ market for equities, public traders' limit orders are displayed and compete with dealers' bids and asks.[2]

If the portfolio manager communicated that he or she had a focus on price rather than immediacy, the trader might consider placing a limit order within the market spread—for example, an order to buy 1,000 shares at 100 limit. The trader's limit order in a market such as NASDAQ would establish a new market bid at 100, and the revised market quote would be 100 bid, 100.49 ask. If nothing else had changed, an incoming market order to sell ECSI shares would "hit" the trader's bid of 100. The trader might also hope that one of the dealers would revise the ask downward and fill part or all of the trader's order. On the other hand, it is also possible that the trader's limit order would expire unfilled.

Dealers have played important roles in bond and equity markets because *dealers can help markets operate continuously*. Bond markets, in particular, are overwhelmingly dealer markets. The explanation lies in a lack of natural liquidity for many bonds. (**Natural liquidity** is an extensive pool of investors who are aware of and have

2 The display of public limit orders on NASDAQ followed a US reform in 1997 that was triggered by a controversy about dealer collusion in setting quotes.

a potential interest in buying and/or selling a security.) Many bonds are extremely infrequently traded. If an investor wanted to buy such a bond, the investor might have a very long wait before the other side of the trade (an interest to sell) appeared from the public. Dealers help markets in such securities operate more nearly continuously by being ready to take the opposite side of a trade.

An examination of the US corporate bond markets highlights the lack of natural liquidity in these markets. In the second quarter of 2011, the average daily volume of corporate bond trades was $15.8 billion, which was only 0.21% of the dollar amount of bonds outstanding at that time.[3] A 2007 study of bond liquidity found that, for the bonds that traded during the time period 2003-2005, the median number of trades was less than one a day. Only 1 percent of active bonds traded more than 20 times per day.[4] Even in the relatively frequently traded issues, an opportunity is thus created for an entity—the dealer—to "make" the market (i.e., create liquidity when no natural liquidity exists). A market is made when the dealer stands ready to provide bridge liquidity by buying securities offered by a seller and holding them until a buyer arrives, in return for earning a spread.

Similar considerations often operate in equities. For example, the London Stock Exchange has a quote-driven, competing dealer market called SEAQ for infrequently traded shares. Dealers also play important roles in markets requiring negotiation of the terms of the instrument, such as forward markets and swap markets, where otherwise finding a counterparty to the instrument would often not be feasible.

The size of the *quoted* bid–ask spread (reflecting the market quote), particularly as a proportion of the quote midpoint, is one measure of trading costs. However, the quoted bid–ask spread may be different from the spread at which a trader actually transacts. The trader's focus is therefore often on the *effective* spread.

The **effective spread** is two times the deviation of the actual execution price from the midpoint of the market quote at the time an order is entered. (If parts of the order execute at different prices, the weighted-average execution price is used in computing the deviation from the midpoint.) The quoted spread is the simplest measure of round-trip transaction costs for an average-size order. The effective spread is a better representation of the true cost of a round-trip transaction because it captures both **price improvement** (i.e., execution within the quoted spread at a price such that the trader is benefited) and the tendency for larger orders to move prices (**market impact**).[5] Exhibit 2 gives the market bid–ask in a hypothetical common equity issue that we can use to illustrate the difference between these two kinds of spreads.

Exhibit 2 A Market Bid–Ask at 10:03:14 (Order Entry)

Bid Price	Bid Size	Ask Price	Ask Size
$19.97	400	$20.03	1,000

With the information in Exhibit 2 before him, a trader with instructions to buy 500 shares with minimal delay enters a market order for 500 shares. As the order is received in the system at 10:03:18, a dealer in the issue enters a quote of $19.96 bid (bid size: 100 shares) and $20.01 ask (ask size: 500 shares) to improve on ("step

3 www.sifma.org/research/statistics.aspx, Accessed 27 September 2011.
4 See Edwards, Harris, and Piwowar (2007), Table 2.
5 Price improvement happens when a trader improves on (or "steps in front of") the best current bid or ask price to take the other side of an incoming market order.

in front of") the prior best ask price of $20.03 and take the incoming market order. This can happen because the dealer quickly decides that the profit from the trade is satisfactory. Exhibit 3 shows the market bid–ask at 10:03:18, when the order executes.

Exhibit 3 A Market Bid–Ask at 10:03:18 (Order Execution)

Bid Price	Bid Size	Ask Price	Ask Size
$19.97	400	$20.01	500

Thus, 500 shares of the trader's market order execute at $20.01, which represents a price improvement of $0.02 relative to the market ask of $20.03 that the trader saw when the order was entered. (The lower purchase price represents a price improvement for the buyer.)

From Exhibit 2 we see that the quoted bid–ask spread is $20.03 – $19.97 = $0.06. The midquote is ($20.03 + $19.97)/2 = $20.00. The effective spread is 2 × ($20.01 – $20.00) = 2 × $0.01 = $0.02, which is $0.06 – $0.02 = $0.04 less than the quoted spread. *The price improvement has resulted in an effective spread that is lower than the quoted spread.*

The **average effective spread** is the mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study. The average effective spread attempts to measure the liquidity of a security's market.

EXAMPLE 1

The Effective Spread of an Illiquid Stock

Charles McClung, portfolio manager of a Canadian small-cap equity mutual fund, is reviewing with his firm's chief trader the execution of a ticket to sell 1,000 shares of Alpha Company. The ticket was split into three trades executed in a single day as follows:

A A market order to sell 200 shares was executed at a price of C$10.15. The quote that was in effect at that time was as follows:

Ask Price	Ask Size	Bid Price	Bid Size
C$10.24	200	C$10.12	300

B A market order to sell 300 shares was executed at a price of C$10.11. The quote that was in effect at that time was as follows:

Ask Price	Ask Size	Bid Price	Bid Size
C$10.22	200	C$10.11	300

C A market order to sell 500 shares was executed at an average price of C$10.01. The quote that was in effect at that time was as follows:

Ask Price	Ask Size	Bid Price	Bid Size
C$10.19	200	C$10.05	300

This order exceeded the quoted bid size and "walked down" the limit order book (i.e., after the market bid was used, the order made use of limit order(s) to buy at lower prices than the market bid).

1. For each of the above market orders, compute the quoted spread. Also, compute the average quoted spread for the stock for the day.
2. For each of the above, compute the effective spread. Also, compute the average effective spread and the share-volume-weighted effective spread for the stock for the day.
3. Discuss the relative magnitudes of quoted and effective spreads for each of the three orders.

Solution to 1:

The quoted spread is the difference between the ask and bid prices. So, for the first order, the quoted spread is C$10.24 – C$10.12 = C$0.12. Similarly, the quoted spreads for the second and third orders are C$0.11 and C$0.14, respectively. The average quoted spread is (C$0.12 + C$0.11 + C$0.14)/3 = C$0.1233.

Solution to 2:

Effective spread for a sell order = 2 × (Midpoint of the market at the time an order is entered – Actual execution price).

For the first order, the midpoint of the market at the time the order is entered = (C$10.12 + C$10.24)/2 = C$10.18. So, the effective spread = 2 × (C$10.18 – C$10.15) = C$0.06.

The effective spread for the second order = 2 × [(C$10.11 + C$10.22)/2 – C$10.11] = C$0.11.

The effective spread for the third order = 2 × [(C$10.05 + C$10.19)/2 – C$10.01] = C$0.22.

The average effective spread = (C$0.06 + C$0.11 + C$0.22)/3 = C$0.13. The share-volume-weighted effective spread = [(200 × C$0.06) + (300 × C$0.11) + (500 × C$0.22)]/(200 + 300 + 500) = (C$12.00 + C$33.00 + C$110.00)/1,000 = C$155.00/1,000 = C$0.155.

Solution to 3:

In the first trade, there was a price improvement because the shares were sold at a price above the bid price. Therefore, the effective spread is less than the quoted spread. In the second trade, there was no price improvement because the shares were sold at the bid price. Also, there was no impact on the execution price because the entire order was fulfilled at the quoted bid. Accordingly, the effective and quoted spreads are equal. In the third trade, the effective spread is greater than the quoted spread because the order size was greater than the bid size and the order had to walk down the limit order book, resulting in a lower average price for the sale and therefore a higher effective spread.

Empirical research confirms that effective bid–ask spreads are lower in higher-volume securities because dealers can achieve faster turnaround in inventory, which reduces their risk. Spreads are wider for riskier and less liquid securities. Later research provided a deeper understanding of trading costs by explaining variation in bid–ask spreads as part of intraday price dynamics. This research showed that market makers are not simply passive providers of immediacy but must also take an active role in price setting to rapidly turn over inventory without accumulating significant positions on one side of the market.

Price may depart from expectations of value if the dealer is long or short relative to desired (target) inventory, giving rise to transitory price movements during the day—and possibly over longer periods. This intuition drives the models of inventory control developed by, among others, Madhavan and Smidt (1993).

2.2.2 *Order-Driven Markets*

Order-driven markets are markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices. Such markets feature trades between public investors, *usually without intermediation by designated dealers* (market makers). The limit order book shown in Exhibit 1 for the hypothetical Economical Chemical Systems, Inc., would also be a possible limit order book for the company if it were traded in an order-driven market, but typically with public traders replacing dealers (dealers may trade in order-driven markets but do so alongside other traders). There might be more competition for orders, because a trader does not have to transact with a dealer (as in a "pure" dealer market). But it is also possible that a trader might be delayed in executing a trade or be unable to execute it because a dealer with an inventory of the security is not present. Orders from the public "drive," or determine, liquidity, explaining the term *order-driven markets*. In order-driven markets, a trader cannot choose with whom he or she trades because a prespecified set of rules (based on factors such as price and time of order entry) mechanically governs the execution of orders submitted to the market.

Examples of order-driven markets include the Toronto Stock Exchange for equities, the International Securities Exchange for options, and Hotspot FX for foreign exchange. For equity markets, a worldwide trend has favored order-driven markets at the expense of quote-driven markets. Various types of order-driven markets are distinguished:

Electronic Crossing Networks Electronic crossing networks are markets in which buy and sell orders are batched (accumulated) and crossed at a specific point in time, usually in an anonymous fashion. Electronic crossing networks execute trades at prices taken from other markets. An example of a crossing network is the POSIT trading system, which matches buyers and sellers at the average of prevailing bid and ask prices at fixed points in the day. Crossing networks serve mainly institutional investors.[6]

In using crossing networks, both buyer and seller avoid the costs of dealer services (the bid–ask spread), the effects a large order can have on execution prices, and information leakage. Commissions are paid to the crossing network but are typically low. However, crossing participants cannot be guaranteed that their trades will find an opposing match: The volume in a crossing system is determined by the smallest quantity submitted.

To illustrate how trades on a crossing network are executed, we will suppose that an investment manager, coded A in Exhibit 4, wishes to buy 10,000 shares of a stock. At the same time, two different mutual fund traders, coded B and C, wish to sell 3,000 and 4,000 shares, respectively. The crossing of orders occurs at 12:00 p.m. on each business day. The market bid and ask prices of the stock are €30.10 and €30.16, respectively.

6 In discussions of US equity markets in particular, a term that is occasionally used for direct trading of securities between institutional investors is the **fourth market**; the fourth market would include trading on electronic crossing networks.

Exhibit 4 Electronic Crossing Network: Crossing of Orders at 12:00 p.m. (Numerical Entries Are Numbers of Shares)

Trader Identity	Buy Orders	Sell Orders
A	10,000	
B		3,000
C		4,000

In this example, total volume is 7,000 shares and the execution price is at the **midquote** (halfway between the prevailing bid and ask prices) of €30.13 = (€30.10 + €30.16)/2. Both sellers have their orders executed in full, but buyer A receives a **partial fill** of 7,000 shares. The buyer has the option of sending the remaining 3,000 shares back to the crossing system for another attempt at execution at the next scheduled crossing or trying to trade this remainder in the open market. None of the participants observes the identities or original submission sizes of the others in the match pool.

Crossing networks provide no price discovery. **Price discovery** means that transaction prices adjust to equilibrate supply and demand. Because the crossing network did not provide price discovery, price could not adjust upward to uncover additional selling interest and fully satisfy trader A's demand to buy.

Auction Markets Many order-driven markets are auction markets—that is, markets in which the orders of multiple buyers compete for execution. Auction markets can be further categorized into **periodic auction markets** or **batch auction markets** (where multilateral trading occurs at a single price at a prespecified point in time) and **continuous auction markets** (where orders can be executed at any time during the trading day). Examples of batch auction markets are the open and close of some stock exchanges and the reopening of the Tokyo Stock Exchange after the midday lunch break; at these times, orders are aggregated for execution at a single price. In contrast to electronic crossing markets, auction markets provide price discovery, lessening the problem of partial fills that we illustrated above for crossing networks.

Automated Auctions (Electronic Limit-Order Markets) These are computer-based auctions that operate continuously within the day using a specified set of rules to execute orders. **Electronic communications networks (ECNs)**, such as the NYSE Arca Exchange in the United States and the Paris Bourse in France, are examples of automated auctions for equities. Like crossing networks, ECNs provide anonymity and are computer-based. In contrast to crossing networks, ECNs operate continuously and, as auction markets, provide price discovery. (Following usual practice, the acronym "ECN" is reserved to refer to electronic communications networks.)

Automated auctions have been among the fastest-growing segments in equity trading. ECNs in particular have blurred the traditional difference between order-driven markets and quote-driven dealer markets. In an ECN, it can be difficult to distinguish between participants who are regulated, professional dealers and other participants who, in effect, are also attempting to earn spread profits by providing liquidity. Hedge funds or day traders, for example, might actively supply liquidity to the market to capture the dealer-like spread profits. From the perspective of an investor, the result is added liquidity and tighter spreads.[7]

7 For further reading on this subject, see Wagner (2004).

2.2.3 *Brokered Markets*

A broker is an agent of the buy-side trader who collects a commission for skillful representation of the trade. The broker may represent the trade to dealers in the security or to the market order flow. However, the term **brokered markets** refers specifically to markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.[8] Typically, these markets are important in countries where the underlying public markets (e.g., stock exchanges) are relatively small or where it is difficult to find liquidity in size. Consequently, brokered markets are mostly used for block transactions.

Brokers can help locate natural counterparties to a difficult order—for example, a block order. A **block order** is an order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets. The trader might use the services of a broker to carefully try to uncover the other side of the trade in return for a commission; the broker might occasionally position a portion of the block. (To **position a trade** is to take the other side of it, acting as a principal with capital at risk.) Brokers can also provide a reputational screen to protect uninformed or liquidity-motivated traders. For example, the broker might "shop the block" only to those potential counterparties that the broker believes are unlikely to **front-run** the trade (trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions). These attributes of brokerage markets facilitate trading and hence add value for all parties to the transaction.

EXAMPLE 2

Market Classifications Are Simplifications

Although it is convenient to equate the dealer function with the activities of professional market makers, many parties can and do perform parts of the dealer function. As discussed, brokerage firms' "upstairs" trading desks may commit capital to support clients' trading desires. Thus, these firms are often called broker/dealers, recognizing that they function as both brokers and dealers. Equally important, investors can compete with dealers. Buy-side traders can reduce their trading costs by providing accommodative, dealer-like services to other market participants—for example, by submitting limit orders that other participants may "hit" to fulfill liquidity needs.

2.2.4 *Hybrid Markets*

Hybrid markets are combinations of the previously described market types. A good example is the New York Stock Exchange (NYSE), which offers elements of batch auction markets (e.g., the opening) and continuous auction markets (intraday trading), as well as quote-driven markets (the important role of NYSE dealers, who are known as specialists).

8 In the United States, brokered equity markets were traditionally referred to as upstairs markets. The reference is to trades executed not on the floor of an exchange ("downstairs") but via communications "upstairs" in brokerage firms' offices.

2.3 The Roles of Brokers and Dealers

Having discussed the types of markets, we now discuss the roles of brokers and dealers, because it is essential that portfolio managers and traders understand their different roles.[9]

A broker is an agent of the investor. As such, in return for a commission, the broker provides various execution services, including the following:

- **Representing the order**. The broker's primary task is to represent the order to the market. The market will accommodate, usually for a price, someone who feels he or she must trade immediately.
- **Finding the opposite side of a trade**. If interest in taking the opposite side of a trade is not currently evident in the market, it usually falls to the broker to try to locate the seller for the desired buy, or the buyer for the desired sale. Often this service requires that the broker act as a dealer and actively buy or sell shares for the broker's own account. The broker/dealer does not bear risk without compensation. Depending on the dealer's inventory position, this service may come at a high cost.
- **Supplying market information**. Market information includes the identity of buyers and sellers, the strength of buying and selling interest, and other information that is relevant to assessing the costs and risks of trading. This market intelligence, which can be provided by the broker, is very valuable to buy-side traders as they consider their trading tactics.
- **Providing discretion and secrecy**. Buy-side traders place great value on preserving the anonymity of their trading intentions. Notice, however, that such secrecy does not extend to the selected broker, whose stock in trade is the knowledge of supply and demand. That an investor is willing to trade is a very valuable piece of information the broker gains as result of his or her relationship with the trader.
- **Providing other supporting investment services**. A broker may provide a range of other services, including providing the client with financing for the use of leverage, record keeping, cash management, and safekeeping of securities. A particularly rich set of supporting services, often including introduction to potential clients, is provided in relationships that have come to be known as **prime brokerage**.
- **Supporting the market mechanism**. Brokerage commissions indirectly assure the continuance of the needed market facilities.

In contrast to the agency relationship of the broker with the trader, the relationship between the trader and a dealer is essentially adversarial. Like any other merchant, the dealer wants to sell merchandise at a higher price (the ask) than the purchase price (the bid). Holding trade volume constant, a dealer gains by wider bid–ask spreads while the trader gains by narrower bid–ask spreads. The dealer is wary of trading with a better-informed counterparty. Consider a portfolio manager who has concluded through new and original analysis that a bond issue currently in the portfolio has more credit risk than the rest of the market perceives. The dealer who makes a market in the company's bonds has set a bid price unaware of the fact that the bond's credit rating may be too high. The dealer's bid is too high relative to the true credit risk of the bond. The portfolio manager's trader liquidates the portfolio position in the bond issue at the dealer's bid price. The dealer's inventory in the bond issue increases, and subsequently the bond's price trends down as the rest of the market becomes aware

9 Many sell-side firms are both brokers and dealers. A given firm may deal in a security at the same time that it collects an agency commission for representing an order in it.

of the bond's actual credit risk. The dealer has just experienced **adverse selection risk** (the risk of trading with a more informed trader). Dealers want to know who is active in the market, how informed traders are, and how urgent their interest in transacting with the dealer is, in order to manage profits and adverse selection risk. The tension occurs because the informed or urgent trader does not want the dealer to know those facts.

Buy-side traders are often strongly influenced by sell-side traders such as dealers (the **sell side** consists of institutions that sell services to firms such as investment managers and institutional investors). The buy-side trader may have more interaction with dealers than with other units of the trader's own firm (which might simply communicate computer files of orders). In contrast, the sell-side trader, who possesses information vital to the buy-side trader's success, is a constant verbal window on the world. Over the years, the buy-side trader may build a reservoir of trust, friendship, comfort, and goodwill with his or her sell-side counterparts. It is often necessary to rely on the sell side's reputation for integrity and its long-term desire to maintain relationships. The trader should manage the relationships with dealers, remembering that the buy-side trader's first allegiance must always be to the firm's clients, for whom the trader acts in a fiduciary capacity.

We now have an overview of how markets function and have discussed in some detail the differences between the roles of brokers and dealers. But how *well* does a market function? Does a particular trading venue deserve order flow? The next section provides some ways to think about these questions.

2.4 Evaluating Market Quality

Markets are organized to provide liquidity, transparency, and assurity of completion, so they may be judged by the degree to which they have these qualities in practice. In detail, a liquid market is one that has the following characteristics:[10]

- **The market has relatively low bid–ask spreads**. Such a market is often called tight. Quoted spreads and effective spreads are low. The costs of trading small amounts of an asset are themselves small. As a result, investors can trade positions without excessive loss of value. If bid–ask spreads are high, investors cannot profitably trade on information except when the information is of great value.
- **The market is deep**. Depth means that big trades tend not to cause large price movements. As a result, the costs of trading large amounts of an asset are relatively small. Deep markets have high **quoted depth**, which is the number of shares available for purchase or sale at the quoted bid and ask prices.
- **The market is resilient**. A market is resilient (in the sense used here) if any discrepancies between market price and intrinsic value tend to be small and corrected quickly.

The great advantage of market liquidity is that traders and investors can trade rapidly without a major impact on price. This, in turn, makes it easy for those with relevant information to bring their insights and opinions into the price of securities. Corporations can then attract capital because investors can see that prices efficiently reflect the opportunities for profit and that they can buy and sell securities at will at relatively low cost. Liquidity adds value to the companies whose securities trade on the exchange. Investors will pay a premium for securities that possess the valuable trait of liquidity. Higher security prices enhance corporate value and lower the cost of capital.

10 This list follows a well-known analysis and definition of liquidity by Kyle (1985).

Many factors contribute to making a market liquid:

- **Many buyers and sellers**. The presence of many buyers and sellers increases the chance of promptly locating the opposite side of a trade at a competitive price. Success breeds success in that the liquidity resulting from many buyers and sellers attracts additional participants to the market. Investors are more willing to hold shares that they can dispose of whenever they choose to do so.
- **Diversity of opinion, information, and investment needs among market participants**. If the investors in a given market are highly alike, they are likely to want to take similar investment actions and make similar trades. Diversity in the factors described above increases the chance that a buyer of a security, who might have a positive opinion about it, can find a seller, who might have a negative opinion about it or a need for cash. In general, a large pool of investors enhances diversity of opinion.
- **Convenience**. A readily accessible physical location or an easily mastered and well-thought-out electronic platform attracts investors.
- **Market integrity**. Investors who receive fair and honest treatment in the trading process will trade again. The ethical tone set by professional market operatives plays a major role in establishing this trust, as does effective regulation. For example, audits of the financial condition and regulatory compliance of brokers and dealers operating in a market increase public confidence in the market's integrity, as do procedures for the disinterested investigation of complaints about the execution of trades.

Transparency means that individuals interested in or transacting in the market can quickly, easily, and inexpensively obtain accurate information about quotes and trades (**pretrade transparency**), and that details on completed trades are quickly and accurately reported to the public (**post-trade transparency**). Without transparency, the chance that the integrity of the trading process can be compromised increases. Assurity of completion depends on **assurity of the contract** (the parties to trades are held to fulfilling their obligations). To ensure the certainty of trade completion, participating brokers or clearing entities may guarantee the trade to both buyer and seller and be subject to standards of financial strength to ensure that the guarantee has "bite."

EXAMPLE 3

Assessing Market Quality after a Market Structure Change

US equity markets switched from price increments in sixteenths of a dollar to one-cent price increments in the first half of 2001. This decimalization of the US markets has received a lot of attention. Several studies have examined the changes that have taken place on the NYSE and NASDAQ (the major dealer market for US equities) as a consequence of decimalization, and some of their findings regarding the changes are as follows.[11]

A Quoted spreads have declined from the predecimalization period to the postdecimalization period.

B Effective spreads have declined.

C Quoted depths have declined.

11 See Bacidore, Battalio, Jennings, and Farkas (2001), Bessembinder (2003), Chakravarty, Wood, and Van Ness (2004), and Oppenheimer and Sabherwal (2003).

For each of the above changes, state whether it suggests an improvement or deterioration in market quality after decimalization, and justify your assertion.

Solution to A:

This change suggests an improvement in market quality. Lower quoted spreads are consistent with lower trading costs, which suggest greater liquidity and an improvement in market quality.

Solution to B:

This change also suggests an improvement in market quality. Lower effective spreads are consistent with lower trading costs, which suggest greater liquidity and an improvement in market quality. Effective spreads are a more accurate measure of trading costs than quoted spreads. One would need to examine changes in commission costs (if any) subsequent to decimalization to get a more complete picture of the changes in trading costs that resulted from decimalization.

Solution to C:

Reduced quoted depths imply that large investors placing large orders are forced to split their orders more often after decimalization. Though small investors who place small orders are not likely to be affected by reduced depths, the trading costs for institutional investors could increase due to reduced depths. By itself, a decline in quoted depths after decimalization implies reduced liquidity supply and deterioration in market quality.

EXAMPLE 4

The Market Quality of Electronic Crossing Networks

Electronic crossing networks offer participants anonymity and low cost through the avoidance of dealer costs and the effect of large orders on execution price. For example, a large sell order in an auction market may be interpreted as conveying negative information and cause bid prices to be revised downward, lowering execution prices. These qualities of crossing networks are particularly valuable for the large trades institutional investors often need to make. As a result of these market quality positives, electronic crossing networks have won significant market share.

Understanding and judging the available alternatives in trading is the new challenge to the buy-side trader. One of the key elements in assessing these alternatives is their costs. Effectively measuring the trading experience over time provides another valuable piece of information to the portfolio manager: On average, how much information advantage do I need to recover the hurdle-rate costs of implementing my decisions? The costs of trading are the subject of the next section.

THE COSTS OF TRADING

3

The view of investment managers on the importance of measuring and managing trading costs has evolved over time. Into the 1970s, trading was viewed as inexpensive and unimportant when contrasted to the hoped-for benefits of securities research.

In those early days, portfolio managers were highly dependent on sell-side firms for investment intelligence and ideas. The traditional way to reward the broker for investment ideas was to channel the resultant trading activity to the broker.

In the early 1970s, several important trends converged to change buy-side trading forever. As pension fund assets grew, the prevailing use of fixed commission schedules for trades on exchanges created an unjustifiable bonanza for the exchange community. Buy-side investors exerted pressure to bring commission charges more in line with the cost of providing trading services. The result was a move to fully negotiated commissions, beginning in 1975 in the United States and continuing worldwide.[12] As a result, different levels of execution services could be bought for different commission charges, presenting the buy-side trader with new choices.

In addition, the first practical applications of the efficient market hypothesis (EMH) came to life in the form of index funds. Index fund managers strongly disagreed with the then-traditional view of trading as being "just a cost of doing business." Since index fund managers have no expectation of recovering trading costs through security selection, reducing these costs is a paramount goal for them. Traders are often the most "active" part of the passive management team.

As the 1980s progressed, trading processes were subjected to analytical thinking. The theory of trading costs measurement received attention. Investors continued to be concerned that trading costs were too high and exacted too great a penalty on investment performance. This concern encouraged a view that trading tactics need to be carefully designed and tailored to the investment decision with due attention paid to managing trading costs.

Today, the prevalent view is that all costs of trading are negative performance. The lower the transaction costs, the more portfolio management ideas that can be executed to add value to the portfolio. The management of transaction costs is today a leading concern of investors and many other market participants. Fund sponsors track transaction costs as part of their responsibility to conserve assets. Investment managers do so both to document their performance in managing costs and to gain information for improving the trading function. Brokers, exchanges, and regulators are also concerned with measuring and evaluating trading costs. Transaction cost measurement not only provides feedback on the success of the trading function; today, its concepts are used in setting trading strategy. An overview of the topic is one building block for our later discussion of trading strategy.

3.1 Transaction Cost Components

Trading costs can be thought of as having two major components: explicit costs and implicit costs. Explicit costs are the direct costs of trading, such as broker commission costs, taxes, stamp duties, and fees paid to exchanges. They are costs for which a trader could be given a receipt. Implicit costs, by contrast, represent indirect trading costs. No receipt could be given for implicit costs; they are real nonetheless. Implicit costs include the following:[13]

- The **bid–ask spread**.
- **Market impact** (or price impact) is the effect of the trade on transaction prices. For example, suppose a trader splits a purchase of 400 bonds into two equal market orders when the quote for a bond is 100.297 to 100.477. The first order executes at the ask price of 100.477, after which the market quotation becomes

12 Some adoption dates for negotiated commissions were 1983 in Canada, 1986 in the United Kingdom, and 1999 in Japan.

13 Not every trade will incur each of these costs.

100.300 to 100.516. The second order is placed and executes at 100.516. The trader moved the price obtained in the second order up by 100.516 – 100.477 = 0.039, or $0.39 per thousand dollars of face value.

- **Missed trade opportunity costs** (or unrealized profit/loss) arise from the failure to execute a trade in a timely manner. For example, suppose a futures trader places a limit order to buy 10 contracts at a price of 99.00 (or better), good for one day, when the market quote is 99.01 to 99.04. The order does not execute, and the contract closes at 99.80. The difference (99.80 – 99.04 = $0.76) reflects the missed trade opportunity cost per contract.[14] By trading more aggressively, the trader might have avoided these costs. Missed trade opportunity costs are difficult to measure. In the example, the time frame (one day) was arbitrary, and the estimate could be quite sensitive to the time frame chosen for measurement.
- **Delay costs** (also called slippage) arise from the inability to complete the desired trade immediately due to its size and the liquidity of markets. Delay costs are often measured on the portion of the order carried over from one day to the next. One reason delay can be costly is that while a trade is being stretched out over time, information is leaking into the market.

Most traders measure implicit costs (i.e., costs excluding commissions) with reference to some price benchmark or reference point. We have already mentioned one price benchmark: the time-of-trade midquote (quotation midpoint), which is used to calculate the effective spread. When such precise information is lacking, the price benchmark is sometimes taken to be the **volume-weighted average price** (VWAP). The VWAP of a security is the average price at which the security traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade. The VWAP is an appealing price benchmark because it allows the fund sponsor to identify when it transacted at a higher or lower price than the security's average trade price during the day. For example, if a buy order for 500 shares was executed at €157.25 and the VWAP for the stock for the day was €156.00, the estimated implicit cost of the order would be 500 × (€157.25 – €156.00) = €625.[15] If explicit costs were €25, the total estimated cost would be €650. Alternative price benchmarks include the opening and closing prices for a security, which use less information about prices and are less satisfactory. Although VWAP involves a data-intensive calculation, a number of vendors supply it.[16]

VWAP is less informative for trades that represent a large fraction of volume. In the extreme, if a single trading desk were responsible for all the buys in a security during a day, that desk's average price would equal VWAP and thus appear to be good, however high the prices paid. Another limitation of VWAP (and of the effective spread) is that a broker with sufficient discretion can try to "game" this measure. (To *game* a cost measure is to take advantage of a weakness in the measure, so that the value of the measure may be misleading.) Furthermore, VWAP is partly determined at any point in the day; by using weights based on volume to that point in the day, a trader can estimate the final value of VWAP. The accuracy of such an estimate would tend to increase as the close of trading approaches. By comparing the current price to that estimate, the trader can judge the chances of doing better than VWAP.

14 The comparison to closing price is for illustrative purposes and only one alternative. For example, the Plexus Group, acquired in 2006 by ITG, would calculate the missed trade opportunity costs with respect to the price of the instrument 30 days after the decision to trade was made.

15 Were this a sell order, in the calculation, we would subtract the trade price from the benchmark price; in this example, we would calculate 500 × (€156.00 – €157.25) = –€625. Executing a sell order at a price above the VWAP is good.

16 For example, Bloomberg terminals report VWAPs.

EXAMPLE 5

Taking Advantage of Weaknesses in Cost Measures

Reginald Smith is consulting to Apex Wealth Management on the use of transaction cost measures. Smith correctly explains to Apex's CIO:

> A broker who has flexibility on how aggressively to fill an order can try to game the effective spread measure by waiting for the trade to come to him—that is, by offering liquidity. The broker with a buy order can wait until an order to sell hits his bid; with a sell order, he can wait until an order to buy hits his ask. By executing buys at the bid and sells at the ask, the broker will always show negative estimated transaction costs if performance is measured by the effective spread. However, the delay costs of this approach to the client may be high. A broker with discretion on timing can also try to improve performance relative to a VWAP benchmark, because VWAP is partly determined at any point into the day. For example, if a buy order is received near the end of the day and the stock's ask price exceeds the VWAP up to that point, the broker might try to move the order into the next day, when he will be benchmarked against a fresh VWAP.

The CIO asserts: "I see your point. Nevertheless, using the opening price as a benchmark might be much more vulnerable to gaming than using VWAP." Critique the CIO's statement.

Solution:

The CIO's statement is correct. In contrast to the VWAP, which is partly determined as the trading day progresses, the opening price is known with certainty at any point into the trading day, making it easier to game.

To address the possibility of gaming VWAP, VWAP could be measured over multiple days (spanning the time frame over which the order is executed), because traders would often be expected to try to execute trades within a day. However, the cost of measuring VWAP over a longer time frame is less precision in estimating trading costs.

Probably the most exact approach to cost measurement—and one not vulnerable to gaming—is the implementation shortfall approach. This approach is also attractive because it views trading from an investment management perspective: What does it cost to actuate investment decisions? This view was first articulated by Andre Perold of the Harvard Business School,[17] following ideas first put forward by Jack Treynor.[18] The approach involves a comparison of the actual portfolio with a paper portfolio, using a price benchmark that represents the price when the decision to trade is made (when the trade list is cut).

Implementation shortfall is defined as the difference between the money return on a notional or paper portfolio in which positions are established at the prevailing price when the decision to trade is made (known as the **decision price**, the arrival price, or the strike price) and the actual portfolio's return. The implementation shortfall method correctly captures all elements of transaction costs. The method takes into account not only explicit trading costs, but also the implicit costs, which are often significant for large orders.

17 Perold (1988).
18 See Treynor (1987).

Implementation shortfall can be analyzed into four components:

1. *Explicit costs*, including commissions, taxes, and fees.
2. *Realized profit/loss*, reflecting the price movement from the decision price (usually taken to be the previous day's close)[19] to the execution price for the part of the trade executed on the day it is placed.
3. *Delay costs* (*slippage*), reflecting the change in price (close-to-close price movement) over the day an order is placed when the order is not executed that day; the calculation is based on the amount of the order actually filled subsequently.
4. *Missed trade opportunity cost* (unrealized profit/loss), reflecting the price difference between the trade cancellation price and the original benchmark price based on the amount of the order that was not filled.

Market movement is a component of the last three of these costs. However, market movement is a random element for which the trader should not bear responsibility. It is now common to adjust implementation shortfall for market movements. An illustration of the calculation of implementation shortfall might be helpful. Consider the following facts:

- On Monday, the shares of Impulse Robotics close at £10.00 per share.
- On Tuesday, before trading begins, a portfolio manager decides to buy Impulse Robotics. An order goes to the trading desk to buy 1,000 shares of Impulse Robotics at £9.98 per share or better, good for one day. The benchmark price is Monday's close at £10.00 per share. No part of the limit order is filled on Tuesday, and the order expires. The closing price on Tuesday rises to £10.05.
- On Wednesday, the trading desk again tries to buy Impulse Robotics by entering a new limit order to buy 1,000 shares at £10.07 per share or better, good for one day. That day, 700 shares are bought at £10.07 per share. Commissions and fees for this trade are £14. Shares for Impulse Robotics close at £10.08 per share on Wednesday.
- No further attempt to buy Impulse Robotics is made, and the remaining 300 shares of the 1,000 shares the portfolio manager initially specified are never bought.

The paper portfolio traded 1,000 shares on Tuesday at £10.00 per share. The return on this portfolio when the order is canceled after the close on Wednesday is the value of the 1,000 shares, now worth £10,080, less the cost of £10,000, for a net gain of £80. The real portfolio contains 700 shares (now worth 700 × £10.08 = £7,056), and the cost of this portfolio is 700 × £10.07 = £7,049, plus £14 in commissions and fees, for a total cost of £7,063. Thus, the total net gain on this portfolio is –£7. The implementation shortfall is the return on the paper portfolio minus the return on the actual portfolio, or £80 – (–£7) = £87. More commonly, the shortfall is expressed as a fraction of the total cost of the paper portfolio trade, or £87/£10,000 = 87 basis points.

We can break this implementation shortfall down further:

- Commissions and fees are calculated naturally as £14/£10,000 = 0.14%.
- Realized profit/loss reflects the difference between the execution price and the relevant decision price (here, the closing price of the previous day). The calculation is based on the amount of the order actually filled:

$$\frac{700}{1{,}000}\left(\frac{10.07 - 10.05}{10.00}\right) = 0.14\%$$

19 The midquote at the time the decision is made is another possible benchmark price.

- Delay costs reflect the price difference due to delay in filling the order. The calculation is based on the amount of the order actually filled:

$$\frac{700}{1{,}000}\left(\frac{10.05 - 10.00}{10.00}\right) = 0.35\%$$

- Missed trade opportunity cost reflects the difference between the cancellation price and the original benchmark price. The calculation is based on the amount of the order that was not filled:

$$\frac{300}{1{,}000}\left(\frac{10.08 - 10.00}{10.00}\right) = 0.24\%$$

- Implementation cost as a percent is 0.14% + 0.14% + 0.35% + 0.24% = 0.87%, or 87 bps.

The shortfall computation of the components is reversed for sells; these use benchmark price less trade price rather than trade price less benchmark price. The implementation shortfall can still be calculated using return on the paper portfolio less return on the actual portfolio.

In this example, shortfall was positive, but this will not always be the case, especially if the effect of the return on the market is removed. To illustrate the adjustment for market return using the market model, suppose that the market had risen 100 basis points (1 percent) over the period of trading and the beta of Impulse Robotics is 1.0. The market model is $\hat{R}_i = \alpha_i + \beta_i R_M$, where $\hat{R}_i$ is the predicted return on asset *i*, R_M is the return on the market portfolio, α_i is the average return on asset *i* unrelated to the market return, and β_i is the sensitivity of the return on asset *i* to the return on the market portfolio. In practice, with daily returns, α_i will be often very close to 0, and $\hat{R}_i \approx \beta_i R_M$. With a beta of 1.0, the predicted return on the shares would be 1.0 × 1% = 1%, and the **market-adjusted implementation shortfall** would be 0.87% – 1.0% = –0.13%. Here, the shortfall is actually negative. By contrast, pretrade cost estimates are always positive.

Exhibit 5 provides an illustration of trading costs for various global equity markets during the third quarter of 2008 and the first quarter of 2011.[20] The trading costs here reflect commissions, the realized profit/loss, and the delay cost components of implementation shortfall.[21]

20 Note that these transaction cost totals, particularly in the earlier period, are large enough to explain the 0.50 percent to 0.75 percent one-way transaction costs inferred from the difference between active and passive management.

21 Estimates of missed trade opportunity costs are not often published and in practice, their measurement is subjective. Some firms use a future stock price that differs from the trade cancellation price. The timing of the future stock price measurement can have a large effect on missed trade opportunity cost estimates. Additionally, different firms use different terms for trading cost components. For example, ITG's "IS Costs" include delay costs and realized profit/loss, but not explicit costs or missed trade opportunity costs. ITG's "broker costs" represent market impact costs, which are measured as the realized profit/loss is defined here.

Exhibit 5 Global Equity Trading Costs in Basis Points

Source for data: ITG's Global Cost Review, 2011/Q1.

Equity trading costs are lower in the developed world, with Europe (excluding the United Kingdom) recently having the lowest costs, followed by the United States and Canada. The highest costs of trading are in the emerging regions. Note, however, that trading costs have declined substantially in most emerging markets. The largest decline in trading costs occurred in Latin America, where costs fell by 60 basis points from 1.50% to 0.90%. The large decline in emerging equity trading costs is perhaps not surprising, given the flight to quality during the 2008 financial crisis.

A smaller decline in trading costs occurred in developed markets, with the exception of Japan, where costs slightly increased. Canada experienced the largest decline in developed equity trading costs as costs fell 34 basis points from 0.87% to 0.53%. In general, the costs of implementing investment ideas has declined significantly across global equity markets.

As a complement to implementation shortfall, some investment management firms measure shortfall with respect not to the above paper portfolio, but with respect to a portfolio in which all trades are transacted in expected markets and the component costs are at expected levels. This approach accounts for the anticipated cost of the trades.[22]

The application of the implementation shortfall approach is hampered when an asset trades infrequently because the decision price is then hard to determine. If the market closing price of a security is "stale"—in the sense of reflecting a trade that happened much earlier—it is not valid. The application of a benchmark price based on trading cost measures, including implementation shortfall, VWAP, and effective spread, is also compromised when a market lacks transparency (accurate price and/or quote information).

Having illustrated trade cost measurement using VWAP and implementation shortfall, we now compare these two major approaches to trade cost measurement in Exhibit 6. VWAP has theoretical disadvantages compared to implementation shortfall but is readily obtained and interpreted and is a useful measure of quality of execution for smaller trades in nontrending markets in particular. The portfolio manager should be familiar with both measures.

22 See Cheng (2003).

Exhibit 6 Comparison of VWAP and Implementation Shortfall

	Volume Weighted Average Price	Implementation Shortfall
Advantages	■ Easy to compute. ■ Easy to understand. ■ Can be computed quickly to assist traders during the execution. ■ Works best for comparing smaller trades in nontrending markets.	■ Links trading to portfolio manager activity; can relate cost to the value of investment ideas. ■ Recognizes the tradeoff between immediacy and price. ■ Allows attribution of costs. ■ Can be built into portfolio optimizers to reduce turnover and increase realized performance. ■ Cannot be gamed.
Disadvantages	■ Does not account for costs of trades delayed or canceled. ■ Becomes misleading when trade is a substantial proportion of trading volume. ■ Not sensitive to trade size or market conditions. ■ Can be gamed by delaying trades.	■ Requires extensive data collection and interpretation. ■ Imposes an unfamiliar evaluation framework on traders.

EXAMPLE 6

Commissions: The Most Visible Part of Transaction Costs (1)

Implementation shortfall totals can be divided into categories that define the nature of trading costs. Each component cost is as real as the other costs. Nevertheless, brokerage commissions are the most visible portion of trading costs. The dealer spreads and responses to market pressures are more difficult to gauge. The commissions, however, are printed on every ticket. For better or worse, efforts to reduce transaction costs focus first on commissions.

A good deal of attention has focused on the use of commissions to buy services other than execution services—that is, a practice known as **soft dollars** (or soft dollar arrangements, or soft commissions). Many investment managers have traditionally allocated a client's brokerage business to buy research services that aid portfolio management. In those cases, commissions pay for research received and execution, with clerical personnel assigned to the trade desk managing the commission budget. However, the practice of soft dollars makes accounting for transaction costs less exact and can be abused. CFA Institute in 1998 issued *Soft Dollar Standards* to provide disclosure standards and other guidance related to soft dollar arrangements.[23] Furthermore, individuals who are CFA Institute

23 See www.cfainstitute.org for any updates. As of late 2011, no substantive revisions had been made to the 1998 release.

members or candidates have an overriding responsibility to adhere to the Code of Ethics and Standards of Professional Conduct. Standard III: Duties to Clients, (A) Loyalty, Prudence, and Care, specifies that CFA Institute members using soft dollars should develop policies and procedures with respect to the use of client brokerage, including soft dollars, and that those policies and procedures should reflect that members and candidates must seek best execution for their clients, among other duties.[24]

EXAMPLE 7

Commissions: The Most Visible Part of Transaction Costs (2)

Transaction costs can be thought of as an iceberg, with the commission being the tip most visible above the water's surface. Large parts of transaction costs are unobservable. They do not appear in accounting statements, and they appear only indirectly in manager evaluations. Extensive data collection and analysis are required to gauge the size and relative importance of transaction cost components. Exhibit 7 illustrates the concept with data from ITG's Global Cost Review, 2011/Q1. For comparison purposes, data are provided for both large-capitalization and micro-capitalization US stocks during the first quarter of 2011.

The exhibit shows that trading costs for large-capitalization and micro-capitalization stocks are very different. Total costs for large-capitalization stocks were 39 (7 + 15 + 17) basis points, versus 158 (26 + 23 + 109) basis points for micro-capitalization stocks. The least visible component—delay costs—were the largest component of trading costs, especially for micro-capitalization stocks. For micro-capitalization stocks, delay costs were 109 basis points, or 69 percent (109/158) of total costs. For large-capitalization stocks, delay costs were almost half of total costs, at 44 percent. For both large-capitalization and micro-capitalization stocks, the most visible component of equity transaction costs—commissions—average only about 17 percent of total costs.

24 See the *Standards of Practice Handbook*, 11th ed. (Charlottesville, VA: CFA Institute, 2014). See www.cfainstitute.org for any updates.

Exhibit 7 The Iceberg of Transaction Costs

Source for data: ITG's Global Cost Review, 2011/Q1.

3.2 Pretrade Analysis: Econometric Models for Costs

Given post-trade shortfall estimates, we can build reliable pretrade estimates using econometric models. The theory of market microstructure suggests that trading costs are systematically related to certain factors, including the following:[25]

- stock liquidity characteristics (e.g., market capitalization, price level, trading frequency, volume, index membership, bid–ask spread);
- risk (e.g., the volatility of the stock's returns);
- trade size relative to available liquidity (e.g., order size divided by average daily volume);
- momentum (e.g., it is more costly to buy in an up market than in a down market);
- trading style (e.g., more aggressive styles using market orders should be associated with higher costs than more passive styles using limit orders).

25 See Madhavan (2000, 2002). More recently, Brownlees, Cipollini, and Gallo (2011) develop a model to predict trading volume and minimize trading costs.

Given these factors, we can estimate the relation between costs and these variables using regression analysis. Since theory suggests a nonlinear relationship, we can use nonlinear methods to estimate the relationship. The key point to note is that the estimated cost function can be used in two ways:

- to form a pretrade estimate of the cost of trading that can then be juxtaposed against the actual realized cost once trading is completed to assess execution quality, and
- to help the portfolio manager gauge the right trade size to order in the first place.

For example, a portfolio manager may want to invest in a stock with an expected excess return target of 5 percent relative to the manager's benchmark over the intended holding period. Initially, a trade of 200,000 shares is proposed with a price currently at $10 per share. However, based on pretrade cost estimates, the cost of a 200,000-share position is 2.5 percent, so that expected round-trip transaction costs are 2 × 2.5% = 5%, which would fully erode the excess return. The optimal trade size will be much smaller than the 200,000 shares initially proposed.

Quantitative managers will balance three factors—return, risk, and cost—in selecting the optimal trade size. But even nonquantitative managers need to make the right choices in terms of balancing expected return against expected entry and exit costs.

EXAMPLE 8

An Econometric Model for Transaction Costs

Several Canadian companies' stocks are listed not only on the Toronto Stock Exchange (TSE), but also on the New York Stock Exchange (NYSE). There are no legal restrictions on cross-border ownership and trading of these stocks. Some of the clients of an American brokerage firm have occasionally asked the brokerage firm for execution of trades in some of the Canadian stocks cross-listed in the United States. These trades can be executed on either the NYSE or TSE, and the American brokerage firm has entered into an alliance with a TSE member firm to facilitate execution of trades on the TSE if desired. John Reynolds is an economist at the brokerage firm. Reynolds has identified 55 of the cross-listed Canadian companies as those in which the firm's clients typically execute trades. Reynolds observes that the implicit transaction costs for some trades in these stocks are lower on the NYSE than on the TSE, or vice versa. Reynolds has built an econometric model that can be used for pretrade assessment of the difference in the implicit costs of transacting on the two exchanges, so that traders can direct trades to the lower-cost venue. Using historic data on trade and firm characteristics and transaction costs, Reynolds developed the following model:

$$\text{Pred. } \Delta\text{Cost} = 0.25 + 1.31 \ln(\text{Mkt Cap}) - 14.91(\text{US Share}) + 1.64 \ln(\text{Order Size}) - 1.40(\text{High Tech})$$

where

Pred. ΔCost = Predicted difference between the implicit transaction costs on the NYSE and TSE in basis points
Mkt Cap = Market capitalization of the company in millions of US dollars
US Share = Proportion (stated as a decimal) of total trading in the stock in the United States and Canada that occurs in the United States
Order Size = Number of shares ordered

High Tech is an industry dummy with a value of 1 if the company is a high-tech company and 0 otherwise.

Reynolds has also concluded that the *explicit* transaction costs for the stocks he has analyzed are lower on the NYSE than on the TSE by about 12 bps.

1. Consider an order to sell 50,000 shares of a non-high-tech company that was included in the companies analyzed by Reynolds. The company has a market capitalization of US$100 million, and the US share of overall trading volume in the company is 0.30. Based on the model estimated above and the assessment of the explicit transaction costs, recommend where the order should be placed.
2. Consider an order to sell 1,000 shares of a high-tech company that was included in the companies analyzed by Reynolds. The company has a market capitalization of US$100 million, and the US share of overall trading volume in the company is 0.50. Based on the model estimated above and the assessment of the explicit transaction costs, recommend where the order should be placed.

Solution to 1:

Pred. ΔCost = 0.25 + 1.31 ln(Mkt Cap) – 14.91 (US Share) + 1.64 ln(Order Size) – 1.40 (High Tech) = 0.25 + 1.31 ln(100) – 14.91 (0.30) + 1.64 ln(50,000) – 1.40 (0) = 19.6 bps. The econometric model suggests that the implicit cost of executing this trade is greater on the NYSE than on the TSE by almost 20 bps. Thus, since the explicit transaction costs are lower on the NYSE by about 12 bps, the total cost of executing the trade on the TSE is expected to be less than the cost on the NYSE by almost 8 bps. The recommendation would be to direct the order to the TSE.

Solution to 2:

Pred. ΔCost = 0.25 + 1.31 ln(Mkt Cap) – 14.91 (US Share) + 1.64 ln(Order Size) – 1.40 (High Tech) = 0.25 + 1.31 ln(100) – 14.91 (0.50) + 1.64 ln(1,000) – 1.40 (1) = 8.8 bps. The econometric model suggests that the implicit cost of executing this trade is greater on the NYSE than on the TSE by about 9 bps. However, since the explicit transaction costs are lower on the NYSE by about 12 bps, the total cost of executing the trade on the NYSE is expected to be less than the cost on the TSE by about 3 bps. The recommendation would be to direct the order to the NYSE.

TYPES OF TRADERS AND THEIR PREFERRED ORDER TYPES

4

Beginning with this section and continuing with Section 5, we discuss traders, trading objectives, strategies, and tactics. We first need to understand how investment style affects trading objectives. Implementation strategy and cost are direct consequences of investment management style. Some investment strategies are inherently inexpensive to implement—for example, contrarian, passive, and other "slow idea" strategies. Other strategies, particularly those based on stock price momentum or widely disseminated "news," are inherently more expensive to implement.

The success of the investment strategy depends on whether the information content of the decision process is sufficient relative to the costs of executing the strategy, including trading costs. Thus, the keystone of the buy-side trader's choice of trading strategy is the **urgency of the trade** (the importance of certainty of execution). Is the decision based on slow changes in fundamental value, valuable new information, or the need to increase cash balances? Will the value of completing the trade disappear or dissipate if it is not completed quickly?

From the portfolio manager's perspective, the key to effective trading is to realize that the portfolio decision is not complete until securities are bought or sold. Because execution is so important, market information is critical. When a trade is first seriously contemplated, the trader needs to ask: How sensitive is the security to buying or selling pressure? How much volume can be accumulated without having the price move out of the desirable range? Are there any special considerations (e.g., news, rumors, competing buyers, or anxious sellers) that make this a particularly good or particularly poor time to deal in this stock? In other words, how resilient is the market? Is the price being driven to a level at which a dealer wants to reduce or increase inventory (i.e., the dealer's layoff or buy-in position, respectively)? Armed with this tactical information, the portfolio manager fine-tunes his interest in the security.

The trader can use the answers to these questions to increase his or her awareness of market conditions and security trading behavior. The crucial function of the trading desk is to achieve the best price–time trade-off for the impending transaction given current market circumstances. This trade-off may change rapidly because of market conditions, dealer inventories, news, and changes in the portfolio manager's desires.

The above considerations regarding investment style and the urgency of the trade in particular lead to the following classification of traders according to their motivation in trading.

4.1 The Types of Traders

Traders can be classified by their motivation to trade, as follows.

Information-motivated traders trade on information that has limited value if not quickly acted upon. Accordingly, they often stress liquidity and speed of execution over securing a better price. They are likely to use market orders and rely on market makers to accommodate their desire to trade quickly. They must execute their orders before the information on which they are buying or selling becomes valueless.

Information traders often trade in large blocks. Their information frequently concerns the prospects of one stock, and they seek to maximize the value of the information. Successful information-motivated traders are wary of acquiring a public reputation for astute trading, because if they did, who would wish to trade against them? Accordingly, information traders often use deceptive actions to hide their intentions.

Value-motivated traders act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range. As explained earlier, they trade infrequently and are motivated only by price and value. They tend to accumulate and distribute large positions quietly over lengthy trading horizons. Value-motivated traders are ready to be patient to secure a better price.

Liquidity-motivated traders do not transact to reap profit from an information advantage of the securities involved. Rather, liquidity-motivated transactions are more a means than an end; such transactions may, for example, release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs. Lacking the information sensitivity of the information and value traders, liquidity-motivated traders tend to be natural trading counterparties to more knowledgeable traders. Thus, they need to be aware of the value their liquidity brings to knowledgeable traders.

Passive traders, acting on behalf of passive or index fund portfolio managers, similarly seek liquidity in their rebalancing transactions, but they are much more concerned with the cost of trading. They tend to use time-insensitive techniques in the hope of exchanging a lack of urgency for lower-cost execution. Passive traders have the flexibility to use lower-cost trading techniques. Because of the types of orders and markets they use, these traders resemble dealers in the sense that they allow the opposing party to determine the timing of the trade in exchange for determining the acceptable trade price.

Other types of traders do not fit exactly into the above categories. Dealers, whose profits depend on earning bid–ask spreads, have short trading time horizons like information-motivated traders. Given that a transaction is profitable, however, they have no specific emphasis on time versus price. Arbitrageurs are sensitive to both price of execution and speed of execution as they attempt to exploit small price discrepancies between closely related assets trading in different markets. **Day traders** rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are ready to hold a position. Like dealers, they often seek to profitably accommodate the trading demands of others.

Exhibit 8 summarizes the attitudes toward trading displayed by the various traders in the market. In the exhibit, the final column gives the trader's emphasis on price or time (i.e., avoiding delay in execution).

Exhibit 8 Summary of Trading Motivations, Time Horizons, and Time versus Price Preferences

Trader	Motivation	Trading Time Horizon	Time versus Price Preference
Information-motivated	New information	Minutes to hours	Time
Value-motivated	Perceived valuation errors	Days to weeks	Price
Liquidity-motivated	Invest cash or divest securities	Minutes to hours	Time
Passive	Rebalancing, investing/divesting cash	Days to weeks	Price
Dealers and day traders	Accommodation	Minutes to hours	Passive, indifferent

This classification of traders is relevant to both equity markets and fixed-income markets.

Alternative investments tend to be characterized by infrequent trading and illiquidity; day traders are not relevant as a trader type in such markets, in general. However, the thematic differences among the major types of traders (information-motivated, value-motivated, liquidity-motivated, and passive) still have recognizable counterparts in many alternative investment markets, although the relevant time horizons are longer. For example, in real estate, information concerning planned future construction, perceived valuation errors, and the need for liquidity can motivate transactions, and some investors may seek long-term, broad, diversified exposure, corresponding roughly to the passive trader type.

4.2 Traders' Selection of Order Types

All of the orders discussed in earlier sections above, as well as others discussed in advanced treatments, are used tactically by buy-side traders as warranted by market conditions and the motivations of the portfolio manager.

4.2.1 *Information-Motivated Traders*

Information traders believe that they need to trade immediately and often trade large quantities in specific names. Demands for high liquidity on short notice may overwhelm the ready supply of stock in the market, triggering adverse price movements as the effect of these demands reverberates through the market. Information traders may use fast action principal trades. By transacting with a dealer, the buy-side trader quickly secures execution at a guaranteed price. The major cost of these trades arises because the dealer demands a price concession to cover the inventory risks undertaken. Furthermore, information-motivated traders fear that the price may move quickly to embed the information, devaluing their information edge. They are aware that their trading often moves the market, but they believe their information justifies the increased trading cost. Accordingly, information-motivated traders may wish to disguise their anxious trading need. Where possible, they use less obvious orders, such as market orders, to disguise their trading intentions. This behavior has led information traders to be called "wolves in sheep's clothing."

4.2.2 *Value-Motivated Traders*

The value-motivated trader develops an independent assessment of value and waits for market prices to move into the range of that assessment. Thus, the market comes with excess inventory to the trader and presents him with attractive opportunities.

The typical value-motivated trader uses limit orders or their computerized institutional market equivalent. An attractive price is more important than timely activity. Thus, price is controlled but timing is not. Even though value-motivated traders may act quickly, they are still accommodative and pay none of the penalties of more anxious traders. As Treynor (1987) pointed out, value traders can sometimes operate as "the dealer's dealer," buying stock when dealers most want to sell stock.

4.2.3 *Liquidity-Motivated Traders*

The commitment or release of cash is the primary objective of liquidity-motivated traders. The types of orders used include market, market-not-held, best efforts, participate, principal trades, portfolio trades, and orders on ECNs and crossing networks. Low commissions and small impact are desirable, and liquidity traders can often tolerate somewhat more uncertainty about timely trade completion than can information-motivated traders.

Many liquidity-motivated traders believe that displaying their true liquidity-seeking nature works in their favor. When trading with a liquidity-motivated trader, dealers and other market participants can relax some of the protective measures that they use to prevent losses to informed traders.

4.2.4 *Passive Traders*

Low-cost trading is a strong motivation of passive traders, even though they are liquidity-motivated in their portfolio-rebalancing operations. As a result, these traders tend to favor limit orders, portfolio trades, and crossing networks. The advantages, in addition to certainty of price, are low commissions, low impact, and the possible reduction or elimination of bid–ask spread costs. The major weakness is the uncertainty of whether trades will be completed within a reasonable time frame. These orders and markets are best suited to trading that is neither large nor heavily concentrated.

5 TRADE EXECUTION DECISIONS AND TACTICS

The diversity of markets, order types, and characteristics of the particular securities that must be traded means that the task of selecting a trading strategy and promptly executing it is quite complex. In the following, we first discuss decisions related to the handling of a trade. Then, we address objectives in trading and trading tactics, including automated trading.

5.1 Decisions Related to the Handling of a Trade

Trading costs are controllable, necessitating thoughtful approaches to trading strategies. Poor trading involving inattentive or inappropriate trading tactics leads to higher transaction costs. Conversely, good trading lowers transaction costs and improves investment performance.

A head trader thinking about how to organize his or her team needs to develop a daily strategy which balances the trading needs of the portfolio manager(s) and the condition of the market. The head trader, of course, controls neither but has to devise a strategy for trading the daily blotter. Considerations that come into play include the following:

- Small, liquidity-oriented trades can be packaged up and executed via direct market access and algorithmic trading. **Direct market access** (DMA) refers to platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker. Trades executed via DMA now represent a substantial fraction of buy-side equity order volume in a number of developed markets. Algorithmic trading, a type of automated electronic trading, will be discussed later. Larger trades can receive custom handling. Why waste the talent of senior traders and the most competent brokers on trades in which it is not possible to make an economically significant difference?
- Large, information-laden trades demand immediate skilled attention. Senior traders are needed to manage the tradeoff between impact and delay costs by releasing the minimum amount of information into the market that is required to get the trade done.
- In addition to best execution, the trader must be cognizant of client trading restrictions, cash balances, and brokerage allocations, if any.

Once the strategy is determined and traders are handed their assignments, the problem of best execution practice becomes tactical. Of course, trading tactics change in response to the market conditions encountered. Each trader, while working orders, should be asking the following questions:

1. What is the right trading tactic for this particular trade at this point in time?
2. Is the trade suitable for DMA or algorithmic trading, or is manual handling of the trade appropriate?
3. If a broker is used, by my experience and measurement, which broker is best suited to handle this order?
4. What is the expected versus experienced cost for this type of trading tactic?
5. Where is the lowest-cost liquidity likely to be found?
6. If the low-cost alternatives fail, where should I go to increase the aggressiveness of the trading?
7. Is the market responding as I would expect, or are there messages that should be conveyed to portfolio management?
8. How can I find out as much as possible about the market situation while revealing as little as possible of my own unfulfilled intentions?
9. What can be done to minimize any negative tax consequences of the trade (such as earmarking specifically the lot of securities being sold so as to control their cost basis)?

The process starts with an order-by-order understanding of the urgency and size constraints. These constraints determine the appropriate processes that the desk can use. Order tactics, in turn, determine the market venues that represent the best alternative. At that point, specific order handling depends on the desk's commitments, activity by brokers currently trafficking in the name, and the desk's comfort with the specific broker or electronic venue.

In summary, the key function of trade desk organization is to prioritize trading. Good desks quickly identify the dangerous trades and assign the priority. They know how their managers think, in general and in relation to the specific individual trade. They attune the mix of brokers to their trading needs, often concentrating trading to increase their clout. Finally, they are constantly innovating and experimenting, trying new trade routes and refining desk processes.

5.2 Objectives in Trading and Trading Tactics

How does a trader decide which type of order to use? Earlier in this reading, the strategic decision of the trade was identified as one of buying or selling time (deciding how much urgency to attach to trade completion). Perhaps the most common trader errors are selling time too cheaply when executing value-motivated transactions and buying time too expensively when executing information-motivated transactions. A third error, and the most serious error for a liquidity trader, is to act in a manner that evokes protective or exploitative responses from dealers and other market participants who sense an information motivation or other time-sensitive motivation.

One tactical decision faced by buy-side traders is the type of order to be used. Few portfolio managers base their investment decisions solely on value, information, or liquidity. Most managers mix strategic goals in response to client agreements, manager perceptions, and market cycles. For example, clients may require full investment in equities at all times, regardless of whether superior investment alternatives are available. Accordingly, trading tactics may at times appear inconsistent with the stated long-term strategic investment objectives. Thus, all buy-side traders need to

understand, and occasionally use, the full range of trading techniques. The subsections that follow discuss a categorization of similarities and differences among various trading techniques.

5.2.1 *Liquidity-at-Any-Cost Trading Focus*

Information traders who believe they need to trade in institutional block size with immediacy use these trading techniques. The problem, of course, is that everyone is wary of trading with an informed trader. On the other hand, dealers are mightily interested in finding out whether these anxious traders have any valuable information. Thus, these traders can usually attract brokers willing to represent their order, but often at a high commission rate or price concession.

These trades demand high liquidity on short notice. They may overwhelm the available liquidity in the market and cause prices to move when their presence is detected. Traders who use these techniques usually recognize that these methods are expensive but pay the price in order to achieve timely execution.

On occasion, urgency will place a normally nonaggressive trader into this category. A mutual fund with unusual end-of-day sales, for example, may need to liquidate security positions whatever the cost.

5.2.2 *Costs-Are-Not-Important Trading Focus*

Market orders and the variations on this type (such as market on close) are examples of orders resulting from a costs-are-not-important focus. Some investors seldom consider using anything other than market orders when trading securities. Market orders work acceptably well for most mixes of investment strategies, in which it is difficult to assign pure information, value, or liquidity motivation. They also serve to mask trading intention, since all market orders look alike.

Traders who use market orders trust the competitive market to generate a fair price. For many orders, fair market price is a reasonable assumption. Exchanges encourage market orders and set up elaborate procedures to assure that these orders receive fair "best execution" prices. Active control of the order is not required.

Market orders work best for smaller trades and more liquid stocks. They are sometimes called "no-brainers" because they require little trading skill on the part of the buy-side trader or the broker. Because they require little effort or risk taking by market makers, they are inexpensive for a broker to execute and have been used to produce "soft dollar" commissions in exchange for broker-supplied services.

Traders who use these orders pay ordinary spreads and commissions to have their orders executed rapidly. Trade costs are accepted without question; indeed, they are seldom even considered.

The weakness of market orders is that all trader discretion is surrendered. The trader has no control over the trade, and the broker exercises only the most rudimentary cautions. The marketplace processes are viewed as sufficient to assure fair treatment. To retain discretion, such a trader may also consider using an aggressive limit order—for example, a limit buy order that improves on the best bid or a limit sell order that improves on the best ask price.

5.2.3 *Need-Trustworthy-Agent Trading Focus*

Buy-side traders often need to execute larger orders than the exchange can accommodate at any given moment, particularly when dealing with thinly traded issues. They recognize that their orders may create adverse impact if they are not handled carefully. Accordingly, these traders engage the services of a carefully selected floor broker to skillfully "work" such orders by placing a best efforts, market-not-held, or participate order. The advantage of these trades is that they match trading desires to interest in taking the other side of the trade as such interest is uncovered or arrives in

the market. Orders are usually completed through a series of partial trades. Obviously, immediate execution is not of primary importance, so such orders are less useful for information-motivated traders.

These orders are the epitome of the agency relationship. The trader passes control of the order to the broker, who then controls when and at what price the orders execute. The trader frequently does not know how much of an order was cleared until after the market closes.

The agent, however, may serve multiple masters, including other clients and even the agent's own brokerage firm. The valuable information that a buyer or seller exists is revealed to the broker. It is difficult for the trader to know whether that information is used exclusively in the trader's best interests.

5.2.4 *Advertise-to-Draw-Liquidity Trading Focus*

Advertising is an explicit liquidity-enhancing technique used with initial public offerings (IPOs), secondary offerings, and **sunshine trades**, which publicly display the trading interest in advance of the actual order. If publicity attracts enough traders taking the opposite side, the trade may execute with little or no market impact.

Implied in agency orders is an authorization to do some low-level advertising on the exchange floor. Advertising lets the market know that a willing buyer or seller is around. That presence may draw out the other side of the trade. However, such an order may also bear the risk of trading in front of the order. For example, if a large block purchase order is announced, traders may take long positions in the security in the hope of realizing a profit by selling the stock at a higher price.

5.2.5 *Low-Cost-Whatever-the-Liquidity Trading Focus*

Limit orders are the chief example of this type of order, particularly limit orders that specify prices that are "behind the market": either a limit buy order at a price below the best bid, or a limit sell order at a price above the best ask price. The objective is to improve on the market bid or the market ask, respectively. Minimizing trading costs is the primary interest of buy-side traders who use this type of order. There may not be a counterparty to the trader's order who is willing to trade on the terms suggested. This order type is best suited to passive and value-motivated trading situations.

The advantages of such orders are low commissions, low impact, and possibly the elimination of the market maker spread. One major weakness, of course, is execution uncertainty (the uncertainty of whether any trades will be made at all). Traders could end up "chasing the market" if the market moves away from the limit price. Furthermore, if the limit price becomes "stale" because significant new information on the security reaches the public, the trader could find that a trade has been executed before he or she has been able to revise the limit price. For example, a limit buy order specifying a price that is well below the most recent transaction price runs the risk of being executed only if major negative news relating to the security reaches the public. If that happens, the security could trade down to even lower levels.

5.2.6 *Trading Technique Summary*

Exhibit 9 summarizes the uses, costs, advantages, and weaknesses of these trading techniques.

Exhibit 9 Objectives in Trading

Focus	Uses	Costs	Advantages	Weaknesses
Liquidity at any cost (I must trade)	Immediate execution in institutional block size	High cost due to tipping supply/demand balance	Guarantees execution	High potential for market impact and information leakage
Need trustworthy agent (Possible hazardous trading situation)	Large-scale trades; low-level advertising	Higher commission; possible leakage of information	Hopes to trade time for improvement in price	Loses direct control of trade
Costs are not important	Certainty of execution	Pays the spread; may create impact	Competitive, market-determined price	Cedes direct control of trade; may ignore tactics with potential for lower cost
Advertise to draw liquidity	Large trades with lower information advantage	High operational and organizational costs	Market-determined price for large trades	More difficult to administer; possible leakage to front-runners
Low cost whatever the liquidity	Non-informational trading; indifferent to timing	Higher search and monitoring costs	Low commission; opportunity to trade at favorable price	Uncertainty of trading; may fail to execute and create a need to complete at a later, less desirable price

5.3 Automated Trading

Trading strategy will vary according to the specifics of the trade and the markets in which the trade might be executed. For example, traders attempting to trade very large orders relative to typical trading volume may involve brokers to avail themselves of the brokers' network of contacts and market knowledge in locating counterparties. By contrast, traders in quote-driven markets will typically try to negotiate trades with dealers, attempting to find the best possible quotes for their trades. As noted earlier, the rapid evolution of market structure worldwide toward order-driven systems, and electronic automated auctions in particular, has important implications for the trading process. Indeed, one of the more important implications of the growth of automated venues is the rapid expansion in algorithmic trading.

Algorithmic trading refers to automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints. Related, but distinct, trading strategies include using portfolio trades, in which the trader simultaneously executes a set of trades in a basket of stocks, and **smart routing**, whereby algorithms are used to intelligently route an order to the most liquid venue. The term **automated trading** is the most generic, referring to any form of trading that is not manual, including trading based on algorithms.

Estimates of automated trading usage vary widely, and some estimates put it as high as 25 percent of average share volume. Informed commentators all agree that this share is increasing, with some projecting algorithmic volume growing at a 30–35 percent rate per annum over the next few years.[26] This revolution raises natural questions: How do algorithmic systems work? What goes inside the "black box" of algorithmic trading? Will algorithmic systems displace human traders, or can savvy human traders infer the logic of the algorithm and profit by gaming the computer? Do algorithms

26 It was estimated in December 2010 that algorithmic trading accounted for 30% of institutional trading in the United States. *Source*: Investment Technology Group, *Algorithmic Trading Usage Patterns and their Costs*, May 2011. www.itg.com/news_events/papers/Algorithmic_Trading.pdf, accessed 27 September 2011.

always work as advertised, or do traders put too much trust in them? Are algorithms really effective in controlling transaction costs and hence adding alpha? What is the future of algorithmic trading? The following discussion sheds light on these issues and focuses on an in-depth analysis of the anatomy of algorithmic trading.

5.3.1 *The Algorithmic Revolution*

The rapid growth of algorithmic trading by institutional traders reflects complex regulatory and technological factors. In the United States, decimalization (the use of a minimum price increment of 0.01, for US currency $0.01) has led to a dramatic reduction in spreads in US equities but has also reduced quoted depths. Average trade size in many US markets, including the New York Stock Exchange and NASDAQ, which constitute a substantial fraction of world equity market value, has fallen dramatically.[27] For institutions with large orders, these changes greatly complicate the task of trading. Institutional orders are typically large relative to normal trading volume. *The underlying logic behind algorithmic trading is to exploit market patterns of trading volume so as to execute orders with controlled risk and costs.* This approach typically involves breaking large orders up into smaller orders that blend into the normal flow of trades in a sensible way to moderate price impact. For active equity trading desks, algorithmic or automated trading is the only recourse for efficiently handling increased volumes given increasingly smaller average trade size.

EXAMPLE 9

The Changing Roles of Traders

Algorithmic trading involves programming a computer to "slice and dice" a large order in a liquid security into small pieces, then meters the pieces into an automated exchange using FIX communications technology (FIX is a messaging protocol in equity markets that facilitates electronic trading).

Trading in 400-share nibbles may sound inefficient, but it is not. Due to the speed of the analytics and the connectivity, trading engines can execute many trades per minute, all without human intervention or human error. Algorithmic trading has changed the role of the trader. Today's traders have become strategists and tacticians, whereas in the past, the primary task of a trader was managing broker relationships.

Of course, the role of the broker also changes when the buy-side institution takes active control of the order. Brokers have in many cases been eliminated from trades they would have formerly been given responsibility for executing. Rather than serving as agents or dealers, brokers increasingly compete on the basis of the quality of their analytic engine.

27 According to the *NYSE Fact Book* (various editions), the average number of shares per trade peaked at 2,568 in June 1988 and then began to decline. The number of shares per trade remained in the low 1,000s for most of the late 1990s, falling below 1,000 shares in March of 2001, the year of decimalization, and steadily declining since. In August 2011, the average was 251 shares per trade. Decimalization, adopted by the United States and Canada during the early 2000s, has long been the international standard in equity marketplaces.

EXAMPLE 10

Order Fragmentation: The Meat-Grinder Effect[28]

The following trade in the Oracle Corporation illustrates both order fragmentation and electronic trading.

Before the market opening, a momentum manager sent a 1,745,640-share buy order to his trading desk, and the process unfolded as follows. The desk fed the order to Bloomberg B-Trade, one of several ECNs available to the trade desk. Trading in the issue began at 9:53 a.m. The order was small, in the sense that it was slightly less than 3 percent of Oracle's trading volume that day, and was completed in just 51 minutes in 1,014 separate executions. At times, there were up to 153 executions per minute—more than any human could handle. Average trade size was about 1,700 shares, roughly a 1,000:1 fragmentation ratio (i.e., the ratio of the size of the order to average trade size). The largest execution was roughly 64,000 shares and occurred in a cluster of rapid trading when almost 190,000 shares were executed in less than one minute. The smallest execution was for 13 shares. Seventeen percent of the executions were for 100 shares or less, and 44 percent were for less than 1,000 shares. Implementation shortfall was $0.15 per share, including $0.14 from market impact and delay and $0.01 per share commissions.

The aggressive trading strategy paid off: Oracle rose at the close to yield a trading profit for the day of 4.1 percent, or $785,538. In order for the 1,700,000-odd-share order to be executed, it had to be forced through a constriction 1,700 shares wide on average. This is the meat-grinder effect: In order for a large equity order to get done, it must often be broken up into many smaller orders.

Ever-faster trade message speed and increased volumes in automated trading systems or electronic limit order books, such as the International Securities Exchange for options and Hotspot FX for foreign exchange, have spurred the development of algorithmic systems. The 2006 merger between the NYSE and the Archipelago Exchange has also promoted greater use of algorithmic systems.

Automated trading requires constant monitoring to avoid taking unintentional risk. For example, if the process executes the easiest trades first, the portfolio manager might wind up later in the day with an unbalanced portfolio or unintended exposure to certain sectors or industries. Algorithmic execution systems that skillfully participate in order flow over time are well adapted to control such portfolio risks.

5.3.2 *Classification of Algorithmic Execution Systems*

Algorithmic trading has gained considerable popularity among more sophisticated institutional traders looking for a technological solution to a complex, fast-moving, and fragmented market environment. These strategies are typically offered through algorithmic execution systems from institutional brokers, although some institutions and hedge funds have developed their own internal algorithms.

Algorithmic trading has its roots in the simple portfolio trades of the 1980s, in which large baskets of stocks were bought and sold (often as part of an index arbitrage strategy) with the push of a button. In the 1990s, automated systems such as ITG's QuantEX™ allowed for so-called rules-based trading. One example of rules-based trading is "pairs trading," in which the trading engine will automatically enter into (or exit from) a long and short position in a predesignated pair of stocks if certain

28 This example is based on Wagner (2003).

conditions are met. The user can, for instance, specify a rule that calls for buying XYZ and simultaneously selling ABC if the price ratio of the two stocks crosses a certain threshold. The success of rules-based trading gave rise in the late 1990s to algorithmic trading, in which decisions regarding trading horizon, style, and even venue are automatically generated by a computer using specified algorithms based on specified inputs and then executed electronically. Before we delve into the details of how algorithms actually work, it is useful to develop a classification of algorithmic strategies.

Exhibit 10 Algorithmic Trading Classification

Logical Participation Strategies		Opportunistic Strategies	Specialized Strategies
Simple Logical Participation Strategies	Implementation Shortfall Strategies		

The most common class of algorithms in use is **logical participation strategies**, protocols for breaking up an order for execution over time.

Simple Logical Participation Strategies Institutional traders use the following simple logical participation strategies to participate in overall market volumes without being unduly visible.

- One of the most popular logical participation strategies involves breaking up an order over time according to a prespecified volume profile. The objective of this **volume-weighted average price (VWAP) strategy** is to match or improve upon the VWAP for the day.

  In a VWAP strategy, the trader attempts to match the expected volume pattern in the stock, typically over the whole day. Forecasts of the volume pattern are generally based on historical data (e.g., 21-day stock-specific or industry averages); increasingly, these forecasts are based on forward-looking volume predictors. Since the actual volume for the day is unknown before the end of the day, however, dynamic predictors are quite volatile.
- The **time-weighted average price (TWAP) strategy** is a particularly simple variant that assumes a flat volume profile and trades in proportion to time.

  The TWAP strategy breaks up the order over the day in proportion to time, which is useful in thinly traded assets whose volume patterns might be erratic. The objective here is normally to match or beat a time-weighted or equal-weighted average price. The participation strategy trades at a constant fraction of volume (usually 5–20 percent), attempting to blend in with market volumes. This strategy can be reactive if based on past trades or proactive if based on a dynamic forecast of incoming volume.
- Another common participation strategy is a **percentage-of-volume strategy**, in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Implementation Shortfall Strategies Recently, a newer logical participation strategy, the so-called **implementation shortfall strategy** (or arrival price strategy), has gained popularity. Unlike simple logical participation strategies, implementation shortfall strategies solve for the optimal trading strategy that minimizes trading costs as measured by the implementation shortfall method.

As discussed earlier, implementation shortfall is defined as the difference between the return on a notional or paper portfolio, in which positions are executed at a price representing the prevailing price when the decision to trade is made, and the actual portfolio's return.

Implementation shortfall strategies seek to minimize implementation shortfall or overall execution costs, usually represented by a weighted average of market impact and opportunity costs. Opportunity costs are related to the risk of adverse price movements, which increases with trading horizon. Consequently, implementation shortfall strategies are typically "front-loaded" in the sense of attempting to exploit market liquidity early in the trading day. Implementation shortfall strategies are especially valuable for portfolio trades, in which controlling the risk of not executing the trade list is critical. They are also useful in transition management (handing over a portfolio to a new portfolio manager), where multiperiod trading is common and there is a need for formal risk controls.

Interest in implementation shortfall strategies is also driven by an increased awareness of the limitations of traditional simple logical participation strategies using VWAP as an objective or benchmark. In addition, the objective of implementation shortfall strategies is consistent with the mean–variance framework used by many quantitative managers, a point we expand upon below. The majority of the value of algorithmically traded orders is executed using simple logical participation and implementation shortfall strategies. Exhibit 11 shows the hypothetical trade schedule for an implementation shortfall algorithmic order. Notice that the order is traded aggressively to minimize a weighted average of market impact costs and trade risk. The black line shows the cumulative fraction of the order that is complete, with the order fully complete by noon EST.

Exhibit 11 Trade Schedule for an Implementation Shortfall Strategy

The remaining major types of algorithmic trading are opportunistic participation strategies and specialized strategies.

Opportunistic Participation Strategies **Opportunistic participation strategies** also involve trading over time. The opportunistic trading strategy involves passive trading combined with the opportunistic seizing of liquidity. The most common examples are pegging and discretion strategies, in which the trader who wishes to buy posts a bid, hoping others will sell to him or her, yielding negative implicit trading costs. If the

bid–offer spread is sufficiently small, however, the trader might buy at the ask. This strategy typically involves using reserve or hidden orders and crossing (internally or externally) to provide additional sources of liquidity at low cost. Because trading is opportunistic, the liquidity strategy is not a true participation strategy.

Specialized Strategies Other strategies include passive order strategies, which do not necessarily guarantee execution; "hunter" strategies, which opportunistically seek liquidity when it is offered; and more specialized strategies that target particular benchmarks. Market-on-close algorithms that target the closing price are an example of this last category. Smart routing, in which algorithms are used to intelligently route an order to the most liquid venue, can be viewed as a specialized form of algorithmic trading.

The next section gives further insight into the reasoning behind the main type of algorithmic trading, logical participation strategies.

5.3.3 *The Reasoning behind Logical Participation Algorithmic Strategies*

To take simple logical participation strategies first, underlying such strategies is the implicit assumption that participating in proportion to the actual trading volume can minimize trading costs. A large body of empirical evidence suggests that the price impact of equity trades is an increasing function of order size. Breaking up the order into smaller sub-blocks may therefore yield a lower average market or price impact. This approach is intuitive, as the cost of an immediate demand for a large amount of liquidity is likely to be quite high, whereas if the same order were spread out in time, more liquidity providers could supply the needed opposite party, lessening the adverse price effects. Under certain assumptions (e.g., if prices are linearly related to the order size), breaking up the order in proportion to expected market liquidity yields lower market impact cost.

An implementation shortfall strategy involves minimizing a weighted average of market impact costs and missed trade opportunity costs. Missed trade opportunity cost refers to the risk of not executing a trade because of adverse price movements. A common proxy for such costs is the volatility of trade value or trade cost, which increases with trading horizon. Intuitively, the sooner an order is made available to the market, the greater the opportunity it usually has to find the opposing side of the trade. Consequently, implementation shortfall strategies are typically front-loaded, in the sense that they can involve trading significant fractions of market volume in the early periods of trading, in contrast to simple logical participation strategies.[29]

The logic for implementation shortfall strategies differs from that of the more traditional participation strategy. Recall that breaking up an order yields the lowest market impact cost. However, there is a cost to extending trade duration by breaking the order very finely, namely, risk. The implementation shortfall strategy—after the user specifies a weight on market impact cost and opportunity cost or risk—solves for the optimal trading strategy.[30] The intuition is straightforward. If the trader is very risk averse, then the strategy will trade aggressively in early periods to complete the order quickly to avoid undue risk. The more formal problem solved by the implementation shortfall algorithm can be expressed mathematically as

$$\text{Min}\{S_1, S_2, \ldots, S_T\}\text{Expected cost}(S_1, S_2, \ldots, S_T) + \lambda\text{Var}[\text{Cost}(S_1, S_2, \ldots, S_T)]$$

where T is the horizon (some algorithms actually solve for this), S_t represents the shares to be traded in trading interval (or bucket) t, λ is the weight placed on risk (aversion parameter), and Var[Cost] represents the variance of the cost of trading. The expression given is an **objective function** (a quantitative expression of the objective

29 The exception might occur when there is significant volume expected at the end of the day that the strategy takes into consideration.

30 See, for example, Almgren and Chriss (2000/2001).

or goal of a process). In words, the objective function states that an implementation shortfall algorithm selects the set of trades that minimizes a quantity equal to the expected total cost of the trades and a penalty term that increases with the variance of the possible cost outcomes for the set of trades. The penalty term reflects the trader's desire for certainty as to costs.

Observe the close correspondence between this problem and the classic mean–variance portfolio optimization problem. Indeed, for a quantitative manager using a mean–variance optimization approach, it is logical to use an implementation shortfall algorithm. Implementation shortfall costs directly reduce the portfolio's return and hence are part of the expected return component in the portfolio optimization problem. Transaction costs are an integral element of portfolio performance because the variance of cost is ultimately manifested in the variance of portfolio returns, and expected costs directly reduce alpha. Although many managers do not recognize this dependence, it is quantitatively important. For example, a small-capitalization fund rebalancing daily might easily incur costs of trading of, say, 80 bps, with a standard deviation of 150–200 bps. On an annualized basis, these figures are large relative to the expected returns and risks of the portfolio. The implementation shortfall algorithm is thus consistent with the ultimate portfolio optimization problem.

Choosing among algorithms and setting the right parameters are difficult tasks. A simple illustration can help us understand the types of considerations that enter into selecting tactics. Exhibit 12 shows summary output from a trader's order management system (OMS) or trade blotter indicating trade size (in shares), various market attributes, and an urgency level from the portfolio manager. (A **trade blotter** is a device for entering and tracking orders to trade and trade executions.)

Exhibit 12 Order Management System

Symbol	Side	Size (Shares)	Avg. Daily Volume	Price	Spread (%)	Urgency
ABC	B	100,000	2,000,000	55.23	0.05	Low
DEF	S	30,000	60,000	10.11	0.55	Low
GHIJ	B	25,000	250,000	23.45	0.04	High

What tactics are appropriate for each order? Although the first order in ABC is the largest in shares and value, it is actually the smallest as a percentage of average daily volume, and given the low spreads and low urgency level, it is ideally suited for algorithmic execution, probably with a VWAP algorithm using the entire day's liquidity. Similarly, the order in GHIJ is just 10 percent of average daily volume, but given the high urgency, an implementation shortfall algorithm might be preferred with a high urgency setting to aggressively execute the purchase. By contrast, the order in DEF is large relative to average daily volume and would likely be traded using a broker or crossing system to mitigate the large spreads.

EXAMPLE 11

A Trading Strategy

Charles Lee is discussing execution strategy with Rachel Katz, the head of equity trading at his investment management firm. Lee has decided to increase the position in Curzon Enterprises for growth-oriented equity accounts. Katz shows Lee Exhibit 13, which depicts the execution of a buy order in Curzon Enterprises

that established the initial position in it. In Exhibit 13, the black line shows the cumulative fraction of the order that is complete as the trading day progresses, with the order fully complete by the close at 4:00 p.m. EST. The shaded area represents trading volume over half-hour intervals.

Exhibit 13 The Execution of an Order

Using the information in Exhibit 13, address the following:

1 Interpret the pattern of intraday trading in Curzon Enterprises.

2 Identify and evaluate the execution strategy depicted in Exhibit 13.

Solution to 1:

Trading in Curzon Enterprises follows a U shape, with highest volume at the opening and close and lowest volume at midday.

Solution to 2:

The exhibit depicts a VWAP algorithmic order. The execution strategy split the order up into pieces to be executed throughout the day. The curve indicating the cumulative fraction executed has a steeper slope earlier and later in the day than in midsession, indicating that the volume of orders the algorithm sent to the market was highest near the opening and the close, following the lead of the U-shaped trading volume, which indicates greatest volume at those times.

SERVING THE CLIENT'S INTERESTS

6

For the portfolio manager and buy-side trader, the effectiveness with which portfolio decisions are executed has an impact on the investment performance delivered to the client. The following sections discuss important issues related to protecting the client's interests.

6.1 CFA Institute Trade Management Guidelines

In 2004, CFA Institute published the Trade Management Guidelines[31] that provide investment managers "a systematic, repeatable, and demonstrable approach to seeking best execution." The Guidelines state:

> The concept of "Best Execution" is similar to that of "prudence" in intent and practice. Although prudence and Best Execution may be difficult to define or quantify, a general determination can be made as to whether they have been met. … Prudence addresses the appropriateness of holding certain securities, while Best Execution addresses the appropriateness of the methods by which securities are acquired or disposed. Security selection seeks to add value to client portfolios by evaluating future prospects; Best Execution seeks to add value by reducing frictional trading costs. These two activities go hand in hand in achieving better investment performance and in meeting standards of prudent fiduciary behavior.

The Guidelines define best execution as "*the trading process Firms apply that seeks to maximize the value of a client's portfolio within the client's stated investment objectives and constraints.*" (Emphasis added; "Firms" refers to investment management firms.) The definition goes on to identify the four characteristics shown in the left-hand column of Exhibit 14. In the right-hand column, the authors amplify the thinking behind the guidelines.

Exhibit 14 Best Execution

Characteristic	Explanation
Best execution is intrinsically tied to portfolio-decision value and cannot be evaluated independently.	The purpose of trading is to capture the value of investment decisions. Thus, the definition has strong symmetry to the definition of prudent expert that guides fiduciary decisions.
Best execution is a prospective, statistical, and qualitative concept that cannot be known with certainty *ex ante.*	Trading is a negotiation, with each side of the trade having equal standing. Both buyer and seller—or their appointed agents—jointly determine what "best execution" is for every trade.
Best execution has aspects that may be measured and analyzed over time on an *ex post* basis, even though such measurement on a trade-by-trade basis may not be meaningful in isolation.	Trading occurs in a volatile environment subject to high statistical variability. One would not evaluate a card player on an individual hand; one would need to observe a sequence of hands to determine skill; similarly for traders. Despite the variability, overall trades contain some information useful in evaluating the process. By compiling trade data, one can deduce useful information about the quality of the process.
Best execution is interwoven into complicated, repetitive, and continuing practices and relationships.	Trading is a process, not an outcome. The standards are behavioral.

31 See www.cfainstitute.org for any updates.

The Trade Management Guidelines are divided into three areas: processes, disclosures, and record keeping:

1. *Processes.* Firms should establish formal policies and procedures that have the ultimate goal of maximizing the asset value of client portfolios through best execution. A firm's policies and procedures should provide guidance to measure and manage effectively the quality of trade decisions.
2. *Disclosures.* Firms should disclose to clients and prospects 1) their general information regarding trading techniques, venues, and agents and 2) any actual or potential trading-related conflicts of interest. Such disclosure provides clients with the necessary information to help them assess a firm's ability to deliver best execution.
3. *Record keeping.* Firms should maintain proper documentation that supports 1) compliance with the firm's policies and procedures and 2) the disclosures provided to clients. In addition to aiding in the determination of best execution, the records may support a firm's broker selection practices when examined by applicable regulatory organizations.

At the time these guidelines were written, the state of the art in transaction cost measurement was such that it was not possible to specify specific methodologies for transaction cost measurement. Rather, the guidelines are a compilation of recommended practices and not standards.

In the end, best execution is primarily an exercise in serving the needs of the investment management clients. Adherence to standards of documentation and disclosure, as important as these are to ensuring best practices, is simply a means to achieving this overriding objective.[32]

6.2 The Importance of an Ethical Focus

"My word is my honor." The code of both buy-side and sell-side traders is that verbal agreements will be honored. The code is self-enforcing: Any trader who does not adhere to it quickly finds that no one is willing to deal with him.

Nonetheless, valuable information is the stock-in-trade of market participants, and the temptations are great. One of the side effects of the explosion of trading techniques and trading alternatives is that it is difficult to trace the uses to which information is being put. It is often necessary to rely on the strength of a trader's reputation and his or her avid desire to maintain and build long-term relationships.

Trading can be looked at as a "zero-sum game" in which one trader's losses are another trader's gains. The near disappearance of the brokerage commission has caused more trading costs to be implicit rather than explicit. Markets are thus becoming more adversarial and less agency-oriented, making it more difficult to align investor or buy-side interests with broker/dealer or sell-side interests.

In every case, the ethical focus for the portfolio manager and the buy-side trader must be the interests of the client. As previously mentioned, the buy-side trader acts in a fiduciary capacity, with access to the client's assets. Loyalties to the trader's own firm and relationships with sell-side traders must be consistent with the trader's fiduciary responsibilities.

32 For further background on the subject, see Wagner and Edwards (1993), Wagner (2003), and Schwartz and Wood (2003).

7 CONCLUDING REMARKS

The ability of the sell-side system of brokers and exchanges to adapt and create solutions to investment requirements is impressive. In general, and increasingly, traders get the trading services they demand. Different order types and different venues serve investors with different motives and trading needs. In return, the broker/dealers and exchanges earn a competitive price for providing the services.

Technological advances continue to play a major role in reducing transaction costs. Faster dissemination of information, improved public access, more sophisticated analysis, and eventually the replacement of exchange floor trading by electronic trading can be expected. These efficiencies will reduce the cost of running the exchange system, but they will not necessarily reduce the cost of dealer services provided. Nor will the pressure to reduce costs and improve portfolio performance diminish.

Because of the intensity of competition and the readiness to adapt and innovate, costs continue to fall. Buy-side traders who demand the facilities and conveniences provided by the exchange community must expect to pay the costs. To reduce trading costs, an ever-evolving understanding of the trading process and its implied costs is essential. Sponsors and investment advisors may face make-or-buy decisions concerning future trading and trading-subsidized services. High-speed connectivity and algorithmic trading are clear examples of how costs can be effectively reduced by removing extraneous middlemen from the trading process.

Investors and traders are accustomed to a market that handles the duties, costs, and risks of trading. In addition, the sell side delivers an array of valuable but sometimes dimly related services without additional charge. Such services do not come free, however. In the future, pension plan sponsors and other clients will demand that portfolio managers and traders make more informed choices that reconcile trade costs with benefits received. Sponsors and other clients pay the costs of trading and are entitled to—and are increasingly demanding—a clear accounting of benefits derived.

SUMMARY

The portfolio decision is not complete until securities are bought or sold. How well that last step is accomplished is a key factor affecting investment results. This reading has made the following points.

- Market microstructure refers to the particular trading protocols that govern how a trader's latent demands are translated into executed trades. Knowledge of market microstructure helps investors understand how their trades will be executed and how market frictions may give rise to discrepancies between price and full-information expectations of value.
- Order-driven markets are those in which prices are established by public limit orders and include auction markets and electronic crossing networks (where trading occurs at prespecified points in time), as well as automated auctions (where trading takes place continuously). Quote-driven markets rely on market makers or dealers to establish prices at which securities can be bought and sold. Brokered markets are markets in which transactions are largely effected by brokers through a search mechanism. Hybrid markets are those, such as the NYSE, that incorporate features of more than one type of market.
- Execution services secured through a broker include the following: representing the order, finding the buyer, market information for the investor, discretion and secrecy, escrow, and support of the market mechanism. A trader's broker stands

in an agency relationship to the trader, in contrast to dealers. Dealers provide bridge liquidity to buyers and sellers in that they take the other side of the trade when no other liquidity is present.

- The effective spread is two times the deviation of the price received or paid from the midpoint of the market at the time an order is entered to the actual execution price. The bid–ask spread is the difference between the bid and the ask prices. The effective spread is a better representation of the true cost of trading than the bid–ask spread because it captures both price improvement and price impact.
- Market quality is judged by the following criteria, which are positives for a market's liquidity: many buyers and sellers; diversity of opinion, information, and investment needs; a readily accessible location; continuous operation during convenient market hours; a reasonable cost of transacting; market integrity, in effect the honesty of market participants; assurity of the contract's integrity.
- Transaction costs include explicit costs and implicit costs. Explicit costs are the direct costs of trading and include broker commission costs, taxes, stamp duties, and fees. Implicit costs include indirect costs such as the impact of the trade on the price received.
- Implementation shortfall is an estimate of transaction costs that amounts to subtracting the all-in transaction costs from the market price at the time the decision was made to buy or sell the security.
- Econometric models for costs are useful for obtaining pretrade estimates of the costs of a trade. These models may use variables such as stock liquidity, risk, trade size relative to available liquidity, momentum, and trading style.
- The major types of traders are information-motivated traders (who trade on information with limited time value), value-motivated traders (who trade on valuation judgments), liquidity-motivated traders (who trade based on liquidity needs), and passive traders (who trade for indexed portfolios). Information-motivated and liquidity-motivated traders have very short trading time horizons and are more sensitive to time than price in execution. By contrast, value-motivated and passive traders have longer trading time horizons and are more sensitive to price than time in execution.
- The two major order types are market orders (for prompt execution in public markets at the best price available) and limit orders (specifying a price at which the order becomes executable). Market orders are among the order types preferred by information-motivated and liquidity-motivated traders because of their time preference. Limit orders are among the order types preferred by value-motivated and passive traders because they are sensitive to price.
- Major focuses influencing the choice of trading strategy include the following: liquidity needed at any cost, need trustworthy agent for possibly hazardous trading situation, costs are not important, advertise to draw liquidity, and low cost whatever the liquidity.
- Algorithmic trading refers to automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints. Three broad categories of algorithmic trading strategies are logical participation strategies (which involve protocols for breaking up an order for execution over time), opportunistic strategies (which involve passive trading combined with the opportunistic seizing of liquidity), and specialized strategies (which cover a range of strategies that serve special purposes).

PRACTICE PROBLEMS

1 An analyst is estimating various measures of spread for Amazon, Inc. The following is the bid and ask quote for a trade in September 2011.

Bid Price ($)	Ask Price ($)
226.10	226.22

A buyer-initiated trade in was executed at a price of $226.17. For this trade, answer the following:

A What is the quoted spread?

B What is the effective spread?

C When would the effective and quoted spreads be equal?

2 Zhou (2011) examines ownership structure and liquidity using trade data from the NYSE Trade and Quote (TAQ) database. The quoted spreads and effective spreads for trades in the shares of firms with the highest and lowest proportions of institutional ownership are shown below.

Spread (Cents)	Highest	Lowest
Quoted spread	14.47	21.61
Effective spread	9.13	14.61

Source: Zhou, Dan. 2011. "Ownership Structure, Liquidity, and Trade Informativeness." *Journal of Finance and Accountancy*. Vol. 6: 1–17.

On the basis of the above results, address the following:

A Determine whether the dealers ("specialists") for these NYSE trades provided price improvements.

B Contrast the price improvement provided for high institutional ownership trades versus that provided for low institutional ownership trades.

3 POSIT is an electronic crossing network providing liquidity in global equities. After stock orders are crossed, there are some stocks for which there are unmatched buy quantities and some stocks with unmatched sell quantities. Discuss whether POSIT should disclose these unmatched quantities after a cross is run.

4 For each of the following, discuss which of the two orders in shares of Sunny Corporation will have a greater market impact. Assume that all other factors are the same.

A **i.** An order to buy 5,000 shares placed by a trader on the NYSE.

ii. An order to buy 50,000 shares placed by the same trader on the NYSE.

B **i.** An order to buy 25,000 shares placed by a trader on the NYSE.

ii. An order to buy 25,000 shares placed on the NYSE by another trader who is believed to represent informed investors in the stock.

C **i.** An order to sell 20,000 shares placed by a trader on the NYSE.

Practice Problems and Solutions: *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

ii. An order to sell 20,000 shares placed by the same trader on POSIT, an electronic crossing network.

5 An investment manager placed a limit order to buy 500,000 shares of Alpha Corporation at $21.35 limit at the opening of trading on 8 February. The closing market price of Alpha Corporation on 7 February was also $21.35. The limit order filled 40,000 shares, and the remaining 460,000 shares were never filled. Some good news came out about Alpha Corporation on 8 February, and its price increased to $23.60 by the end of that day. However, by the close of trading on 14 February, the price had declined to $21.74. The investment manager is analyzing the missed trade opportunity cost using the closing price on 7 February as the benchmark price.

A What is the estimate of the missed trade opportunity cost if it is measured at a one-day interval after the decision to trade?

B What is the estimate of the missed trade opportunity cost if it is measured at a one-week interval after the decision to trade?

C What are some of the problems in estimating the missed trade opportunity cost?

6 A portfolio manager would like to buy 5,000 shares of a very recent IPO stock. However, he was not able to get any shares at the IPO price of £30. The portfolio manager would still like to have 5,000 shares, but not at a price above £45 per share. Should he place a market order or a limit order? What would be the advantage and disadvantage of each type of order, given his purposes?

7 An asset management firm wants to purchase 500,000 shares of a company. It decides to shop the order to various broker/dealer firms to see which firm can offer the best service and lowest cost. Discuss the potential negatives of shopping the order.

8 Google Inc. is listed on NASDAQ. A trader sold 100 shares of Google on 27 September 2011 at 12:42 at a price of $542.23 per share. Assume that the trades for Google below encompass all trades for that day.

Time	Trade Price ($)	Shares Traded
9:30	$538.20	300
9:48	$538.72	200
12:28	$543.61	600
12:42	$542.23	100
12:58	$543.44	300
13:58	$545.84	500
15:59	$539.34	300

Source: Yahoo Finance.

The trader is analyzing the implicit costs of the trade, focusing on the bid–ask spread and market impact using specified price benchmarks.

A What would be the estimated implicit transaction costs using each of the following as the price benchmark?

i. Opening price.

ii. Closing price.

iii. Volume-weighted average price (VWAP).

B Evaluate the effect on estimated implicit transaction costs of the choice of benchmark price.

9 A client of a broker evaluates the broker's performance by measuring transaction costs with a specified price benchmark. The broker has discretion over the timing of his trades for the client. Discuss what the broker could do to make his performance look good to the client (even though the broker's execution decisions may not be in the best interests of the client) if the price benchmark used by the client for evaluation is the:

A opening price.

B closing price.

C volume-weighted average price (VWAP).

10 A trader decided to sell 30,000 shares of a company. At the time of this decision, the quoted price was €53.20 to €53.30. Because of the large size of the order, the trader decided to execute the sale in three equal orders of 10,000 shares spread over the course of the day. When she placed the first order, the quoted price was €53.20 to €53.30, and she sold the shares at €53.22. The trade had a market impact, and the quoted price had fallen to €53.05 to €53.15 when she placed the next order. Those shares were sold at €53.06. The quoted price had fallen to €52.87 to €52.98 when she placed the last order. Those shares were sold at €52.87. Suppose this was the market closing price of the shares that day. Answer the following questions. Ignore commissions.

A Estimate the total transaction cost of the sale of 30,000 shares if the closing price is used as the price benchmark.

B What is the implementation shortfall estimate of the total cost of executing the sale?

C Discuss and compare the answers to A and B above. Which of the two approaches is appropriate for the situation in this problem?

11 Suppose 1,000 shares of Acme Co. stock are ordered to be bought on Monday with a benchmark price of $10.00. On Monday, 600 shares are purchased at $10.02 per share. Commissions and fees are $20. On Monday, the closing price is $9.99 per share. On Tuesday, 100 more shares are purchased at $10.08 per share. Commissions and fees are $12. Shares for Acme close on Tuesday at $10.01 per share. The remaining shares are not purchased, and the order is canceled on Wednesday just as the market closes at $10.05 per share.

A Calculate the implementation shortfall for this trade.

B Calculate the components of the implementation shortfall for this trade.

12 Jane Smith manages an equity fund. She has decided to undertake a major portfolio restructuring by increasing the exposure of the fund to the telecommunications sector. The implementation of her decision would involve investing more than $2 million in the stocks of about 20 telecommunications companies. Contrast the use of a portfolio trade to the use of purchase orders for these stocks placed individually (stock by stock) in terms of the probable market impact of the two approaches.

13 Famed Investments has a C$25 million portfolio. It follows an active approach to investment management and, on average, turns the portfolio over twice a year. That is, it expects to trade 200 percent of the value of the portfolio over the next year. Every time Famed Investments buys or sells securities, it incurs execution costs of 75 basis points, on average. It expects an annual return before execution costs of 8 percent. What is the expected return net of execution costs?

14 Several British stocks trade on both the London Stock Exchange and the New York Stock Exchange. Due to the time difference between London and New York, these stocks trade for six hours every day in London only, followed by the opening of the NYSE and a two-hour period when both markets are open before London closes. Menkveld (2008) found that the volatility of prices in London is much higher during the two-hour period when both markets are open than during the preceding six-hour period when only London is open. What could be an information-motivated reason for this finding? Assume that US traders do not trade in London.

15 An employee retirement fund manager believes he has special information about a particular company. Based on this information, he believes the company is currently undervalued and decides to purchase 50,000 shares of the company. The manager decides that he will not place a large single order for 50,000 shares but will instead place several medium-sized orders of 2,500–5,000 shares spread over a period of time. Why do you think the manager chooses to follow this strategy?

16 Consider some stocks that trade in two markets, with a trader being able to trade in these stocks in either market. Suppose that the two markets are identical in all respects except that bid–ask spreads are lower and depths (the number of shares being offered at the bid and ask prices) are greater in one of the two markets. State in which market liquidity-motivated and information-motivated traders would prefer to transact. Justify your answer.

17 A trader has been given two trades to execute with the following characteristics. What tactics do you recommend?

Trade	Size (Shares)	Average Daily Volume (ADV)	Price	Spread (%)	Urgency
A	200,000	6,000,000	10.00	0.03	High
B	150,000	200,000	10.00	0.60	High

18 A trader must rebalance a pension plan's actively managed $500 million US small-cap equity portfolio to an S&P 500 indexed portfolio in order to effect a change in the plan's strategic asset allocation. He is told that his primary goal is to minimize explicit costs in this rebalance. What should his trading strategy be?

Questions 19–25 relate to Mel Rojas

Mel Rojas is a risk manager for Deep Asset Management (DAM). DAM prides itself on its investment process, which is characterized by low turnover, a long investment horizon, and deep research into company fundamentals. Rojas has recently been tasked with evaluating DAM's trading desk processes and procedures to evaluate the efficacy of the desk in carrying out trades.

Rojas reviews DAM's purchase of Arachnid Mining (ARCM), which trades on an order-driven market. DAM's trader considered using a market order to buy 5,000 shares, a limit order to buy 5,000 shares at $46.50 or better, or an iceberg order to only show 500 shares at a time. The portfolio manager instructed the trader that he was interested in establishing the position quickly, and that his estimate of fair value for ARCM was $100/share. When the order was placed, the best offer for ARCM was $47.25 for 4,400 shares. Average daily trading volume in ARCM over the previous 10 days has been 98,200 shares.

Rojas then reviews a recent trade in which DAM bought Enviroscrape (NVRO) stock, adding to an existing position. NVRO's price was $17.05 when the decision to add to the position was made. NVRO trades on a quote-driven dealer market, and has an average daily volume of 10,000,000 shares. When the order was placed with the desk on Tuesday at 11:50am, the order book appeared as follows:

Exhibit 1 NVRO Order Book, Tuesday

Bid				Ask			
Dealer	Time	Price	Size	Dealer	Time	Price	Size
C	11:49am	17.02	300	C	11:49am	17.05	3200
A	11:37am	17.00	1000	B	11:45am	17.09	2500
B	11:35am	16.95	5400	D	11:43am	17.15	4500
D	11:33am	16.90	9000	A	11:37am	17.20	500

The desk placed a limit order to buy 10,000 shares at $17.05 or better. After buying 3,200 shares at $17.05, the market traded up and closes at $17.20. No further shares were bought that day. DAM paid $64 in commissions, and the VWAP for the day's trading was 17.00.

The next day, Wednesday, the desk buys another 3,000 shares at $17.25. The market closes at $17.50 and no further action is taken. The desk pays $0.02 per share in commissions for these trades.

A week later, DAM decides to take a much larger position in NVRO. They intend to buy 50,000 shares. First, they decide to enter a 50,000 share buy order on an Electronic Crossing Network (ECN). This network trades once a day at 4:00pm New York time. On the day in question, despite entering in a 50,000 share buy order, DAM is only able to buy 2,000 shares.

The next day, rather than going back to the ECN, the trading desk decides to work with a broker to improve their execution of their NVRO purchase. The broker reviews three different algorithmic trading strategies with DAM: Volume Weighted Average Price (VWAP), Time Weighted Average Price (TWAP), and Percentage-of-Volume (POV).

19 Based on the ARCM market, the trader's choice of order type to buy ARCM was *most likely*:

A a limit order.

B a market order.

C an iceberg order.

20 Based on Exhibit 1, if the DAM trader places a market order to buy 5,700 shares of NVRO at 11:50am, and the order is filled at an average price of $17.07, he will have paid an effective spread *closest* to:

A $0.02.

B $0.03.

C $0.07.

21 Which of the following is the *most likely* reason DAM turned to a broker after failing to execute their 50,000 share order of NVRO with the ECN?

A DAM values price discovery in the marketplace.

B DAM wants to minimize market impact on NVRO.

C NVRO is a very liquid stock and DAM's order would have little market impact.

22 For Tuesday's trading, assuming that DAM uses VWAP as the price benchmark, DAM's implicit transaction cost on the NVRO trade was *closest* to:

A $96.

B $160.

C $256.

23 At the end of Wednesday, DAM's implementation shortfall on the NVRO trade is *closest* to:

A $1,084.

B $2,434.

C $4,376.

24 DAM is *most likely* to be characterized as:

A a value-motivated trader.

B a liquidity-motivated trader.

C an information-motivated trader.

25 Which of the following statements *most likely* explains why the broker recommended a VWAP strategy in order to get the 50,000-share NVRO order executed?

A The stock is thinly traded with erratic volume.

B DAM prefers to execute as close to the closing price as possible.

C The order is a low percentage of the average daily volume of the stock.

SOLUTIONS

1 A The quoted spread is the difference between the ask and bid prices in the quote prevailing at the time the trade is entered. The bid is \$226.10 and the ask is \$226.22. So, the quoted spread = Ask – Bid = \$226.22 – \$226.10 = \$0.12.

B The time-of-trade quotation midpoint = (\$226.10 + \$226.22)/2 = \$226.16. Effective spread = 2 × (Trade price – Time-of-trade quotation midpoint) = 2 × (\$226.17 – \$226.16) = 2 × \$0.01 = \$0.02.

C The effective and quoted spreads would be equal if a purchase took place at the ask price or a sale took place at the bid price.

2 A The difference between quoted spreads and effective spreads reflects the price improvement provided by dealers. If the effective spreads are lower than the quoted spreads, dealers are providing price improvements. Since the effective spreads are lower than the quoted spreads for both the highest and lowest proportion of institutional ownership firms, dealers provided price improvements for both types of trades.

B The difference between the quoted and effective spreads is greater for the lowest institutional ownership firms (7.00 cents) than for the highest institutional ownership firms (5.34 cents). Therefore, on an absolute dollar basis, dealers provided greater price improvement for the lowest institutional ownership firms.

3 POSIT should not disclose unmatched quantities. Crossing networks maintain complete confidentiality not only in regard to the size of the orders and the names of the investors placing the orders, but also in regard to the unmatched quantities. If POSIT were to disclose the unmatched quantities, it would provide useful information to other parties that would affect the supply and demand of these stocks in which clients want to transact. As a result of the information leakage, transaction costs for its clients would likely rise.

4 A The second order will have a greater market impact because it is bigger in size.

B The second order will have a greater market impact because the trader placing it has a reputation of representing informed investors in the stock. Thus, other traders may believe that the stock's intrinsic value differs from the current market price and adjust their quotations accordingly. In contrast to most other situations in which a reputation of being smart is beneficial, in stock trading, it is not to one's advantage.

C By definition, orders executed on crossing networks, such as POSIT, avoid market impact costs because the orders are crossed at the existing market price determined elsewhere, regardless of size. Therefore, the first order will have greater market impact. Note, however, that a part of a large order may go unfilled on the crossing network.

5 A Missed trade opportunity cost is the unfilled size times the difference between the subsequent price and the benchmark price for buys (or times the difference between the benchmark price and the subsequent price for sells). So, using the closing price on 8 February as the subsequent price, the estimated missed trade opportunity cost is 460,000 × (\$23.60 – \$21.35) = \$1,035,000.

B Using the closing price on 14 February as the subsequent price, the estimated missed trade opportunity cost is 460,000 × ($21.74 – $21.35) = $179,400.

C One of the problems in estimating missed trade opportunity cost is that the estimate depends upon when the cost is measured. As the solutions to Parts A and B of this problem indicate, the estimate could vary substantially when a different interval is used to measure the missed trade opportunity cost. Another problem in estimating the missed trade opportunity cost is that it does not consider the impact of order size on prices. For example, the estimates above assume that if the investment manager had bought the 500,000 shares on 8 February, he would have been able to sell these 500,000 shares at $23.60 each on 8 February (or at $21.74 each on 14 February). However, an order to sell 500,000 shares on 8 February (or on 14 February) would have likely led to a decline in price, and the entire order of 500,000 shares would not have been sold at $23.60 (or at $21.74). Thus, the missed trade opportunity costs above are likely to be overestimates.

6 Since the portfolio manager does not want to pay more than £45 per share, he should place a limit order to buy 5,000 shares at no more than £45 per share. An advantage of placing the limit order is that he avoids the risk of paying too high a price and then suffering substantial losses if the stock price subsequently declines. However, a disadvantage is that his order may not be filled because the market price may never touch his limit order price of £45, incurring a missed trade opportunity cost. For example, consider a situation in which the stock's ask price is £47 when the order to buy at £45 limit is placed and the stock trades up to £80. If the portfolio manager had placed a market order, he would have been able to purchase the stock at £47 and make a profit by selling the stock at the current price of £80. An advantage of a market order is certainty of execution. The disadvantage of a market order is uncertainty concerning the price at which the order will be executed. Because the portfolio manager's chief focus is on execution price, the limit order would be preferred.

7 One negative of shopping the order is that it could delay the execution of the order, and the stock price could increase in the meantime. Another important negative of shopping the order is that it leaks information to others about the buying intention of the asset management firm. This information leakage could result in an adverse price movement in the shares that the asset management firm wants to buy because the broker/dealers could revise their quotes or trade based on the information gained.

8 **A** Estimated implicit costs = Trade size × (Trade price – Benchmark price) for a buy, or Trade size × (Benchmark price – Trade price) for a sale. In this problem, Trade size = 100 and Trade price = $542.23.

i. Opening price = $538.20

Estimated implicit costs = 100 × ($538.20 – $542.23) = –$403

ii. Closing price = $539.34

Estimated implicit costs = 100 × ($539.34 – $542.23) = –$289

iii. We need to first calculate the VWAP.

VWAP = Dollar volume/Trade volume

Dollar volume = (300 × $538.20) + (200 × $538.72) + (600 × $543.61) + (100 × $542.23) + (300 × $543.44) + (500 × $545.84) + (300 × $539.34) = $1,247,347.00

Trade volume = 300 + 200 + 600 + 100 + 300 + 500 + 300 = 2,300 shares

So, VWAP = $1,247,347.00/2,300 = $542.3248 per share. Estimated implicit costs = 100 × ($542.3248 – $542.23) = $9.48

B Using VWAP as a benchmark, implicit costs are $9.48, whereas implicit costs are –$403 (–$289) if the opening price (closing price) is used as a benchmark. Estimated implicit costs may be quite sensitive to the choice of benchmark.

9 A If the order is received late in the day, the broker would act based on how the prices have changed during the day. If the order is a sell order and prices have increased since the opening, the broker would immediately fill the order so that the sale price is greater than the benchmark price. If prices have fallen during the day, the broker would wait until the next day to avoid recording a low-priced sale on a day when the market opened higher. The broker would do the opposite if the order is a buy order. If prices have increased since the opening, the broker would wait until the next day to avoid recording a high-priced buy on a day when the market opened lower. If the prices have fallen during the day, the broker would immediately fill the order so that the purchase price is lower than the benchmark price.

B The broker would execute the order just before closing so that the transaction price is the same as the closing price.

C The broker would split the order and spread its execution throughout the day so that the transaction price is close to the market VWAP.

10 A For a sale, Estimated cost = Trade size × (Benchmark price – Trade price). Using €52.87 as the benchmark price, the transaction cost estimate of the first trade is 10,000 × (€52.87 – €53.22) = –€3,500. The transaction cost estimate of the second trade is 10,000 × (€52.87 – €53.06) = –€1,900. The transaction cost estimate of the third trade is 10,000 × (€52.87 – €52.87) = €0. The total transaction cost estimate = –€3,500 + (–€1,900) + €0 = –€5,400.

B The quotation midpoint that prevailed at the time of the decision to trade was €53.25. This is the benchmark price, and the implementation shortfall estimate of the cost of executing the first order is 10,000 × (€53.25 – €53.22) = €300. The implementation shortfall estimate of the cost of executing the second order is 10,000 × (€53.25 – €53.06) = €1,900. The implementation shortfall estimate of the cost of executing the third order is 10,000 × (€53.25 – €52.87) = €3,800. So, the implementation shortfall estimate of the total cost of executing the three orders is €300 + €1,900 + €3,800 = €6,000.

C The estimated transaction cost using the closing price as the benchmark is negative. This result makes it seem as if the trader had a trading profit. This conclusion is not reasonable because the trader did pay the bid–ask spread and her trades had a market impact, making prices less favorable in her subsequent trades. For example, in the first trade, the trader sold the shares close to the bid price and the trade resulted in a decline in prices. Overall, the use of closing price as the benchmark is not appropriate in this problem because the benchmark itself is significantly affected by the large size of the order.

In contrast, the implementation shortfall estimate uses a benchmark which is determined before the order has an impact on prices. The implementation shortfall approach, which results in a reasonable estimate of €6,000 as the total cost of executing the sale, is the appropriate approach in this problem.

11 A The paper portfolio traded 1,000 shares on Monday for $10.00 per share. The value of the portfolio at the close on Wednesday is $10,050. The net value is $50.

The real portfolio contains only 700 shares and was traded over the course of two days. On Wednesday's close, it is worth 700 × $10.05 = $7,035.

The cost of the portfolio is $7,052:

Monday: 600 × $10.02 = $6,012 + $20 commissions = $6,032

Tuesday: 100 × $10.08 = $1,008 + $12 commissions = $1,020

The net value of the real portfolio is $7,035 – 7,052 = –$17. Thus, the implementation shortfall is $50 – (–$17) = $67, or 67 bps.

B Implementation shortfall broken into components is as follows:

- Delay

  Monday: 600/1,000 × [($10.00 – $10.00)/$10.00] = 0.00%

  Tuesday: 100/1,000 × [($9.99 – $10.00)/$10.00] = –0.01%

- Realized profit and loss

  Monday: 600/1,000 × [($10.02 – $10.00)/$10.00] = 0.12%

  Tuesday: 100/1,000 × [($10.08 – $9.99)/$10.00] = 0.09%

- Missed trade opportunity cost

  300/1,000 × [($10.05 – $10.00)/$10.00] = 0.15%

Commissions are 0.20% + 0.12% = 0.32%.

Total implementation shortfall is 0.67%, or 67 bps.

12 Portfolio trades involve the purchase or sale of a basket of stocks, with the buy or sell orders placed as a coordinated transaction. Jane Smith could ask a broker for a quote for the entire basket of telecommunications stocks that she wants to purchase. Because there are multiple stocks in the basket being purchased, it is clear to the counterparty that the purchase is not motivated by information about a particular stock and the market impact of the trade is likely to be less. As a consequence, the cost of trading the basket of stocks is expected to be lower than the total trading cost of buying each stock individually.

13 The average execution cost for a purchase of securities is 75 basis points, or 0.75 percent, and the average execution cost for a sale of securities is also 0.75 percent. So, the average execution for a round-trip trade is 2 × 0.75%, or 1.5%. Since the portfolio is expected to be turned over twice, expected execution costs are 1.5% × 2 = 3%. Therefore, the expected return net of execution costs is 8% – 3% = 5%.

14 Just as some traders in London possess information about stocks that traders in New York may not, some New York–based traders possess information that London-based traders may not. When New York–based traders begin to trade with the opening of US markets, their trades reveal new information. The new information is incorporated into prices not only in New York but also in London during the hours of overlap between the markets. This incorporation of additional information from New York in London results in higher volatility of prices in London after the opening of the US markets.

15 One reason the manager may have chosen not to trade more aggressively is that he does not think there are other informed traders who have the same information he has about the company's stock. That is, he does not expect other traders to trade in the stock based on information, thus quickly eliminating his informational advantage. By trading in smaller sizes over a period of time, the manager attempts to reduce the chance that other traders will infer that the fund manager is trading based on special information. By spreading his trades over time, the manager is trying to reduce the price impact of trading by not revealing his full trading intentions.

16 Liquidity-motivated traders transact only to meet liquidity needs and desire low transaction costs. So, they would prefer the market with the lower bid–ask spreads. The information-motivated traders trade strategically to maximize the profits from their information. Some of their profits are made in trades in which liquidity-motivated traders are the counterparty. Since the liquidity-motivated traders trade in the market with the lower spreads, information-motivated traders will trade with them in that market. Also, information-motivated traders prefer to place larger orders to profit from any superior information they have. Such traders with large orders are particularly concerned about the market impact cost in the form of a price change for large trades. Since the quoted prices are firm for only a fixed depth, larger orders may move the bid (ask) price downward (upward). In a market with greater depth, the market impact cost is less. Thus, the market with greater depths would be preferred by information-motivated traders. Overall, between the two alternate trading venues, the one with lower spreads and greater depths would be preferred by both types of traders.

17 *Trade A*: In spite of the high urgency level, this trade represents 3 percent ADV. This trade is suitable for an implementation shortfall algorithm.

Trade B: This trade represents 75 percent ADV and has high spreads. It is not suitable for an algorithmic trade and should be traded using a broker.

18 Although the goal is to minimize explicit transaction costs, the trader needs also to consider the opportunity cost of not being invested in the S&P 500 portfolio. The trader should use an implementation shortfall strategy to control the risk of this rebalance. In short, he should minimize explicit costs by waiting for trades to cross in an electronic crossing network, such as the POSIT trading system, but he should also submit names not likely to cross to a broker in order to minimize opportunity costs. Such a strategy would balance the costs of a delay in implementing a strategic asset allocation against the concern to minimize explicit transaction costs.

19 B is correct. The portfolio manager wanted the order executed quickly and the order would have little impact on the market. Under such circumstances a market order makes sense as it eliminates execution uncertainty at the expense of price uncertainty.

20 C is correct. The effective spread is two times the deviation of the actual execution price from the midpoint of the market quote at the time of the order.

$$2\left(17.07 - \frac{17.05 + 17.02}{2}\right)$$

21 B is correct. Their attempt to use an ECN indicates they value low cost and low market impact above all, and by letting a broker shop an order or use an algorithmic method, they can minimize these costs.

22 B is correct. The implicit cost estimate is the difference between the actual execution price and the VWAP. This is given as

$$\begin{aligned}\text{Cost} &= \text{shares} \times (\text{executed price} - \text{VWAP})\\ &= 3{,}200 \times (\$17.05 - \$17.00)\\ &= \$160\end{aligned}$$

23 B is correct. At the end of the second day, DAM wanted to own 10,000 shares of NVRO at $17.05. Their gross paper profit/loss is thus

$$10{,}000 \times (\$17.50 - \$17.05) = \$4{,}500$$

Their actual position was long 3,200 shares at \$17.05 and 3,000 shares at \$17.25, and they paid \$0.02*6,200 shares = \$124 in commissions. Thus their actual profit/loss was

$$3{,}200 \times (\$17.50 - \$17.05) + 3{,}000 \times (\$17.50 - \$17.25) - \$124 = \$2{,}066$$

The implementation shortfall is just the difference between these, \$4,500 – \$2,066 = \$2,434.

24 A is correct. Value-motivated traders are patient, infrequent traders driven by differences between price and value.

25 C is correct. A VWAP algorithmic trade is best suited for an order that is a low percentage of the average daily volume of the stock. The 50,000-share order is a small percentage of the average daily volume of 10,000,000 shares.

CUSTOMER SERVICE

68

READING

32

Monitoring and Rebalancing

by Robert D. Arnott, Terence E. Burns, CFA, Lisa Plaxco, CFA, and Philip Moore

Robert D. Arnott is at Research Affiliates, LLC (USA). Terence E. Burns, CFA, is at Campion Asset Management (USA). Lisa Plaxco, CFA, is at CFA Institute (USA). Philip Moore (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss a fiduciary's responsibilities in monitoring an investment portfolio;
☐	**b.** discuss the monitoring of investor circumstances, market/economic conditions, and portfolio holdings and explain the effects that changes in each of these areas can have on the investor's portfolio;
☐	**c.** recommend and justify revisions to an investor's investment policy statement and strategic asset allocation, given a change in investor circumstances;
☐	**d.** discuss the benefits and costs of rebalancing a portfolio to the investor's strategic asset allocation;
☐	**e.** contrast calendar rebalancing to percentage-of-portfolio rebalancing;
☐	**f.** discuss the key determinants of the optimal corridor width of an asset class in a percentage-of-portfolio rebalancing program;
☐	**g.** compare the benefits of rebalancing an asset class to its target portfolio weight versus rebalancing the asset class to stay within its allowed range;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**h.** explain the performance consequences in up, down, and flat markets of 1) rebalancing to a constant mix of equities and bills, 2) buying and holding equities, and 3) constant proportion portfolio insurance (CPPI);
☐	**i.** distinguish among linear, concave, and convex rebalancing strategies;
☐	**j.** judge the appropriateness of constant mix, buy-and-hold, and CPPI rebalancing strategies when given an investor's risk tolerance and asset return expectations.

1 INTRODUCTION

After a portfolio manager has worked closely with a client to document investment objectives and constraints in an investment policy statement (IPS), agreed on the strategic asset allocation that best positions the client to achieve stated objectives, and executed the strategic asset allocation through appropriate investment strategies for each asset class segment, the manager must constantly monitor and rebalance the portfolio. The need arises for several reasons.

First, clients' needs and circumstances change, and portfolio managers must respond to these changes to ensure that the portfolio reflects those changes. Life-cycle changes are expected for individual investors, so the portfolio manager must plan for these changes and respond to them when they occur. Institutional investors face changing circumstances just as commonly. A pension fund may receive a mandate from its trustees to assume less volatility. A university endowment may need to react to higher-than-anticipated inflation in faculty salaries.

Second, capital market conditions change. Portfolio managers must monitor such changes, adjust their capital market expectations appropriately, and reflect changed expectations in how the portfolio is invested. For example, if a client's return requirement is 8 percent but the strategic asset allocation promises to return on average 6.5 percent in the current climate, what changes should a portfolio manager recommend in light of the anticipated 150 bps shortfall?

Third, fluctuations in the market values of assets create differences between a portfolio's current asset allocation and its strategic asset allocation. These differences may be trivial on a daily basis; over longer periods of time, however, they can result in a significant divergence between the intended and actual allocations. When and how a portfolio manager rebalances the portfolio to the strategic asset allocation is one of the primary focuses of this reading.

For a portfolio manager, designing and building a portfolio is only the beginning of the dynamic and interactive process that lasts for as long as she is the client's trusted advisor. As markets evolve, maintaining the alignment between a client's portfolio and his investment objectives requires constant vigilance. Therefore, monitoring and rebalancing the portfolio is one of the most important elements of the dynamic process of portfolio management.

We divide this reading into two major sections, the first covering monitoring and the second covering rebalancing.

MONITORING

2

To monitor something means to systematically keep watch over it to collect information that is relevant to one's purpose. In investments, the purpose is to achieve investment goals. And a reality of investing is that what you don't know *can* hurt you. An overlooked fact may mean not reaching a goal. A portfolio manager should track everything affecting the client's portfolio. We can categorize most items that need to be monitored in one of three ways:

- investor circumstances, including wealth and constraints;
- market and economic changes; and
- the portfolio itself.

Monitoring investor-related factors sometimes results in changes to a client's investment policy statement, strategic asset allocation, or individual portfolio holdings. Monitoring market and economic changes sometimes results in changes to the strategic asset allocation (when they relate to long-term capital market expectations), tactical asset allocation adjustments (when they relate to shorter-term capital market expectations), changes in style and sector exposures, or adjustments in individual holdings. Monitoring the portfolio can lead to additions or deletions to holdings or to rebalancing the strategic asset allocation.

Fiduciaries need to pay particular attention to adequate monitoring in fulfilling their ethical and legal responsibilities to clients. Investment managers for individual and/or institutional separate accounts; managers of pooled funds (including mutual funds and unit trusts); and trustees of private trusts, pension plans, and charitable organizations are all fiduciaries because of their positions of trust with respect to the management of assets owned by or benefiting others. Fiduciaries have a range of ethical, reporting, auditing, disclosure, and other responsibilities to clients. But germane to this discussion, when taking investment actions, fiduciaries must consider the appropriateness and suitability of the portfolio relative to 1) the client's needs and circumstances, 2) the investment's basic characteristics, or 3) the basic characteristics of the total portfolio. These factors change over time. Only by systematic monitoring can a fiduciary secure an informed view of the appropriateness and suitability of a portfolio for a client.

The following sections provide a fuller explanation of monitoring.

2.1 Monitoring Changes in Investor Circumstances and Constraints

Each client has needs and circumstances that will most likely change over time. A successful portfolio manager makes every effort to remain sensitive to client needs and to anticipate events that might alter those needs. Periodic client meetings are an ideal time to ask whether needs, circumstances, or objectives have changed. If they have, the manager may need to revise the IPS and bring the portfolio into line with the revisions. In many cases, minor changes are needed that do not require revising the IPS. In the field of private wealth management, reviews are usually semiannual or quarterly. In institutional investing, the asset allocation review is a natural time for reviewing the range of changes in circumstance. Such reviews are often held annually. In all contacts with any type of client, however, the advisor should be alert to new client circumstances.

When a review is undertaken, what areas should be covered? Changes in investor circumstances and wealth, liquidity requirements, time horizons, legal and regulatory factors, and unique circumstances all need to be monitored.

2.1.1 *Changes in Investor Circumstances and Wealth*

Changes in circumstances and wealth often affect a client's investment plans. For private wealth clients, events such as changes in employment, marital status, and the birth of children may affect income, expenditures, risk exposures, and risk preferences. Each such change may affect the client's income, expected retirement income, and perhaps risk preferences. The responsibilities of marriage or children have repercussions for nearly all aspects of a client's financial situation. Such events often mark occasions to review the client's investment policy statement and overall financial plan. For institutional clients, operating performance, constituent pressures (such as demands for increased support from the beneficiaries of endowments), and changes in governance practices are among the factors that may affect income, expenditures, risk exposures, and risk preferences. A portfolio manager should communicate regularly with the client to become aware of such changes.

Wealth or net worth is one client factor that is central to investment plans. Wealth, when evaluated in the context of an investor's other circumstances, is both a measure of achieved financial success and an influence on future investment planning. Changes in wealth result from saving or spending, investment performance, and events such as gifts, donations, and inheritances. The investor's return requirements may change as a result, as financial goals recede or move closer to achievement, and risk tolerance may change too. Utility theory suggests that increases in wealth allow investors to increase their level of risk tolerance, accepting more systematic risk with its attendant expected reward. In reality, however, portfolio managers should consider only substantial and permanent changes in wealth in establishing the client's risk tolerance, even though client risk perceptions can vary quite substantially with recently experienced market performance. The portfolio manager's appraisal of a client's risk tolerance should be largely unaffected by transient changes in wealth. The investment manager thus has a difficult role to moderate some investors' desire to dramatically change asset allocations in response to market volatility. In contrast, more-conservative investors may be unprepared to increase their risk tolerance even when a substantial increase in wealth suggests an increased capacity for bearing risk. Such a client's goal may become merely preserving gains that they never expected to have despite the opportunity costs. The portfolio manager should try to understand this mindset and, working within the client's comfort level, seek to restrain its excesses.

2.1.2 *Changing Liquidity Requirements*

When a client needs money to spend, the portfolio manager should strive to provide it. A liquidity requirement is a need for cash in excess of new contributions or savings as a consequence of some event, either anticipated or unanticipated.

Individual clients experience changes in liquidity requirements as a result of a variety of events, including unemployment, illness, court judgments, retirement, divorce, the death of a spouse, or the building or purchase of a home. Changes in liquidity requirements occur for a variety of reasons for institutional clients, such as the payment of claims by insurers or of retirement benefits by defined-benefit pension plans, or the funding of a capital project by a foundation or endowment.

The possibility of major withdrawals may constrain a portfolio manager's commitments to illiquid investments because of the costs in exiting those investments quickly. Managers who do not face major withdrawals are better positioned to earn the return premium such investments supply. Managers who do face major withdrawals near term may need to hold some part of their portfolio in liquid and low-price-risk assets such as money market instruments.

2.1.3 *Changing Time Horizons*

Individuals age and pension funds mature. Reducing investment risk is generally advisable as an individual moves through the life cycle and his time horizon shortens; bonds become increasingly suitable investments as this process occurs. Today's life-cycle mutual funds reflect that principle in their asset allocations. In contrast to individuals, some entities such as endowment funds have the hope of perpetual life; the passage of time in and of itself does not change their time horizon, risk budgets, or appropriate asset allocation.

Many private wealth clients have multistage time horizons. For example, a working person typically faces an accumulation stage up to retirement in which she builds wealth through saving and investment, followed by a retirement stage in which she spends wealth and ultimately bequeaths it to heirs. Accumulating funds for a child's higher education can create one or more stages before retirement. Changes in investment policy are usually needed as one time horizon (for example, reaching retirement or selling a closely-held family business) is reached and another begins.

Although some changes in time horizon are forecastable, time horizons can also shift abruptly. For instance, when the last income beneficiary of a trust dies and the **residue** (remaining funds) passes to the **remaindermen** (beneficiaries with a claim on the trust's residue), investment policy, as well as the portfolio, should be adjusted promptly. Annuitizing the benefits for older participants in a pension plan can result in an abrupt change in the plan's remaining liability stream. That should lead to an overhaul of the asset structure and rebalancing to a portfolio structure that more closely fits the new needs. The untimely death of an income-earning spouse requires immediate attention. Portfolio managers need to think about how they will respond to these changes and events and must monitor the client's circumstances for changes in time horizon. Example 1 addresses a change in investment horizon for an individual investor.

EXAMPLE 1

Monitoring a Change in Investment Horizon

William and Mary deVegh, both 32 years old, met and married when they were university students. They each embarked on promising and highly demanding executive careers after leaving college. They are hoping to retire at age 55 to travel and otherwise enjoy the fruits of their hard work. Now well established at their companies, they also want to start a family and are expecting the birth of their first child in two months. They hope the child will follow their tracks and obtain a four-year private university education. The deVeghs anticipate supporting their child through college. Assume that the deVeghs will each live to age 85.

1. Compare and contrast the deVeghs' investment time horizons prior to and immediately subsequent to the birth of their first child.
2. Interpret the challenges the birth will present to their retirement objectives and discuss approaches to meeting those challenges, including investing more aggressively.

Solution to 1:

Prior to the birth of their child, the deVeghs have a two-stage time horizon. The first horizon extends from age 32 up to age 55. This first time horizon could be described as an accumulation period in which the deVeghs save and invest for early retirement. The second time horizon is their retirement and is expected to extend from age 55 to age 85. After the birth of their child, they will have a three-stage time horizon. The first stage extends from age 32 through age 50,

when they expect their child to enter university at age 18. During this period, the deVeghs must accumulate funds both for retirement and their child's university education. The second stage extends from age 51 up to age 55. In this period the deVeghs must anticipate disbursing substantial funds for tuition, room and board, and other expenses associated with a private university education. The third stage is retirement, expected to extend from age 55 to age 85 as before.

Solution to 2:

The birth of the child creates a four-year period of heavy expenses immediately prior to the deVeghs' intended retirement date. Those expenses could put their intended retirement date at risk. The most direct way to mitigate this risk is to increase the amount of money saved and to invest savings for the child's education in a tax-efficient way (tax-advantaged education saving vehicles are available in certain tax jurisdictions). Can the deVeghs mitigate their risk by increasing their risk tolerance? The need for a larger future sum of money does not in itself increase an investor's ability to take risk, although it may affect the investor's willingness to do so. There is no indication that the child's birth will be accompanied by a salary raise or other event increasing the ability to take risk. If the deVeghs' stated risk tolerance prior to the child's birth accurately reflects their ability to bear risk, investing more aggressively after the child's birth will not help them meet the challenges the event poses to their retirement objective.

2.1.4 *Tax Circumstances*

Taxes are certain; the form they will take and their amount in the future are uncertain. Taxable investors should make all decisions on an after-tax basis. Managers for taxable investors must construct portfolios that deal with each client's current tax situation and take future possible tax circumstances into account. For taxable investors, holding period length and portfolio turnover rates are important because of their effect on after-tax returns. In evaluating investment strategies to meet a taxable investor's changed objective, a portfolio manager will take into account each strategy's **tax efficiency** (the proportion of the expected pretax total return that will be retained after taxes). Monitoring a client's tax situation may suggest the following actions, for example:

- Deferring the realization of income from a higher-tax year to an anticipated lower-tax year.
- Accelerating expenses to a high-tax year.
- Realizing short-term losses at year-end to offset realized short-term gains in the same year.
- Deploying assets with high unrealized gains so as to use a step-up in tax basis from original cost to market value (a break allowed investors for certain transactions in some tax jurisdictions). For example, if the client intends to make a charitable donation, making the contribution in appreciated securities may be tax advantageous in some tax jurisdictions.
- Reducing or increasing commitments to tax-exempt securities, where available.

2.1.5 *Changes in Laws and Regulations*

Laws and regulations create the environment in which the investor can lawfully operate, and the portfolio manager must monitor them to ensure compliance and understand how they affect the scope of the advisor's responsibility and discretion in managing client portfolios. For example, in the United States in recent years, corporate trustees

have reevaluated how they manage investment portfolios for trust clients in light of the adoption of the Uniform Prudent Investor Rule (versus the traditional prudent man rule) and the Uniform Principal and Income Act.

Besides that necessity, portfolio managers should seek to grasp the implication of such legal and regulatory changes for current portfolio holdings and investment opportunities. Portfolio managers for both taxable and tax-exempt investors should monitor changes in tax regulations because such changes typically affect not only taxes but the equilibrium relationships among assets.

2.1.6 *Unique Circumstances*

A unique circumstance is an internal factor (other than a liquidity requirement, time horizon, or tax concern) that may constrain portfolio choice. The client may present the portfolio manager with a variety of challenges in this respect. For example, some clients direct portfolio managers to retain concentrated stock positions because of an emotional attachment to the particular holding, because the client must maintain the stock position to demonstrate his or her commitment as an officer of the company, or because the concentrated position effectively has an extremely large unrealized capital gain. Is it feasible and appropriate to hedge or monetize the position through one of several special strategies? If not, given the volatility and concentrated risk of this single holding, how should the portfolio manager allocate the balance of the client's portfolio? As a portfolio manager, what investment actions will you recommend or implement when the emotional attachment is gone, when the client is no longer an officer of the company, or when the client's heirs receive the position?

Institutional clients may have a range of special concerns. For example, a client may adopt principles of socially responsible investing (often referred to by its acronym, SRI). Endowments and public employee pension plans often have been particularly active in SRI. As an example, a fund may decide to reduce or eliminate holdings in "sin" stocks, such as gaming, alcohol, and tobacco. SRI constraints have tended to tilt a portfolio away from large companies, which introduces non-market-related risks and causes a small-capitalization stock bias. In the mid-1980s, when small-cap stocks were demonstrating a return advantage over large-cap stocks, SRI seemed a costless (even profitable) strategy. However, the client should be aware of the potential costs in adopting an SRI policy.

Institutional clients are focusing significant attention on evaluating and fostering improvements in corporate governance, believing that those efforts will in the long run enhance return and/or reduce portfolio risk. Indeed, European fund managers themselves have demanded better integration of extrafinancial issues such as corporate governance, human capital management, value creation or destruction during mergers and acquisitions, and global environment challenges in sell-side analysis.[1] Portfolio managers must respect such client concerns in evaluating the appropriateness of investments.

In Example 2, an investment advisor determines an appropriate investment recommendation for an inheritance and later, a new investment advisor makes changes to the client's IPS in light of dramatically changed needs. This example shows the detailed analysis and judgment that enters into revising an IPS.

1 In 2004, four major European fund managers representing €330 billion under management announced an Enhanced Analytics Initiative in which 5 percent of brokerage commissions would be awarded on the basis of the integration of these concerns in brokerage house analysis.

EXAMPLE 2

Monitoring Changes in an Investor's Circumstances and Wealth[2]

John Stern, 55 years old and single, is a dentist. Stern has accumulated a $2.0 million investment portfolio with a large concentration in small-capitalization US equities. Over the last five years, the portfolio has averaged 20 percent annual total return on investment. Stern does not expect to retire before age 70. His current income is more than sufficient to meet his expenses. Upon retirement, he plans to sell his dentistry practice and use the proceeds to purchase an annuity to cover his retirement cash flow needs. He has no additional long-term goals or needs.

In consultation with Stern, his investment advisor, Caroline Roppa, has drawn up an investment policy statement with the following elements. (Roppa's notes justifying each item are included.)

Elements of Stern's Investment Policy Statement

Risk tolerance: Stern has above-average risk tolerance. *Roppa's notes*:

- Stern's present investment portfolio and his desire for large returns indicate a high *willingness* to take risk.
- His financial situation (large current asset base, ample income to cover expenses, lack of need for liquidity or cash flow, and long time horizon) indicates a high *ability* to assume risk.

Return objective: The return objective is an average total return of 10 percent or more with a focus on long-term capital appreciation. *Roppa's notes*: Stern's circumstances warrant an above-average return objective that emphasizes capital appreciation for the following reasons:

- Stern has a sizable asset base and ample income to cover his current spending; therefore, the focus should be on growing the portfolio.
- Stern's low liquidity needs and long time horizon support an emphasis on a long-term capital appreciation approach.
- Stern does not rely on the portfolio to meet living expenses.

The numerical objective of 10 percent represents an estimate of a target Stern can aim for rather than a minimum return required to meet a specific financial goal.

Liquidity: Stern's liquidity needs are low. *Roppa's notes*:

- Stern has no regular cash flow needs from the portfolio because the income from his dentistry practice meets all current spending needs.
- No large, one-time cash needs are stated. However, it could be considered appropriate to keep a small cash reserve for emergencies.

Time horizon: Stern's time horizon is long term and consists of two stages:

- The first stage consists of the time until his retirement, which he expects to be 15 years.
- The second consists of his lifetime following retirement, which could range from 10 to 20 years.

2 Adapted from the 2001 Level III CFA examination.

Roppa has also summarized Stern's current portfolio in Exhibit 1.

Exhibit 1 Summary of Stern's Current Portfolio

	Value	Percent of Total	Expected Annual Return	Expected Annual Standard Deviation
Short-term bonds	$200,000	10%	4.6%	1.6%
Domestic large-cap equities	600,000	30	12.4	19.5
Domestic small-cap equities	1,200,000	60	16.0	29.9
Total portfolio	$2,000,000	100%	13.8%	23.1%

Stern expects to soon receive an inheritance of $2.0 million. Stern and Roppa sit down to discuss its investment in one of four index funds. Given Stern's already above-average risk tolerance and level of portfolio risk, Roppa and Stern have concluded that the risk tolerance description in the current IPS remains valid; they do not want to contemplate a further increase in portfolio risk. On the other hand, they do not wish to reduce expected return. Roppa is evaluating the four index funds shown in Exhibit 2 for their ability to produce a portfolio that will meet the following two criteria relative to the current portfolio:

- maintain or enhance expected return, and
- maintain or reduce volatility.

Each fund is invested in an asset class that is not substantially represented in the current portfolio as shown in Exhibit 1. Exhibit 2 presents statistics on those index funds.

Exhibit 2 Index Fund Characteristics

Index Fund	Expected Annual Return	Expected Annual Standard Deviation	Correlation of Returns with Current Portfolio's Returns
Fund A	15%	25%	+0.80
Fund B	11	22	+0.60
Fund C	16	25	+0.90
Fund D	14	22	+0.65

1 Recommend the most appropriate index fund to add to Stern's portfolio. Justify your recommendation by describing how your chosen fund *best* meets both of the stated criteria. No calculations are required.

Twenty years later, Stern is meeting with his new financial advisor, Jennifer Holmstrom. Holmstrom is evaluating whether Stern's investment policy remains appropriate for his new circumstances.

- Stern is now 75 years old and retired. His spending requirements are expected to increase with the rate of general inflation, which is expected to average 3.0 percent annually.
- Stern estimates his current living expenses at $150,000 annually. An annuity, purchased with the proceeds from the sale of his dentistry practice, provides $20,000 of this amount. The annuity is adjusted for inflation annually using a national price index.
- Because of poor investment performance and a high level of spending, Stern's asset base has declined to $1,200,000 exclusive of the value of the annuity.
- Stern sold all of his small-cap investments last year and invested the proceeds in domestic bonds.
- Because his past international equity investments have performed poorly, Stern has become markedly uncomfortable with holding international equities.
- Stern plans to donate $50,000 to a charity in three months.

2 Discuss how *each* of the following components of Stern's investment policy statement should now reflect the changes in his circumstances.

i. Risk tolerance.

ii. Return requirement.

iii. Liquidity needs.

iv. Time horizon.

Note: Your discussion should focus on, but not be limited to, the *direction* and *magnitude of change* in each component rather than on a specific numeric change.

Stern's investment portfolio at age 75 is summarized in Exhibit 3.

Exhibit 3 Stern's Investment Portfolio at Age 75

	Current Allocation	Expected Return	Expected Standard Deviation
Cash equivalents	2%	5%	3%
Fixed income	75	7	8
Domestic equities	10	10	16
International equities	3	12	22
Domestic real estate	10	10	17

3 Given Stern's changed circumstances, state whether the current allocation to *each* asset class should be lower, the same, or higher. Justify your response with *one* reason for *each* asset class. No calculations are required.

i. Cash equivalents.

ii. Fixed income.

iii. Domestic equities.

iv. International equities.

v. Domestic real estate.

Note: Your response should be based only on Stern's changed circumstances and the information in Exhibit 3.

4 Explain one way in which Stern might seek to reduce the tension between his current return requirement and his current risk tolerance.

Solution to 1:

Fund D represents the single *best* addition to complement Stern's current portfolio, given the selection criteria. Fund D's expected return (14.0 percent) has the potential to increase the portfolio's return somewhat. Second, Fund D's relatively low correlation coefficient with his current portfolio (+0.65) indicates that it will provide larger diversification benefits than any of the other alternatives except Fund B. The result of adding Fund D should be a portfolio with about the same expected return and somewhat lower volatility compared to the original portfolio.

The other three funds have shortcomings in either expected return enhancement or volatility reduction through diversification:

- Fund A offers the potential for increasing the portfolio's return but is too highly correlated with other holdings to provide substantial volatility reduction through diversification.
- Fund B provides substantial volatility reduction through diversification but is expected to generate a return well below the current portfolio's return.
- Fund C has the greatest potential to increase the portfolio's return but is too highly correlated with other holdings to provide substantial volatility reduction through diversification.

Solution to 2:

i. *Risk tolerance.* Stern's risk tolerance has declined as a result of investment losses and the material erosion of his asset base. His *willingness* to accept risk as reflected in his portfolio holdings and aversion to international equities has declined. Also, Stern's return requirement has risen sharply at the same time that assets available to generate that return are lower. Thus, Stern's *ability* to accept risk has also declined. Investments should emphasize less volatile securities.

ii. *Return requirement.* Stern now has a return requirement that represents an increase in both dollar and percentage terms from his return objective of 20 years earlier. In contrast to his prior situation, Stern now must use investments to meet normal living expenses.

Stern's annual expenses not covered by annuity payments total $130,000 (10.8 percent of his now reduced assets). His expenses are increasing at a rate at least as high as the 3 percent general inflation rate. To stay ahead of inflation without eroding the principal value of his portfolio, Stern needs to earn 13.8 percent. This percentage will increase to 14.3 percent after the $50,000 charitable donation occurs, because this distribution will further diminish Stern's asset base.

iii. *Liquidity needs*. Stern will require $50,000 (4.2 percent of assets) in three months for a charitable donation. In addition, Stern's need to fund a large part of his living expenses from his portfolio has created a substantial

ongoing liquidity need. Investments should emphasize liquid securities in part to meet any unplanned near-term expenses without incurring substantial transaction costs.

iv. *Time horizon.* Stern is now 20 years older than when his initial investment policy was written. Assuming his life expectancy is normal, Stern's time horizon remains long term (i.e., in excess of 10 years) but shorter than when the initial policy was drafted.

Solution to 3:

i. Cash equivalents should have a substantially higher weight than 2 percent. Stern requires $50,000 (4.2 percent of assets) in three months for the charitable donation. Compared with his position 20 years ago, his willingness and ability to accept volatility have decreased, his liquidity needs have increased, and his time horizon is now shorter. Stern needs a larger portion of his portfolio in low-risk, highly liquid assets.

ii. Fixed income should have a lower weight than 75 percent. Bonds are expected to provide a greater return than cash equivalents, which would help to meet Stern's return requirement. To meet additional liquidity needs and provide higher returns for expenses and inflation, however, a lower allocation is warranted.

iii. Domestic equities should have a higher weight than 10 percent. Stern requires fairly high returns and protection from inflation. Domestic equity investments would help meet those needs, but his lower ability and willingness to assume risk suggest only a moderate allocation to this somewhat volatile asset class, although higher than the current allocation.

iv. International equities should be eliminated. Although international equities may provide higher returns and diversification benefits, Stern is uncomfortable with holding international equities because of his experience with them. In the interests of respecting client wishes, Holmstrom should thus eliminate this asset class from the portfolio.

v. Domestic real estate should have a lower weight than 10 percent because of Stern's substantial liquidity requirements and reduced risk tolerance. Domestic equities have the same expected return as real estate with lower expected standard deviation and generally greater liquidity; therefore, domestic equities would be favored over domestic real estate among the higher expected return asset classes. Nevertheless, a smaller (i.e., less than 10 percent) real estate allocation could be maintained to obtain diversification benefits, to possibly generate income, and as a potential hedge against inflation.

Solution to 4:

Based on his current expenses of $150,000 annually, Stern has a very high return requirement in relation to his current risk tolerance. The most direct way to reduce this tension would be to decrease annual expenses, although that might involve a change in living arrangements or lifestyle. For example, if annual expenses were cut by one-third to $100,000, only $80,000 would need to be supplied by investments after annuity payments. That would represent $80,000/$1,200,000 = 6.7% of assets, resulting in a return requirement of 9.7% prior to the charitable contribution. All else equal, the higher the return

requirement relative to actual returns earned, the greater the need to spend principal and the greater **longevity risk** (the risk that one will outlive one's funds). Reducing expenses would mitigate that risk.

High-net-worth individuals often face the issue of concentrated stock holdings, which may be complicated by the issue of high unrealized capital gains. In Example 3, a change in client circumstances leads an investment advisor to search for the appropriate means to address the problem.

EXAMPLE 3

An Investor with a Concentrated Stock Position

Jonathan Wiese, CFA, serves as investment counsel for the Lane family. Franklin Lane, 62 years old, has a 2,000,000 share position in Walton Energy, Inc. (WEI), an actively traded mid-cap energy company, accumulated through five years' service on its board of directors and earlier service as chief operating officer. At current market prices, the position is worth $24,000,000, representing 40 percent of Lane's total portfolio of $60,000,000. Another 20 percent of his portfolio is invested in other common equities, with the balance of 40 percent invested in Treasury inflation-protected and government agency securities. The cost basis of the WEI position is $2,400,000, and the sale of the position would trigger a tax liability exceeding $3.2 million. In the past Lane has insisted on maintaining his position in WEI shares to show his commitment to the company, but with Lane's recent retirement from WEI's board Wiese has suggested that a portfolio review is appropriate. WEI shares are part of a mid-cap stock index, and Lane's position is substantial compared to average daily trading volume of WEI. Techniques to deal with concentrated stock positions fall under the rubric of hedging and monetization strategies. Wiese has organized several of these strategies in Exhibit 4, one or more of which may be appropriate to deal with Lane's concentrated position.

Exhibit 4 Hedging and Monetization Strategies

Strategy and Description	Advantages	Drawbacks
Zero-premium collar. Simultaneous purchase of puts and sale of call options on the stock. The puts are struck below and the calls are struck above the underlying's market price. The call premiums fund the cost of the puts.	■ Locks in a band of values for the stock position. ■ Defers capital gains until stock is actually sold.	■ Hedge lasts only the duration of the option's life. ■ Involves commissions. ■ Provides downside protection but gives away most of upside.
Variable prepaid forward. In effect, combines a collar with a loan against the value of the shares. When the loan comes due (often in two to four years), shares are sold to pay off the loan and part of any appreciation is shared with the lender.	■ Converts 70 to 90 percent of the value of the position to cash. ■ Defers capital gains until stock is actually sold.	■ Involves commissions and interest expenses. ■ Surrenders part of any appreciation in the stock.

(continued)

Exhibit 4 (Continued)

Strategy and Description	Advantages	Drawbacks
Exchange fund. Fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself. At the end of a period of time (often seven years), the fund distributes assets to shareholders pro rata.	■ Diversifies holdings without triggering tax consequences.	■ Expense ratio often 2 percent and other fees usually apply. ■ Diversification may be incomplete.
Private exchange. Shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.	■ Exchange is tax free. ■ Low continuing expenses. ■ Greatly increases diversification.	■ Shares usually must be part of an index so not generally applicable. ■ Share position must be very substantial. ■ Concession to market value of shares exchanged may need to be offered. ■ May not be possible to arrange because fund interest may be lacking.

Note: Zero-premium collars and variable prepaid forwards may involve a tax liability; the taxation of these strategies varies across tax jurisdictions.

Lane faces no liquidity requirements, at least in the short term. At the review, Wiese and Lane agree that a 60/40 stock/bond mix remains appropriate for Lane.

1 Identify and evaluate Lane's primary investment need and the primary constraint on addressing that need.

2 Determine and justify the two strategies that most directly address the need identified in Part 1.

Solution to 1:

Lane's primary need is for diversification of his concentrated stock position. Having ended his last ties to WEI, Lane should be in a position to satisfy that need. The tax liability that would result from a sale of WEI stock, however, acts as a constraint on addressing that need: Selling the WEI position and investing the proceeds in a diversified stock portfolio would incur a tax liability of about $3.2 million.

Solution to 2:

The exchange fund and private exchange options most directly address Lane's diversification need. The zero-premium collar would hedge the value of WEI position but would not diversify Lane's equity position. Also, the zero-premium collar would essentially convert the WEI holding into a position with volatility not dissimilar to short-term bonds, over the collar's duration, changing the effective asset allocation. The variable prepaid forward would convert a large fraction of the value of the position to cash, which could then be invested in a diversified equity position; so that instrument could be used to address the diversification need. Because of the huge built-in tax liability, however, Lane would need to roll over the forward indefinitely with the attendant expenses. The exchange fund is a costly option because of its fee structure, but it does address Lane's needs

more directly and on a longer-term basis. The same can be said of the private exchange option, which appears to be more cost effective than the exchange fund while achieving a similar purpose.

2.2 Monitoring Market and Economic Changes

In addition to changes in individual client circumstances, the economic and financial markets contexts of investments also require monitoring. Those contexts are not static. The economy moves through phases of expansion and contraction, each with some unique characteristics. Financial markets, which are linked to the economy and expectations of its future course, reflect the resulting changing relationships among asset classes and individual securities.[3] A portfolio manager's monitoring of market and economic conditions should be broad and inclusive. Changes in asset risk attributes, market cycles, central bank policy, and the yield curve and inflation are among the factors that need to be monitored.

2.2.1 *Changes in Asset Risk Attributes*

The historical record reflects that underlying mean return, volatility, and correlations of asset classes sometimes meaningfully change. An asset allocation that once promised to satisfy an investor's investment objectives may no longer do so after such a shift. If that is the case, investors will need either to adjust their asset allocations or to reconsider their investment objectives. Monitoring changes in asset risk attributes is thus essential. Fiduciaries also owe their clients a duty to understand the risk factors in individual investments as such factors evolve.

Changes in asset risk attributes also present investment opportunities. Market prices for all assets reflect consensus perceptions of risk and reward. Changes in those perceptions produce immediate gains or losses. Successful active managers assess differences between actual risk and perceived risk of an investment and embrace that investment when the consensus view is unduly pessimistic.

Investment theoreticians and practitioners have long recognized the risk–reward trade-off. Long-run incremental rewards are generally unattainable without incurring incremental risk. Conversely, an investor must sacrifice some return when seeking to minimize risk. Systematic risk, which diversification cannot eliminate, is the most likely type of risk to promise reward according to asset pricing theory. Although a link exists between systematic risk and return, it is less consistent than pure theory suggests. For active managers, the key to exploiting inconsistencies lies in determining when risk is already priced into an asset and when perceptions of risk deviate enough from quantifiable risk so that a courageous investor can profit from favorable mispricings and avoid the others. In equity markets historically, increasing volatility has signaled opportunity more often than not, providing buying opportunities when fear prompts others to sell.

2.2.2 *Market Cycles*

Investors monitor market cycles and valuation levels to form a view on the short-term risks and rewards that financial markets offer. Based on these opinions, investors may make tactical adjustments to asset allocations or adjust individual securities holdings.

Tactically, the markets' major swings present unusual opportunities to be either very right or very wrong. When things are going well, securities eventually perform too well; during economic weakness, stock prices often decline excessively. Weakness engenders an environment that may foreshadow extraordinary profits, while ebullient

3 See the reading on capital market expectations for more information.

markets provide unusual opportunities to sell, reinvesting elsewhere. Although this point is easily illustrated by looking over our shoulders at the US stock market in 1999 and 2000, it should be remembered that it was only the extremeness of the 1999–2000 market peak that is notable; these cycles recur nearly every decade or so. Market veterans may recall the environment of late 1974 as one of extraordinary opportunity. At one point the earnings yield of the US stock market was 600 bps higher than bond yields, a difference not seen since the early 1950s. Conversely, in 1980 and 1981 and again in 1999 and 2000, bond yields exceeded earnings yields by a wide margin. That cyclical top presented another historic tactical opportunity as well as a shining example of the power and speed of mean reversion of asset-class returns. Reducing exposure to outperforming asset classes and increasing exposure to underperforming asset classes at the asset-class level—selling the stocks that had proven so comfortable and buying the bonds that the investment world seemed then to abhor—would have had a profound positive influence on total portfolio risk and return during those times.

Individual securities routinely show similar excesses. There are always securities whose issuers have either received such laudatory notices or suffered such unremitting adversity that their prices depart from reality. It is difficult to isolate those securities and then to act; only those investors suitably prepared and armed with courage will accept the challenge.

2.2.3 *Central Bank Policy*

Central banks wield power in the capital markets through the influence of their monetary and interest rate decisions on liquidity and interest rates. Their influence is felt in both bond and stock markets.

In bond markets, the most immediate impact of monetary policy is on money market yields rather than long-term bond yields. A central bank's influence on bond market *volatility*, however, is profound.

An example of this influence occurred in 1979, when the board of the US Federal Reserve Bank under Paul Volcker changed its focus from controlling interest rates to controlling monetary growth. Previously the board had adjusted the discount rate in response to movements in the money supply, while simultaneously trying to manage that supply. Interest rates took a back seat in the board's deliberations, and T-bill rates rose from 9 percent to 14 percent in an eight-month period. The effect was dramatic. Volatility in the bond market exploded between late 1979 and mid-1982 (at which time policy was quietly reversed to combat recession). High-yielding bonds provided a compelling alternative to stocks, putting downward pressure on stock prices until the summer of 1982, when rallying bond prices and declining bond yields finally eased the pressure, making stocks again more attractive.

Turning to the stock market, "Do not fight the Fed" has been a longstanding warning from Martin Zweig—a warning that it can be problematic to invest in the market when the Fed is tightening the money supply. Jensen, Johnson, and Mercer (2000) and Conover, Jensen, Johnson, and Mercer (2005) have documented that in the United States, stock returns are on average higher during periods of expansionary monetary policy than in periods of restrictive monetary policy, as indicated by decreases and increases in the discount rate, respectively.[4]

These lessons bear repetition. Fed policy does matter and should not be ignored: Restricted credit and higher interest rates usually hurt stock returns; eased credit and lower interest rates usually enhance stock returns.

4 The discount rate is the rate a Federal Reserve member bank pays for borrowing reserves from the Federal Reserve system. Along with open market operations (the purchase and sale of government securities by the Fed) and changes in reserve requirement, discount rate policy is one of the three tools of US monetary policy.

2.2.4 *The Yield Curve and Inflation*

The default-risk-free yield curve reflects investors' required return at various maturities. It incorporates not only individuals' time preferences for current versus future real consumption but also expected inflation and the maturity premium demanded. Yield curve changes reflect changes in bond values, and bond value changes affect equity values through the competition that bonds supply to equities. Thus investors closely monitor the yield curve.

The premium on long-term bonds over short-term bonds tends to be countercyclical (i.e., high during recessions and low at the top of expansions) because investors demand greater rewards for bearing risk during bad times. By contrast, short-term yields tend to be procyclical because central banks tend to lower short rates in an attempt to stimulate economic activity during recessions. Yield curves thus tend to become steeply upward-sloping during recessions, to flatten in the course of expansions, and to be downward sloping (inverted) before an impending recession. In the United States, for example, nearly every recession after the mid-1960s was predicted by an inverted yield curve within six quarters of the recession; only one inverted yield curve was not followed by a recession during this period.[5] Thus the evidence suggests that the yield curve contains information about future GDP growth. Theory also suggests that the yield curve reflects expectations about future inflation.

Investors monitor a number of variables to gauge opportunities in bond markets. If relative yields of lower-quality issues exceed historical norms, the prospect of higher returns by investing in bonds of lower quality is enhanced. Even a measure as simple as the slope of the bond market yield curve is an indicator of bond performance relative to (short-term) cash equivalents.

Looking back at the late 1970s and early 1980s and focusing on yield curve slope rather than height, the spread between bond yields and cash yields steepened, starting with a flat to mildly inverted yield curve from late 1978 through mid-1981 and increasing to a 4 percent bond risk premium by July 1982. This increased bond risk premium preceded the bond rally of August–October 1982, during which 30-year Treasuries rallied 29 percent in three months. Although it is the rise in interest rates that catalyzes subsequent stock bear markets, it is the spread between long-term and short-term rates that presages bond rallies. If the yield curve is unusually steep (i.e., if bond yields are high relative to cash equivalent yields), the outlook tends to be good for bonds. This relationship is significant when either cash yield or the inflation rate is used as a proxy for the underlying risk-free rate.[6]

This interpretation of steep yield curves is unconventional. The usual fear is that the forward curve[7] foreshadows rising yields and falling bond prices. Empirical evidence tends to refute any basis for that apprehension.

Inflation has a pervasive influence on investors' ability to achieve their financial and investment objectives. On the one hand, it affects the nominal amount of money required to purchase a given basket of goods and services. On the other hand, inflation influences returns and risk in capital markets. When inflation rises beyond

5 See Ang, Piazzesi, and Wei (2006).

6 T-bills and other cash instruments are not truly risk free, as they have both nonzero durations and nonzero standard deviations. Although they are generally an excellent reflection of the theoretical risk-free rate, the inflation rate can sometimes be preferable as a proxy for the risk-free rate, because it is not directly subject to manipulation by a central bank.

7 A "forward curve" shows the incremental yield earned by going one step further out on the yield curve. Suppose a one-year bond yields 2 percent and an equivalent-credit two-year bond yields 4 percent. The two-year bond must have a one-year forward yield of approximately 6 percent during its second year in order for its two-year average yield to be 4 percent. A steep yield curve implies an expectation of rising future bond yields.

expectations, bond investors face a cut in *real yield.* As nominal yields rise in turn to counteract this loss, bond prices fall. Unexpected changes in the inflation rate are highly significant to stock market returns as well.

2.3 Monitoring the Portfolio

Monitoring a portfolio is a continuous process that requires the manager to evaluate 1) events and trends affecting the prospects of individual holdings and asset classes and their suitability for attaining client objectives and 2) changes in asset values that create unintended divergences from the client's strategic asset allocation. The former tend to lead to changes in investment policy or to substitutions of individual holdings; the latter lead directly to rebalancing to the existing strategic asset allocation.

In a perfect-markets world, we could hold portfolio managers to a demanding standard: If a portfolio manager were to begin building a portfolio afresh today, would it mirror the existing portfolio? If not, he should consider changing the existing portfolio. Of course, taxes and transaction costs, discussed later, mean managers do not continuously revise portfolios. After even one day no portfolio is exactly optimal; however, the costs of adjustment may well outweigh any expected benefits from eliminating small differences between the current portfolio and the best possible one.

New information on economic and market conditions or on individual companies may lead a portfolio manager to take a variety of investment actions in an effort to add value for the client. The following examples offer some perspectives for the practitioner to consider as he or she translates monitoring into investment action.

EXAMPLE 4

How Active Managers May Use New Analysis and Information

As portfolio managers gather and analyze information that leads to capital market expectation revisions, they may attempt to add value through at least three types of portfolio actions:

- **Tactical asset allocation.** The portfolio manager may, in the short term, adjust the target asset mix within the parameters of the investment policy statement by selling perceived overpriced asset classes and reinvesting the proceeds in perceived underpriced asset classes in an attempt to profit from perceived disequilibria. When an investor's long-term capital market expectations change, however, the manager must revisit the strategic asset allocation.
- **Style and sector exposures.** Portfolio managers may alter investment emphasis within asset classes because of changes in capital market expectations. For example, a portfolio manager may lengthen the duration in the fixed-income allocation based on expectations of a sustained period of declining interest rates or adjust the style of the equity portfolio based on expectations that an economy is entering a period of sustained economic growth. Portfolio managers also may adjust the exposure to certain sectors back to or closer to historical weightings to reduce sector exposure relative to the index. For example, consider the impact on portfolio risk and return of reducing the exposure to the technology sector (within the

large-cap US equity allocation) in January 2000, when technology represented more than 31 percent of the S&P 500 Index relative to the historical average of about 17 percent.

- **Individual security exposures.** A portfolio manager may trade an individual issue for one that seems to offer better value or reduce the exposure of a specific security as the returns of a single security begin to contribute a greater proportion of the total return than the manager believes to be appropriate.

EXAMPLE 5

The Characteristics of Successful Active Investors

Ironic gaps exist between the theory of revising portfolios and its practice. Some managers persist in constantly juggling the asset mix and churning portfolios in response to their basic emotions, clouded thinking, classic behavioral finance errors, and the desire to maximize fee revenue—often shrouding their "illusion of action" with marketing glitz. Clients tend to hire managers after recent success and fire them after recent disappointment. This chasing of investment performance, which reflects human nature, infrequently benefits investment results. What then are the elements of investment success?

Successful active investors stray from established roles. Nature conditions us to feel that what has been working will continue to work and that failure heralds failure. In investments, experience belies this notion. Consider investment managers who scramble to find a fix when their style is out of fashion. Often they (and their clients) change their approach during a period of disappointment, just before results rebound. We see the same pattern in customers' decisions to hire and fire managers. These costly errors stem from a quest for comfort that capital markets rarely reward and a lack of discipline to remain committed to long-term strategy as defined in the investment policy statement. Investors crave the solace that companionship affords. In the investment business, when one has too much company, success is improbable.

Successful active investors are not swayed by the crowd. The cultures of successful corporations and winning investors are profoundly different. Corporations, which are cooperative enterprises, prize teamwork and reward triumph while dismissing failure. The exceptional investor pursues an opposite course, staying far from the crowd and seeking opportunities in overlooked areas while avoiding excesses of the crowd. Investing in areas that are not popular while refusing to join in trends sets the successful investor apart.

Successful active investors are disciplined. There is a subtle pattern in the trading of successful investors and a key ingredient of investment success—discipline. Successful investors make disciplined changes even when they are performing well, and they often are willing to endure disappointment patiently.

Opportunistic investors must steel themselves against discomfort. Only knowledge and discipline can give them the confidence needed to transact. Indeed, even then, consideration for clients (or fears of their reactions) may inhibit the profitable move. Many investors fear the consequences of acting contrary to recent market experience. Disciplined investment decision processes add value by providing an *objective* basis for having confidence in an uncomfortable investment action.

As we shall discuss in more detail later, disciplined rebalancing to the strategic asset allocation reinforces the strategy of selling high and buying low or reducing exposure to outperforming asset classes and increasing exposure to underperforming asset classes. That behavior and discipline unfortunately is at odds with human nature. When investments have performed poorly, less successful investors and portfolio managers tend to address the problem by making changes for the sake of change or by abandoning a strategy altogether! If investments are doing well, the tendency is to coast with the winning strategy. These common patterns can often make underperformance problems significantly worse (i.e., selling near the bottom) or result in forgoing some portion of handsome market gains (i.e., not selling near the top).

EXAMPLE 6

The Nonfinancial Costs of Portfolio Revision

When a portfolio manager revises a portfolio, he obviously incurs financial costs as detailed later in Section 3.1.2. Financial costs will indeed be a focus of the section on rebalancing. But the costs of transacting can also take nonfinancial forms. If a client grows uncomfortable with portfolio turnover she considers excessive, the portfolio manager may lose credibility and the client may limit future trading. Even if trading is timely and likely to be profitable, it may impose subjective costs that are all too real. Finance theory recognizes these costs by directing managers to focus on optimizing client satisfaction rather than maximizing return. Even the most profitable strategy or investment process is useless if the client abandons it.

3 REBALANCING THE PORTFOLIO

Monitoring and rebalancing a portfolio is similar to flying an airplane: The pilot monitors and adjusts, if necessary, the plane's altitude, speed, and direction to make sure that the plane ultimately arrives at the predetermined destination. Just as a pilot makes in-flight adjustments, so does the portfolio manager. An important question in this regard is how far off course can the plane get before the pilot must make an adjustment? In the following sections we address that issue, but we first must be clear on the scope of what we will discuss under the rubric of rebalancing.

The term "rebalancing" has been used in the literature of investing to cover a range of distinct actions including 1) adjusting the actual portfolio to the current strategic asset allocation because of price changes in portfolio holdings; 2) revisions to the investor's target asset class weights because of changes in the investor's investment objectives or constraints, or because of changes in his capital market expectations; and 3) tactical asset allocation (TAA). For pedagogical reasons and because subjects such as TAA are covered in other readings, in this section we use "rebalancing" to refer only to the first type of action: rebalancing to the strategic asset allocation in reaction to price changes. Both individual and institutional investors need to set policy with respect to this type of action.

3.1 The Benefits and Costs of Rebalancing

Portfolio rebalancing involves a simple trade-off: the cost of rebalancing versus the cost of not rebalancing.

3.1.1 *Rebalancing Benefits*

Clients and their investment managers work hard to have their normal asset policy mix reflect an educated judgment of their appetite for reward and their aversion to risk. That having been done, however, the mix often drifts with the tides of day-to-day market fluctuations. If we assume that an investor's strategic asset allocation is optimal, then any divergence in the investor's portfolio from this strategic asset allocation is undesired and represents an expected utility loss to the investor. Rebalancing benefits the investor by reducing the present value of expected losses from not tracking the optimum. In theory, the basic cost of not rebalancing is this present value of expected utility losses.[8] Equivalently, the cost of not rebalancing is the present value of expected utility losses from straying from the optimum.

There are also several practical risk management benefits to rebalancing. First, if higher-risk assets earn higher returns on average and we let the asset mix drift, higher-risk assets will tend to represent ever-larger proportions of the portfolio over time. Thus the level of portfolio risk will tend to drift upward.[9] Portfolio risk will tend to be greater than that established for the client in the investment policy statement. Rebalancing controls drift in the overall level of portfolio risk. Second, as asset mix drifts, the *types* of risk exposures drift. Rebalancing maintains the client's desired systematic risk exposures. Finally, not rebalancing may mean holding assets that have become overpriced, offering inferior future rewards. A commitment to rebalance to the strategic asset allocation offers an effective way to dissuade clients from abandoning policy at inauspicious moments. Once signed on to the concept, clients are more likely to stay the course.

Example 7 illustrates the benefits of disciplined rebalancing judged against the do-nothing alternative of letting asset mix drift.

EXAMPLE 7

An Illustration of the Benefits of Disciplined Rebalancing

Although portfolios can be rebalanced using a variety of methods, it is important to recognize that, in comparison to letting an asset mix drift, any disciplined approach to rebalancing tends to add value over a long-term investment horizon by enhancing portfolio returns and/or reducing portfolio risk.

For example, assume an institutional client wishes to maintain the stated policy mix of 60 percent stocks and 40 percent bonds and requires monthly rebalancing to the equilibrium 60/40 mix. That asset mix is not uncommon for North American pension funds and provides a reasonable baseline from which to quantify the likely benefits from disciplined rebalancing. Transaction costs of 10 bps on each side of a trade are assumed to be attainable using futures.

In the four decades (1973–2010) summarized in Exhibits 5 and 6, simple monthly rebalancing produced an average annual return of 9.29 percent versus 9.02 percent for a drifting mix—a 27 bp enhancement. Furthermore,

8 See Leland (2000).

9 This type of drift will be more acute for portfolios with asset classes with dissimilar volatility and/or with low correlations.

the incremental return involved significantly less risk. That is, the rebalanced portfolio's standard deviation during that time period was 11.96 percent versus 13.66 percent—170 bps less than that of the drifting mix!

Analyzing the results of the two strategies across time adds additional insight. Examining Exhibit 6 gives rise to some significant return differences. First, the rebalancing strategy significantly underperformed the drifting mix strategy in the late 1990s as the tech bubble began to build. During this period, the equity market experienced large gains attributable mainly to technology stocks. As equity prices kept climbing, the drifting mix portfolio held higher and higher percentages of its assets in equity. As long as the price of equities continued to rise, the drifting mix benefitted from its skewed asset allocation. As the tech bubble burst in 2000, however, the benefit of disciplined rebalancing becomes obvious. With the drastic price declines in stocks, the drifting mix portfolio suffers substantial losses in 2000, 2001, and 2002. Meanwhile, the rebalanced portfolio, which held a significant portion of assets in bonds throughout the tech bubble, is not as exposed to the bursting of the tech bubble and performs relatively well compared with the drifting mix portfolio.

A second trend evident in Exhibit 6 is the outperformance by the rebalanced portfolio during the recent economic crisis. The intuition for this outperformance is similar to the explanation of the tech boom and bust above. With strong positive stock returns in the mid- 2000s, especially in 2003 and 2006, the drifting mix portfolio again becomes heavily invested in equities. With the equity market's precipitous drop in 2008, the drifting mix experiences a significant loss. The rebalanced portfolio, by retaining a healthy mix of stocks and bonds, avoids some of this exposure and performs relatively well.

In the most recent 16-year period (1995–2010), rebalancing appears to be even more beneficial. As seen in Exhibit 7, the additional average annual return for a monthly rebalanced portfolio over a drifting mix portfolio is 68 bps for the period. This incremental return is over twice as large as the 27 bps difference observed over the entire period from 1973–2010 (see Exhibit 5). Exhibit 7 illustrates that the risk (standard deviation of return) during the last 16 years is significantly higher than the risk measured for the entire 38-year period. However, consistent with the full-period findings, rebalancing during this more recent period results in substantially lower risk than the drifting mix approach (the difference in risk is 184 bps). Relative to the full-period, the recent 16-year period shows lower overall average returns and higher risk, yet the benefits of rebalancing remain consistent. This most recent period provides an obvious example of the benefit of rebalancing. By rebalancing, investors are able to retain a diversified mix of assets and avoid over-exposure to extreme price fluctuations in individual asset classes. Over the last 16 years, a rebalanced portfolio would have allowed investors to avoid some of the losses associated with the bursting of the tech bubble and the most recent financial crisis.

Exhibit 5 Full-Period Rebalancing Results January 1973–December 2010

	Rebalancing Return	Drifting Mix Return	Difference
Average	9.29%	9.02%	0.27%
Maximum	35.25	35.75	
Minimum	–15.71	–13.57	

Exhibit 5 (Continued)

	Rebalancing Return	Drifting Mix Return	Difference
Standard deviation	11.96	13.66	
Reward/Risk ratio	0.78	0.66	

Exhibit 6 Rebalancing Returns vs. Drifting Mix Returns By Year

Year	Rebalancing	Drifting Mix	Difference
1973	–10.22%	–10.19%	–0.03%
1974	–15.71	–13.57	–2.14
1975	24.87	21.66	3.21
1976	20.80	20.15	0.65
1977	–5.10	–4.62	–0.48
1978	3.28	2.51	0.77
1979	8.00	7.15	0.85
1980	16.09	15.46	0.63
1981	–1.51	–1.99	0.48
1982	29.40	28.90	0.50
1983	13.14	13.39	–0.25
1984	9.91	9.38	0.53
1985	32.41	32.29	0.12
1986	20.43	19.99	0.44
1987	2.73	1.30	1.43
1988	13.27	13.45	–0.18
1989	26.54	26.93	–0.39
1990	1.36	0.78	0.58
1991	26.26	26.74	–0.48
1992	7.64	7.55	0.09
1993	12.97	12.49	0.48
1994	–1.90	–1.36	–0.54
1995	35.25	35.75	–0.50
1996	13.58	16.23	–2.65
1997	26.38	29.00	–2.62
1998	24.45	26.60	–2.15
1999	9.12	15.72	–6.60
2000	–0.29	–6.98	6.69
2001	–5.17	–8.47	3.30
2002	–7.83	–12.88	5.05
2003	17.47	18.11	–0.64
2004	7.06	7.31	–0.25
2005	2.54	2.57	–0.03
2006	9.86	10.58	–0.72

(continued)

Exhibit 6 (Continued)

Year	Rebalancing	Drifting Mix	Difference
2007	5.79	5.19	0.60
2008	–23.75	–25.37	1.62
2009	17.93	16.85	1.08
2010	9.65	9.18	0.47

Exhibit 7 Portfolio Returns January 1995–December 2010

	Rebalancing	Drifting Mix	Difference
Average	8.88%	8.20%	0.68%
Maximum	35.25	35.75	
Minimum	–23.75	–25.37	
Standard deviation	14.38	16.22	
Reward/Risk ratio	0.62	0.51	

Example 7 reinforces the point that disciplined rebalancing has tended to reduce risk while incrementally adding to returns. "Tended" means just that: It does not work in every year or even in every market cycle, but it should work over long-term investment horizons. Historically, the benefit of rebalancing has justified the minimal activity involved with implementing the approach. Studies such as Arnott and Lovell (1993), Plaxco and Arnott (2002), and Buetow et al. (2002) have supported this conclusion using both historical and simulated data. Rebalancing to a fixed asset mix—because it involves both selling appreciated assets and buying depreciated assets—can be viewed as a contrarian investment discipline that can be expected to earn a positive return for supplying liquidity.

3.1.2 *Rebalancing Costs*

Despite its benefits, rebalancing exacts financial costs. These costs are of two types—transaction costs and, for taxable investors, tax costs.

Transaction Costs Transaction costs can never be recovered, and their cumulative erosion of value can significantly deteriorate portfolio performance. Transaction costs offset the benefits of rebalancing. Yet the true trade-off is not easy to gauge because transaction costs are difficult to measure.

Relatively illiquid investments such as private equity and real estate have become increasingly important in the portfolios of investors such as endowments and pension funds. These investments pose special challenges to rebalancing because the costs of rebalancing these investments represent a high hurdle. At the same time, the valuations given such assets often underestimate their true volatility because the valuations may be based on appraisals. If rebalancing requires reducing the value of illiquid holdings,

this reduction may sometimes be accomplished through reinvestment of cash flows from them.[10] At the same time, portfolio managers cannot increase the allocations of these assets as quickly as in liquid asset markets.

Focusing on more liquid markets such as public equities, we can estimate transaction costs but only with error. There is in fact no exact answer to the question of what the transaction costs of a trade are. Transaction costs consist of more than just explicit costs such as commissions. They include implicit costs, such as those related to the bid–ask spread and market impact. Market impact is the difference between realized price and the price that *would have prevailed in the absence of the order.* That cost is inherently unobservable. In an analogy to the Heisenberg principle in physics, the process of executing a trade masks what would exist without the trade taking place. Furthermore, the trades one seeks but fails to execute impose yet another tariff—an opportunity cost. This missed trade opportunity cost may be more onerous than the others, and it is equally unobservable. Trading costs take on the character of an iceberg: Commissions rise above the surface, visible to all, while the submerged leviathan encompasses the market impact of trades and the imponderable cost of the trades that never happened.

A useful analogy can be drawn from the bond market. Most bond portfolios are priced from matrix prices, which may better represent "fair value" than actual transaction prices.[11] Bond transaction prices can be too dependent on the idiosyncratic meeting of one buyer and one seller. The same curious conclusion can be drawn for equities. Actual prices are set by the marginal seller and buyer who represent not a consensus but the strongest motivation to transact at a particular point in time.[12]

Because unaffected prices are unobservable, market impact costs can never be more than indirectly estimated. Still, this is not a fatal flaw: Total transaction costs can be estimated to a useful degree of accuracy, relative to the imprecision of other financial measurements (e.g., beta, value or future internal rate of return).

Tax Costs In rebalancing, a portfolio manager sells appreciated asset classes and buys depreciated asset classes to bring the asset mix in line with target proportions. In most jurisdictions the sale of appreciated assets triggers a tax liability for taxable investors and is a cost of rebalancing for such investors.[13] The US tax code distinguishes between long- and short-term capital gains based on the length of the holding period (as of 2004, holding periods greater than 12 months qualify as long-term). As of 2004 the maximum tax rates applicable to short- and long-term capital gains in the United States, 35 percent and 15 percent respectively, differed significantly. For a US taxable investor, therefore, a rebalancing trade that realizes a short-term rather than long-term capital gain can be very costly. However, an appreciated asset class may contain assets with not only unrealized short- and long-term capital gains but also short- and long-term capital losses. Realizing short-term losses, long-term capital losses, long-term capital gains, and lastly short-term gains, in that order, would usually be the tax-efficient priority in selling. In contrast to the difference between long-and short-term capital gains, the value of the deferral of a long-term capital gain is generally much less in magnitude.[14]

10 See Horvitz (2002).

11 **Matrix prices** are prices determined by comparisons to other securities of similar credit risk and maturity.

12 The need to outbid competitive traders suggests that market impact can even be negative. Prices would always be the same or lower without the most motivated buyer's willingness to buy. Prices similarly would always be the same or higher without the most motivated seller's willingness to sell.

13 Some tax jurisdictions such as Jamaica, Hong Kong, and Singapore do not impose taxes on capital gains. See Ernst & Young (2005).

14 See Horvitz (2002). The value of tax deferral of X years is the tax bill if the sale is today (call this Y) minus the present value of Y to be paid in X years, using a default-risk-free tax-exempt rate.

3.2 Rebalancing Disciplines

A rebalancing discipline is a strategy for rebalancing. In practice, portfolio managers have most commonly adopted either calendar rebalancing or percentage-of-portfolio rebalancing.

3.2.1 *Calendar Rebalancing*

Calendar rebalancing involves rebalancing a portfolio to target weights on a periodic basis, for example, monthly, quarterly, semiannually, or annually. Quarterly rebalancing is one popular choice; the choice of rebalancing frequency is sometimes linked to the schedule of portfolio reviews.[15]

If an investor's policy portfolio has three asset classes with target proportions of 45/15/40, and his investment policy specifies rebalancing at the beginning of each month, at each rebalancing date asset proportions would be brought back to 45/15/40. Calendar rebalancing is the simplest rebalancing discipline. It does not involve continuously monitoring portfolio values within the rebalancing period. If the rebalancing frequency is adequate given the portfolio's volatility, calendar rebalancing can suffice in ensuring that the actual portfolio does not drift far away from target for long periods of time. A drawback of calendar rebalancing: It is unrelated to market behavior. On any given rebalancing date, the portfolio could be very close to or far away from optimal proportions. In the former case, the portfolio would be nearly optimal and the costs in rebalancing might swamp the benefits. In the latter case, an investor might incur unnecessarily high costs in terms of market impact by rebalancing.

3.2.2 *Percentage-of-Portfolio Rebalancing*

Percentage-of-portfolio rebalancing (also called percent-range or interval rebalancing) offers an alternative to calendar rebalancing. Percentage-of-portfolio rebalancing involves setting rebalancing thresholds or trigger points stated as a percentage of the portfolio's value. For example, if the target proportion for an asset class is 40 percent of portfolio value, trigger points could be at 35 percent and 45 percent of portfolio value. We would say that 35 percent to 45 percent (or 40% ± 5%) is the corridor or tolerance band for the value of that asset class. The portfolio is rebalanced when an asset class's weight first passes through one of its rebalancing thresholds, or equivalently, outside the corridor.

For example, consider a three-asset class portfolio of domestic equities, international equities, and domestic bonds. The target asset proportions are 45/15/40 with respective corridors 45% ± 4.5%, 15% ± 1.5%, and 40% ± 4%. Suppose the portfolio manager observes the actual allocation to be 50/14/36; the upper threshold (49.5%) for domestic equities has been breached. The asset mix would be rebalanced to 45/15/40.

Rebalancing trades can occur on any calendar date for percentage-of-portfolio rebalancing, in contrast to calendar rebalancing. Compared with calendar rebalancing (particularly at lower frequencies such as semiannual or annual), percentage-of-portfolio rebalancing can exercise tighter control on divergences from target proportions because it is directly related to market performance.

Percentage-of-portfolio rebalancing requires monitoring of portfolio values at an agreed-upon frequency in order to identify instances in which a trigger point is breached. To be implemented with greatest precision, monitoring should occur

15 In practice, some portfolio managers will rebalance a portfolio just before a scheduled client meeting so the portfolio manager appears to be fulfilling his or her responsibility, although that practice may reflect more the concerns of the portfolio manager than the concerns of the client. By contrast, other portfolio managers may rebalance a portfolio just after the client meeting so the client or investment committee has the opportunity to approve the manager's actions.

daily. Daily monitoring obviously requires having an efficient custodian, one who can accurately monitor and quickly process and communicate portfolio and asset class valuations.

An obvious and important question is: How are the corridors for asset classes determined?

Investors sometimes set ad hoc corridors. We have already illustrated an example of one well-known yet ad hoc approach, based on a hypothetical portfolio of domestic equities, international equities, and domestic bonds. The corridors were set according to a formula based on a percentage of the target allocation, target ± (target allocation × P%), where P% was 10% (but could be another percentage such as 5%). Following that formula, a corridor of 45% ± (45% × 10%) = 45% ± 4.5% applied to domestic stocks, 15% ± 1.5% applied to international equities, and 40% ± 4% applied to domestic bonds. However, *ad hoc* approaches such as this one are open to several criticisms. The approach illustrated does not account for differences in transaction costs in rebalancing these three asset classes, for example.

The literature suggests that at least five factors should play a role in setting the corridor for an asset class:

- transaction costs;
- risk tolerance concerning tracking risk versus the strategic asset allocation;
- correlation with other asset classes;
- volatility;
- volatilities of other asset classes.

The more expensive it is to trade an asset class (or the lower its liquidity), the wider its corridor should be, because the marginal benefit in rebalancing must at least equal its marginal cost. The higher the risk tolerance (i.e., the lower the investor's sensitivity to straying from target proportions), the wider corridors can be.

Correlations also should be expected to play a role. In a two asset-class case, a higher correlation should lead to wider tolerance bands. Suppose one asset class has moved above its target allocation (so the other asset class is below its target weight). A further increase in value has an expected smaller effect on asset weights if the assets classes' returns are more highly positively correlated because the denominator in computing the asset class's weight is the sum of the values of the two asset classes. That denominator's value is likely to be higher for a given up-move of the asset class of concern if the two asset classes' returns are positively correlated. In a multi-asset-class case, all pairwise asset class correlations would need to be considered, making the interpretation of correlations complex. To expand the application of the two-asset case's intuition, one simplification involves considering the balance of a portfolio to be a single hypothetical asset and computing an asset class's correlation with it.[16]

A higher volatility should lead to a narrower corridor, all else equal. It hurts more to be a given percent off target for a more highly volatile asset class because it has a greater chance of a further large move away from target. In a two-asset case the more volatile the second asset, the more risk there is in being a given percent off target for the first asset class, all else equal. All asset classes' volatilities would affect the optimal corridor in the multi-asset-class case. Again, a simplification is to treat the balance of the portfolio as one asset. Exhibit 8 summarizes the discussion. (It applies to the two-asset-class case, or to the multi-asset-class case with the simplification of treating all other asset classes—the balance of the portfolio—as one asset class.)

16 As in Masters (2003).

Exhibit 8 Factors Affecting Optimal Corridor Width

Factor	Effect on Optimal Width of Corridor (All Else Equal)	Intuition
Factors Positively Related to Optimal Corridor Width		
Transaction costs	The higher the transaction costs, the wider the optimal corridor.	High transaction costs set a high hurdle for rebalancing benefits to overcome.
Risk tolerance	The higher the risk tolerance, the wider the optimal corridor.	Higher risk tolerance means less sensitivity to divergences from target.
Correlation with rest of portfolio	The higher the correlation, the wider the optimal corridor.	When asset classes move in synch, further divergence from targets is less likely.
Factors Inversely Related to Optimal Corridor Width		
Asset class volatility	The higher the volatility of a given asset class, the narrower the optimal corridor.	A given move away from target is potentially more costly for a high-volatility asset class, as a further divergence becomes more likely.
Volatility of rest of portfolio	The higher this volatility, the narrower the optimal corridor.	Makes large divergences from strategic asset allocation more likely.

EXAMPLE 8

Tolerance Bands for an Asset Allocation

An investment committee is reviewing the following strategic asset allocation:

Domestic equities	50% ± 5%
International equities	15% ± 1.5%
Domestic bonds	35% ± 3.5%

The committee views the above corridors as appropriate if each asset class has identical risk and transaction-cost characteristics. It now wants to account for differences among the asset classes in setting the corridors.

Evaluate the implications of the following sets of facts on the stated tolerance band (set off by italics), given an all-else-equal assumption in each case:

1. Domestic bond volatility is much lower than that of domestic or international equities, which are equal. *Tolerance band for domestic bonds.*
2. Transaction costs in international equities are 10 percent higher than those for domestic equities. *Tolerance band for international equities.*
3. Transaction costs in international equities are 10 percent higher than those for domestic equities, and international equities have a much lower correlation with domestic bonds than do domestic equities. *Tolerance band for international equities.*

4 The correlation of domestic bonds with domestic equities is higher than their correlation with international equities. *Tolerance band for domestic equities.*

5 The volatility of domestic bonds has increased. *Tolerance band for international equities.*

Solution to 1:

The tolerance band for domestic bonds should be wider than 35% ± 3.5%.

Solution to 2:

The tolerance band for international equities should be wider than 15% ± 1.5%.

Solution to 3:

Transaction costs point to widening the tolerance band for international equities, but correlations to narrowing it. The overall effect is indeterminate.

Solution to 4:

The tolerance band for domestic equities should be wider than 50% ± 5%.

Solution to 5:

The tolerance band for international equities should be narrower than 15% ± 1.5%.

3.2.3 *Other Rebalancing Strategies*

The investment literature includes rebalancing disciplines other than those discussed above. Calendar rebalancing can be combined with percentage-of-portfolio rebalancing (as described in Buetow et al.). In this approach (which may be called **calendar-and-percentage-of-portfolio rebalancing**), the manager monitors the portfolio at regular frequencies, such as quarterly. The manager then decides to rebalance based on a percentage-of-portfolio principle (has a trigger point been exceeded?). This approach mitigates the problem of incurring rebalancing costs when near the optimum that can occur in the calendar rebalancing.

McCalla (1997) describes an **equal probability rebalancing** discipline. In this discipline, the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor. In this discipline each asset class is equally likely to trigger rebalancing if the normal distribution describes asset class returns. However, equal probability rebalancing does not account for differences in transaction costs or asset correlations.

Goodsall and Plaxco (1996) and Plaxco and Arnott (2002) discuss as **tactical rebalancing** a variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals. This approach seeks to add value by tying rebalancing frequency to expected market conditions that most favor rebalancing to a constant mix.

3.2.4 *Rebalancing to Target Weights versus Rebalancing to the Allowed Range*

In the descriptions of rebalancing strategies, we have presented the standard paradigm in which a rebalancing involves adjusting asset class holdings to their target proportions. The alternative, applicable to rebalancing approaches that involve corridors, is to rebalance the asset allocation so that all asset class weights are within the allowed range but not necessarily at target weights. The rebalancing may follow a rule, such as adjusting weights halfway back to target (e.g., if an asset class's corridor is 50% ± 5% and the asset class's weight is 57 percent, reducing the weight to 52.5%), or to some judgmentally determined set of proportions. Compared with rebalancing to

target weight, rebalancing to the allowed range results in less close alignment with target proportions but lower transaction costs; it also provides some room for tactical adjustments. For example, suppose that a US investor's target allocation to non-US equities is 15 percent and that its weight moves above its corridor on the upside. During an expected transitory period of a depreciating US dollar, the portfolio manager may want to rebalance the exposure only part way to the target proportion to take advantage of the apparent exchange rate tactical opportunity. The discipline of rebalancing to the allowed range also allows portfolio managers to better manage the weights of relatively illiquid assets.

A number of studies have contrasted rebalancing to target weights to rebalancing to the allowed range based on particular asset classes, time periods, and measures of the benefits of rebalancing. They have reached a variety of conclusions which do not permit one to state that one discipline is unqualifiedly superior to the other.

3.2.5 *Setting Optimal Thresholds*

The optimal portfolio rebalancing strategy should maximize the present value of the *net* benefit of rebalancing to the investor. Equivalently, the optimal strategy minimizes the present value of the sum of two costs: expected utility losses (from divergences from the optimum) and transaction costs (from rebalancing trades). Despite the apparent simplicity of the above formulations, finding the optimal strategy in a completely general context remains a complex challenge:

- If the costs of rebalancing are hard to measure, the benefits of rebalancing are even harder to quantify.
- The return characteristics of different asset classes differ from each other, and at the same time interrelationships (correlations) exist among the asset classes that a rebalancing strategy may need to reflect.
- The optimal rebalancing decisions at different points in time are linked; one decision affects another.
- Accurately reflecting transaction costs may be difficult; for example, transaction costs can be nonlinear in the size of a rebalancing trade.
- The optimal strategy is likely to change through time as prices evolve and new information becomes available.
- Rebalancing has tax implications for taxable investors.

Researchers are beginning to make headway in addressing optimal rebalancing in a general context.[17] At some future date, investors may be able to update optimal rebalancing thresholds in real time based on a lifetime utility of wealth formulation, including a transaction costs penalty component. Implementing such a system lies in the future rather than present of industry practice. If reasonable simplifying assumptions are permitted, some models are currently available to suggest specific values for optimal corridors, although no industry standard has been established yet.

3.3 The Perold–Sharpe Analysis of Rebalancing Strategies

Prior sections discussed rebalancing to a strategic asset allocation for a portfolio of many risky asset classes. That discipline of rebalancing, which can also be called a constant-mix strategy, is a bread-and-butter topic for investment practitioners. The following sections share the insights of Perold and Sharpe's (1988) analysis contrasting constant mix with other strategies. To make its points, the Perold–Sharpe

17 See Leland (2000) and Donohue and Yip (2003).

analysis assumes a simple two-asset class setting in which just one asset class is risky. Nevertheless, the analysis throws light on the underlying features of the strategies and what market dynamics and investor attitudes to risk favor or disfavor each of them.

3.3.1 *Buy-and-Hold Strategies*

A buy-and-hold strategy is a passive strategy of buying an initial asset mix (e.g., 60/40 stocks/Treasury bills) and doing absolutely nothing subsequently. Whatever the market does, no adjustments are made to portfolio weights. It is a "do-nothing" strategy resulting in a drifting asset mix.

The investment in Treasury bills (bills, for short) is risk-free and for the sake of simplicity is assumed to earn a zero return; it is essentially cash. In a buy-and-hold strategy, the value of risk-free assets represents a floor for portfolio value. For instance, take €100 and invest it initially according to 60/40 stocks/cash asset allocation. If the value of the stock allocation were to fall to zero, we would still have the €40 invested in cash. Therefore, the following expression pertains:

Portfolio value = Investment in stocks + Floor value

For a 60/40 stock/cash allocation the equation is

Portfolio value = Investment in stocks + Floor value of €40

Portfolio value is a linear function of the investment in stocks (the risky asset). If the buy-and-hold strategy has a floor, it is also true that there is no limit on upside potential so long as the portfolio is above the floor. The higher the initial allocation to stocks, the greater the increase (decrease) in value when stocks outperform (underperform) bills.

The amount by which portfolio value exceeds the investment in cash is the cushion (i.e., a buffer of value above the floor value). For a buy-and-hold strategy, the value of the investment in stocks moves 1:1 with the value of the cushion, as can be seen from rearranging the previous expression for portfolio value:

Investment in stocks = Cushion = Portfolio value − Floor value **(1)**

In our one-risky-asset portfolio, the portfolio return (the percent change in portfolio value over a given holding period) equals the fraction of assets in stocks multiplied by the return on stocks (under the assumption of a zero return on bills).

Portfolio return = (Percent in stocks) × (Return on stocks)

For example, if stocks earn a 10 percent return, the value of stocks rises by 6 from 60 to 66; the value of the portfolio goes up by 6 from 100 to 106 (equal to 66 + 40). For the portfolio, that represents a 6 percent return as 6/100 = 6%. And 6% = 0.6 × 10%.

The investor's percent allocation to stocks is directly related to stock performance. For example if stocks earn a −100 percent return, the stock/bills allocation goes from 60/40 to 0/100 (the cushion is zero, the value of the portfolio is 40, which is the amount invested in bills). If stocks earn a +100 percent return, the asset allocation goes from 60/40 to 75/25 (the value of stocks goes from 60 to 120, increasing portfolio value from 100 to 160; 120/160 = 0.75 or 75%, which becomes the new stock allocation). A higher allocation to stocks reflects a greater risk tolerance. Therefore, a buy-and-hold strategy would work well for an investor whose risk tolerance is positively related to wealth and stock market returns.

To summarize, for a buy-and-hold strategy the following holds:

- Upside is unlimited, but portfolio value can be no lower than the allocation to bills.
- Portfolio value is a linear function of the value of stocks, and portfolio return is a linear function of the return on stocks.

- The value of stocks reflects the cushion (above floor value) 1:1.
- The implication of using this strategy is that the investor's risk tolerance is positively related to wealth and stock market returns. Risk tolerance is zero if the value of stocks declines to zero.

3.3.2 *Constant-Mix Strategies*

What we have called rebalancing to the strategic asset allocation in prior sections is a constant-mix strategy in the terminology of Perold–Sharpe. Constant mix is a "do-something" (or "dynamic") strategy in that it reacts to market movements with trades. An investor decides, for example, that his portfolio will be 60 percent equities and 40 percent bills and rebalances to that proportion regardless of his level of wealth. In particular, the target investment in stocks in the constant-mix strategy is

$$\text{Target investment in stocks} = m \times \text{Portfolio value} \tag{2}$$

where m is a constant between 0 and 1 that represents the target proportion in stocks. If the equity market moves up, the actual stock proportion increases, but then it is adjusted down to m. If the equity market moves down, the actual stock proportion decreases, but then it is adjusted up to m.

Although a constant-mix strategy is "do-something," its effect is to maintain stable portfolio systematic risk characteristics over time, in contrast to a buy-and-hold strategy and the other "do-something" strategies that we will discuss shortly.

So far as returns alone are concerned, the adjustment policy of a constant-mix strategy will prove inferior to a buy-and-hold strategy if returns either move straight up, or move straight down. Strong bull and bear markets favor a buy-and-hold strategy. In the bull market case, the investor is cutting back on the shares of stock through rebalancing prior to further moves upwards. The buy-and-hold investor, by contrast, would profit by holding the number of shares constant (actually representing an increasing fraction of the portfolio invested in stocks). In the bear market case, the investor buys more shares prior to further moves down. The buy-and-hold investor does better by not changing his share holdings.

On the other hand, the constant-mix strategy tends to offer superior returns compared with buy-and-hold strategies if the equities returns are characterized more by reversals than by trends. For example, suppose the corridor for equities is 60% ± 5%. The stock market drops and the equity allocation falls below 55 percent; the equity allocation is rebalanced to 60 percent by selling bills and purchasing shares. The stock market then appreciates to its initial level (i.e., a return reversal occurs). The shares purchased in rebalancing under a constant-mix strategy show a gain. On the other hand, if the stock market first goes up, triggering a sale of shares and purchase of bills, and then drops back to its initial level, the constant-mix strategy also realizes a gain. Either returns reversal pattern is neutral for the buy-and-hold strategy. The constant-mix strategy is contrarian and supplies liquidity. Buying shares as stock values fall and selling shares as stock values rise are actions that supply liquidity because the investor is taking the less popular side of trades.

A constant-mix strategy is consistent with a risk tolerance that varies proportionately with wealth.[18] An investor with such risk tolerance desires to hold stocks at all levels of wealth.

18 That is, with a constant-mix strategy, the amount of money invested in risky assets increases with increasing wealth, implying increasing risk tolerance. Because the amount of money held in risky assets increases to maintain a constant ratio of risky assets to wealth, risk tolerance increases proportionately with wealth (constant *relative* risk tolerance or constant *relative* risk aversion).

3.3.3 *A Constant-Proportion Strategy: CPPI*

A constant-proportion strategy is a dynamic strategy in which the target equity allocation is a function of the value of the portfolio less a floor value for the portfolio. The following equation is used to determine equity allocation:

$$\text{Target investment in stocks} = m \times (\text{Portfolio value} - \text{Floor value}) \quad (3)$$

where m is a fixed constant. Constant-proportion strategies are so called because stock holdings are held to a constant proportion of the cushion. A characteristic of constant-proportion strategies is that they are consistent with a zero tolerance for risk (and hence no holdings in stocks) when the cushion is zero. Comparing Equation 1 with Equation 3, we see that a buy-and-hold strategy is a special case of a constant-proportion strategy in which $m = 1$. (For a buy-and-hold strategy, there is no distinction between the actual and target investment in stocks. The desired investment is whatever the actual level is.) When m exceeds 1, the constant-proportion strategy is called constant-proportion portfolio insurance (CPPI).[19]

CPPI is consistent with a higher tolerance for risk than a buy-and-hold strategy (when the cushion is positive), because the investor is holding a larger multiple of the cushion in stocks. Whereas a buy-and-hold strategy is do-nothing, CPPI is dynamic, requiring a manager to sell shares as stock values decline and buy shares as stock values rise. The floor in a buy-and-hold strategy is established with a fixed investment in bills; by contrast, in a CPPI strategy it is established dynamically. When stock values are trending up, the investment in stocks increases more than 1:1 with the increase in the value of stocks. The holding of bills may be minimal. When stocks are trending down, the allocation to stocks decreases more than 1:1 with the decrease in the value of stocks. The holding in bills rapidly increases until it reaches the floor value.

To manage transaction costs, a CPPI strategy requires some rules to determine when rebalancing to the stated multiple of the cushion should take place. One approach transacts when the portfolio value changes by a given percentage. At this point, the portfolio incurs transaction costs to rebalance. Because taxes can be a material consideration for taxable investors, they create a need for a rebalancing rule.

We expect a CPPI strategy to earn high returns in strong bull markets because the share purchases as the cushion increases are profitable. In a severe bear market, the sale of shares also is profitable in avoiding losses on them. By contrast, CPPI performs poorly in markets characterized more by reversals than by trends. CPPI requires a manager to sell shares after weakness and buy shares after strength; those transactions are unprofitable if drops are followed by rebounds and increases are retraced. The CPPI strategy is just the opposite of the constant-mix strategy in using liquidity and being momentum oriented.

3.3.4 *Linear, Concave, and Convex Investment Strategies*

A buy-and-hold strategy has been called a linear investment strategy because portfolio returns are a linear function of stock returns. The share purchases and sales involved in constant-mix and CPPI strategies introduce nonlinearities in the relationship. For constant-mix strategies, the relationship between portfolio returns and stock returns is concave; that is, portfolio return increases at a decreasing rate with positive stock returns and decreases at an increasing rate with negative stock returns.[20] In contrast, a CPPI strategy is convex. Portfolio return increases at an increasing rate with positive stock returns, and it decreases at a decreasing rate with negative stock returns.[21] Concave and convex strategies graph as mirror images of each other on

19 A value of m between 0 and 1 (and a floor value of zero) represents a constant-mix strategy.
20 The graph of portfolio return against stock return would have an inverted saucer shape.
21 The graph of portfolio return against stock return has a saucer shape.

either side of a buy-and-hold strategy. Convex strategies represent the purchase of portfolio insurance, concave strategies the sale of portfolio insurance. That is, convex strategies dynamically establish a floor value while concave strategies provide or sell the liquidity to convex strategies.

3.3.5 *Summary of Strategies*

Exhibit 9 summarizes the prior discussion of Perold–Sharpe analysis. The multiplier refers to Equation 3 which integrates all the models discussed.

Exhibit 9 Relative Return Performance of Different Strategies in Various Markets

	Constant Mix	Buy and Hold	CPPI
Market Condition			
Up	Underperform	Outperform	Outperform
Flat (but oscillating)	Outperform	Neutral	Underperform
Down	Underperform	Outperform	Outperform
Investment Implications			
Payoff curve	Concave	Linear	Convex
Portfolio insurance	Selling insurance	None	Buying insurance
Multiplier	$0 < m < 1$	$m = 1$	$m > 1$

It is important to recognize that we have focused the discussion of performance in Exhibit 9 and the reading on return performance, not risk (except to mention the downside risk protection in the CPPI and stock/bills buy-and-hold strategies).

Finally, the appropriateness of buy-and-hold, constant-mix, and constant-proportion portfolio insurance strategies for an investor depends on the investor's risk tolerance, the types of risk with which she is concerned (e.g., floor values or downside risk), and asset-class return expectations, as Example 9 illustrates.

EXAMPLE 9

Strategies for Different Investors

For each of the following cases, suggest the appropriate strategy:

1. Jonathan Hansen, 25 years old, has a risk tolerance that increases by 20 percent for each 20 percent increase in wealth. He wants to remain invested in equities at all times.
2. Elaine Cash has a $1 million portfolio split between stocks and money market instruments in a ratio of 70/30. Her risk tolerance increases more than proportionately with changes in wealth, and she wants to speculate on a flat market or moderate bull market.
3. Jeanne Roger has a €2 million portfolio. She does not want portfolio value to drop below €1 million but also does not want to incur the drag on returns of holding a large part of her portfolio in cash equivalents.

Solution to 1:

Given his proportional risk tolerance (constant relative risk tolerance) and desire to remain invested in equities at all times, a constant-mix strategy is appropriate for Hansen.

Solution to 2:

Her risk tolerance is greater than that of a constant-mix investor, yet Cash's forecasts include the possibility of a flat market in which CPPI would do poorly. A buy-and-hold strategy is appropriate for Cash.

Solution to 3:

The concern for downside risk suggests either a buy-and-hold strategy with €1 million in cash equivalents as a floor or dynamically providing the floor with a CPPI strategy. The buy-and-hold strategy would incur the greater cash drag, so the CPPI strategy is appropriate.

3.4 Execution Choices in Rebalancing

In our discussion of rebalancing we have skirted the important issue of transaction execution. The particulars of execution depend on the specific asset classes held, the availability of relevant derivative markets in addition to cash markets, and the tax consequences of different execution means for taxable investors. The major choices are to rebalance by selling and buying portfolio assets (cash market trades) or by overlaying derivative positions onto the portfolio (derivative trades).

3.4.1 *Cash Market Trades*

Cash market trades represent the most direct means of portfolio rebalancing. Such trades represent adjustment at the "retail" level of risk because they typically involve buying and selling individual security positions.[22] If the investor employs active managers, then such adjustments need to be executed with care to minimize the impact on active managers' strategies. Cash market trades generally are more costly, and slower to execute, than equivalent derivative trades. For taxable investors, however, tax considerations may favor cash market trades over derivative market trades. First, there may be no exact derivative market equivalent to a cash market trade on an after-tax basis. Second, in some tax jurisdictions such as the United States, derivative market trades may have unfavorable tax consequences relative to cash market trades.[23] In addition, even if differences in taxation are irrelevant (as in the case of tax-exempt investors), not all asset class exposures can be closely replicated using derivatives, and individual derivative markets may have liquidity limitations. To some extent, the level of granularity with which asset classes have been defined affects the availability of adequate derivative equivalents.

3.4.2 *Derivative Trades*

Portfolio managers can also often use derivative trades involving instruments such as futures contracts and total return swaps for rebalancing. Trades are carried out so that the total exposure to asset classes (portfolio and derivative positions) closely mimics the effect of rebalancing by buying and selling underlying assets.

22 An exception would be rebalancing a passive exposure through an available exchange-traded fund (ETF) or basket trade.

23 See Horvitz (2002) for some details.

Rebalancing through derivatives markets, for the portion of the portfolio that can be closely replicated through derivative markets, has a number of major advantages:

- lower transaction costs;
- more rapid implementation—in derivative trades one is buying and selling systematic risk exposures rather than individual security positions; and
- leaving active managers' strategies undisturbed—in contrast to cash market trades, which involve trading individual positions, derivative trades have minimal impact on active managers' strategies.[24]

Besides the possibility that an asset class exposure may not be closely replicable with available derivatives, individual derivatives markets may have liquidity limits. Many investors, including tax-exempt investors, find it appropriate to use both cash and derivative trades in rebalancing their portfolios.

4 CONCLUDING REMARKS

Managers must accord markets the respect they deserve. Implementation of portfolio strategies and tactics must be as rigorous as the investment decision process. A manager should understand his or her clients. Nothing is more important than a client's inherent tolerance for risk. Each client is unique; so should be the manager's understanding of the client's needs. When those needs change sufficiently, transaction costs assume a secondary role.

A portfolio manager must constantly monitor changes in investor circumstances, market and economic changes, and the portfolio itself, making sure that the IPS, asset allocation, and individual holdings continue to appropriately address the client's situation and investment objectives. The manager must serve as the client's champion in the investment realm, understand changes in the client's needs, and incorporate those changes into the dynamic management of the portfolio.

Legitimate chances to improve on diversified portfolios are rare. It pays to be wary of the multitude of vendors whose commercial interest argues otherwise.

A predetermined policy portfolio designed to be the continuing ideal and standard for an investor's combination of objectives, risk tolerance, and available asset classes, while hardly sacred, is the beacon one should generally steer toward.

SUMMARY

Even the most carefully constructed portfolios do not manage themselves. In this reading we have discussed two ingredients to ensuring an investment program's continuing relevancy: monitoring and rebalancing.

- Portfolio managers need to monitor everything that is relevant to positioning a portfolio to satisfy the client's objectives and constraints. Three areas that the portfolio manager must monitor are changes in investor circumstances and wealth, market and economic changes, and the portfolio itself.

24 There may also be tactical advantages to using futures. For example, futures may trade cheaply in relation to the underlying cash market when the cash market is falling. See Kleidon and Whaley (1992).

- Fiduciaries have an ethical and legal responsibility for adequate monitoring. Only by systematic monitoring can the fiduciary secure an informed view of the appropriateness and suitability of a portfolio for a particular client.
- Rebalancing to an investor's strategic asset allocation has benefits and costs. If the target asset class proportions of an investor's strategic asset allocation represent his optimum, any divergence from the target proportions represents an expected utility loss to the investor. The benefit in rebalancing equals the reduction in the present value of expected utility losses from not tracking the optimum. Rebalancing is a risk-control discipline that helps ensure an appropriate level of portfolio risk.
- The costs of rebalancing include transaction costs and, for taxable investors, tax costs (tax liabilities that are triggered by rebalancing trades).
- Calendar rebalancing involves rebalancing the portfolio to target weights on a periodic basis such as monthly, quarterly, semiannually, or annually. Calendar rebalancing is the simplest rebalancing discipline; it has the drawback of being unrelated to market performance. Yet it can suffice in ensuring that the actual portfolio does not drift far away from target for long periods of time if the rebalancing frequency is adequate given the portfolio's volatility.
- Percentage-of-portfolio rebalancing involves setting rebalancing thresholds (trigger points) that define a corridor or tolerance band for the value of that asset class such as 50% ± 5%. Compared with calendar rebalancing (particularly at lower frequencies such as semiannually or annually), percentage-of-portfolio rebalancing can exercise tighter control on divergences from target proportions because it is directly related to market performance.
- In rebalancing, two disciplines are rebalancing to target weights and rebalancing to the allowed range. The former exercises tighter discipline on risk exposures, the latter allows for more control of costs and for tactical adjustment.
- Factors positively related to optimal corridor width for an asset class include transaction costs, risk tolerance, and correlation with the rest of the portfolio. The greater these factors, the wider the optimal corridor, in general.
- Factors negatively related to optimal corridor width for an asset class include the asset class's volatility and the volatility of the rest of the portfolio. The greater these factors, the narrower the optimal corridor, in general.
- Three contrasting strategies are buy and hold, constant mix (rebalancing to the strategic asset allocation), and constant proportion (which includes constant-proportion portfolio insurance).
- A buy-and-hold strategy is a passive strategy of buying an initial asset mix (e.g., 60/40 stocks/bills) and doing absolutely nothing subsequently. It is synonymous with a drifting asset mix. A constant-mix strategy involves rebalancing so that the investment in stocks is a constant fraction of portfolio value. A constant-proportion portfolio insurance strategy involves making trades so the investment in stocks represents a constant multiple of the cushion of portfolio value above a floor value.
- In strong bull markets, CPPI outperforms a buy-and-hold strategy, while a buy-and-hold strategy outperforms a constant-mix strategy, in general. In strong bear markets, the same priority of performance holds. In a market characterized more by reversals than by trends, a constant-mix strategy tends to do best, followed by buy-and-hold and then CPPI strategies.

PRACTICE PROBLEMS

1 Evaluate the most likely effects of the following events on the investor's investment objectives, constraints, and financial plan.

A A childless working married couple in their late 20s adopts an infant for whom they hope to provide a college education.

B An individual decides to buy a house in one year. He estimates that he will need $102,000 at that time for the down payment and closing costs on the house. The portfolio from which those costs will be paid has a current value of $100,000 and no additions to it are anticipated.

C A foundation with a €150,000,000 portfolio invested 60 percent in equities, 25 percent in long-term bonds, and 15 percent in absolute return strategies has approved a grant totaling €15,000,000 for the construction of a radio telescope observatory. The foundation anticipates a new contribution from a director in the amount of €1,000,000 towards the funding of the grant.

2 Duane Rogers, as chief investment officer for the Summit PLC defined benefit pension scheme, has developed an economic forecast for presentation to the plan's board of trustees. Rogers projects that UK inflation will be substantially higher over the next three years than the board's current forecast.

Rogers recommends that the board immediately take the following actions based on his forecast:

A Revise the pension scheme's investment policy statement to account for a change in the UK inflation forecast.

B Reallocate pension assets from domestic (UK) to international equities because he also expects inflation in the United Kingdom to be higher than in other countries.

C Initiate a program to protect the pension scheme's financial strength from the effects of UK inflation by indexing benefits paid by the scheme.

State whether *each* recommended action is correct or incorrect. Justify *each* of your responses with *one* reason.

The following two interpretative monitoring questions (3–4) are presented as two-part narratives: initial client circumstances, which comprise the gist of a client's IPS and the detailed information going into its formulation, followed by the changed client circumstances.

3 **Initial Client Circumstances** Claire Wisman, a vice president for Spencer Design, is a 42-year-old widow who lives in the United States. She has two children: a daughter, age 21, and a son, age 7. She has a $2,200,000 portfolio; half of the portfolio is invested in Spencer Design, a publicly traded common stock, which has a cost basis of $350,000. Despite a substantial drop in the value of her portfolio over the last two years, her long-term annual total returns have averaged 7 percent before tax. The recent drop in value has caused her great anxiety, and she believes that she can no longer tolerate an annual decline greater than 10 percent.

Wisman intends to retire in 20 years and her goals for the next 20 years, in order of priority, are as follows. The present values given are gross of taxes.

Practice Problems and Solutions: *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

- Funding the cost of her daughter's upcoming final year of college, which has a present value of $26,000, and her son's future college costs, which have a present value of $130,000.
- Increasing the portfolio to a level that will fund her retirement living expenses, which she estimates to be $257,000 for the first year of her retirement.
- Building her "dream house" in five years, the cost of which (including land) has a present value of $535,000.
- Giving, if possible, each of her children $1,000,000 when they reach age 40.

After subtracting the present value (before tax) of her children's education costs and her homebuilding costs, the present value of her portfolio is $1,509,000. With returns from income and gains taxable at 30 percent and with continued annual growth of 7 percent before tax (7% × (1 – 0.30) = 4.9% after taxes), the portfolio's value will be approximately $3,928,000 net of taxes at the end of 20 years.

Wisman's annual salary is $145,000, her annual living expenses are currently $100,000, and both are expected to increase at an inflation rate of 3 percent annually. Taxes on income and short-term capital gains (holding period one year or less) are substantially higher than taxes on long-term capital gains (holding period greater than one year). For planning purposes, however, Wisman wants to assume that her average tax rate on all income and gains is 30 percent. The inflation and tax rates are expected to remain constant. Currently, Wisman rents a townhouse, has no debt, and adamantly intends to remain debt-free. Spencer Design has no pension plan but provides company-paid medical insurance for executives for life and for their children to age 25. After taxes, Wisman's salary just covers her living expenses and thus does not allow her to make further meaningful capital contributions to her portfolio.

Wisman's current investment policy statement has the following elements:

- *Return requirement.* A total return objective of 7 percent before tax is sufficient to meet Claire Wisman's educational, housing, and retirement goals. If the portfolio earns total return of 7 percent annually, the value at retirement ($3.93 million) should be adequate to meet ongoing spending needs then ($257,000/$3,928,000 = 6.5 percent spending rate) and fund all Wisman's extraordinary needs (college and homebuilding costs) in the meantime. The million-dollar gifts to her children are unrealistic goals that she should be encouraged to modify or drop.
- *Risk tolerance.* Wisman has explicitly stated her limited (below average) willingness to take risk. Wisman appears to have an average ability to take risk. Her portfolio has some flexibility, because her expected return objective of 7 percent will meet her goals of funding her children's education, building her "dream house," and funding her retirement. Overall her risk tolerance is below average.
- *Time horizon.* Her time horizon is multistage. The time horizon could be described as three-stage (the next 5 pre-retirement years defined by work/housing costs; the subsequent 15 pre-retirement years defined by work/college costs; and beyond 20 years postretirement).
- *Liquidity.* Wisman has only a minor liquidity need ($26,000 in present value terms) to cover education expenses for her daughter next year. After that she has no liquidity need for the next five years. Only then ($535,000 in present value terms, for home construction) and in Years 11 through 14 ($130,000 in present value terms, for her son's education) will significant liquidity concerns exist.

- *Taxes.* Taxes are a critical concern because Wisman needs to fund outlays with after-tax dollars.
- *Unique circumstances.* A significant unique circumstance is the large concentration (50 percent of her assets) in Spencer Design stock. Another factor is her desire to build a new home in five years yet incur no debt. Also, she would "like" to give each child $1 million, but this goal is unrealistic and should not drive portfolio decisions.

Wisman indicates that Spencer Design has a leading and growing market share. The company has shown steady fundamental growth trends, and Wisman intends to hold her Spencer Design stock, which is expected to return at least 9 percent annually before tax with a standard deviation of returns of 20 percent.

Changed Client Circumstances

Claire Wisman, now 47 years old, has recently married a coworker at Spencer Design. Wisman and her husband are buying their dream house at a total cost of $700,000, and they have decided to make an immediate down payment of $430,000 and finance the remainder over 15 years. Wisman also indicates that her son has contracted a rare disease, requiring major surgery; the disease will prevent him from attending college. Although Wisman and her husband have medical insurance that will pay her son's ongoing medical expenses, her son's surgery will cost an additional $214,000 immediately. The cost of medical expenditures is expected to grow at a rate exceeding the general inflation rate for the foreseeable future. Wisman has decided to quit work to care for her son, whose remaining life expectancy is 40 years. She also insists on the need to provide care for her son when she and her husband are no longer capable of doing so. Wisman's parents died one year ago, and her daughter is now financially independent. Wisman's husband intends to retire in 25 years.

Given these circumstances, the investment portfolio held by Wisman and her husband will need to provide an amount equal to $1,713,000 (present value) to meet their living expenses until his retirement. They also want their portfolio to grow enough to cover their living expenses at retirement, which they estimate to be $400,000 annually. They believe they will need a before-tax portfolio growth rate of approximately 8 to 10 percent annually to achieve this goal. Based on a retirement spending goal of $400,000, their corresponding effective postretirement spending rate will be approximately 6 to 7 percent annually.

Wisman summarizes her new financial information in Exhibit 1 below. She indicates that her portfolio and her husband's portfolio should be considered as one. She further states that her husband has taken well above-average risk in the past but he is now willing to leave the investment management decisions to her.

Exhibit 1 New Financial Information

	Claire Wisman	Husband	Combined	Current Allocation Percentage of Combined Portfolio
Salary	$0	$150,000	$150,000	—
Assets				
Money market	$61,000	$27,000	$88,000	2.4%
Diversified bond fund	$1,129,000	$0	$1,129,000	30.5%

Exhibit 1 (Continued)

	Claire Wisman	Husband	Combined	Current Allocation Percentage of Combined Portfolio
Equities				
Large-capitalization equities	$385,000	$0	$385,000	10.4%
Emerging market equities	$0	$407,000	$407,000	11.0%
Spencer Design common stock	$1,325,000	$122,000	$1,447,000	39.1%
Undeveloped commercial land	$0	$244,000	$244,000	6.6%
Total portfolio	**$2,900,000**	**$800,000**	**$3,700,000**	**100.0%**

A Indicate how *each* component of Wisman's investment policy statement should change as a result of Wisman's new circumstances. Justify *each* of your responses with *two* reasons based on Wisman's new circumstances.

B Recommend whether the current allocation percentage (given in the exhibit) for *each* of the following assets should be decreased or increased as a result of Wisman's new circumstances. Justify *each* of your responses with *one* reason based on Wisman's new circumstances.

i. Spencer Design common stock.

ii. Money market.

iii. Diversified bond fund.

iv. Large-capitalization equities.

v. Emerging market equities.

vi. Undeveloped commercial land.

4 **Initial Client Circumstances** Both parents of 12-year-old Andrew Campbell recently died in an accident. The parents had been supporting Andrew and his grandmother, Lisa Javier, age 77. The parents' accumulated assets prior to their death were $640,000 in a diversified common stock (both domestic and international) portfolio and $360,000 in the common stock of Newman Enterprises, a publicly traded company founded by Javier's husband. The parents' assets will now be held in a single US-based trust—the Javier–Campbell Trust (the Trust)—to benefit both Javier and Campbell. In addition to these assets, the Trust received life insurance proceeds of $2,000,000.

Newman Enterprises will continue to provide medical coverage for Javier until her death. Campbell has government-provided healthcare until he reaches age 22. Campbell will attend university for four years beginning at age 18. In addition to normal living expenses, initial annual university costs are projected to be $38,000, rising 8 percent annually.

According to the provisions of the Trust document:

- The Trust should provide for Javier's and Campbell's annual living expenses, currently estimated to total $78,000 per year (after tax). The Trust portfolio should earn a return sufficient to cover the living expenses of Javier

and Campbell, taking taxes into consideration and allowing for inflation (expected to be 2 percent annually). Income and capital gains are taxed at 30 percent, and this tax treatment is not expected to change.

- The Trust should limit shortfall risk (defined as expected total return minus two standard deviations) to no lower than a –10 percent return in any one year.
- Campbell is entitled to receive distributions from the Trust until he reaches age 32. At that point, the Trust will continue making distributions for Javier's living expenses.
- Upon Javier's death, the Trust's assets will go to Campbell, provided he is at least 32 years old. If Campbell is not yet aged 32 when Javier dies, the Trust will then distribute income and principal to Campbell until he reaches age 32, at which point the Trust will terminate and the assets will be distributed to Campbell.
- The Newman Enterprises common stock cannot be sold without Javier's approval for as long as she is alive. Javier has stated her strong desire to retain the Newman stock indefinitely, to fulfill a promise she made to her husband.
- The Trust must hold in cash equivalents an amount equal to nine months of living expenses (on a pretax basis) for Javier and Campbell.
- In the unlikely event that Campbell dies before Javier, distributions will continue for Javier's benefit until she dies, at which point any remaining Trust assets will be distributed to several charities.

As a result of poor financial advice, Javier lost all of her inheritance from her husband's estate. Because her assets are nearly depleted, she wants to minimize any future losses in the Trust portfolio; in fact, she has expressed serious concerns about the Trust's ability to meet Campbell's and her needs during her lifetime.

The risk tolerance and return requirement elements of the Javier–Campbell Trust's IPS are as follows:

Risk Tolerance

- *Ability.* The Trust has average ability to assume risk, largely because of its substantial asset base in relation to its spending needs. Because the portfolio is Javier's only source of support, the Trust's ability to assume risk is lower than it might otherwise be.
- *Willingness.* The Trust has below-average willingness to assume risk. The Trust document requires that the account be invested so that shortfall risk (defined as expected total return minus two standard deviations) is limited to a –10 percent return in any one year. This limitation implies that the Trust will be unwilling to tolerate any substantial volatility in portfolio returns.
- *Overall risk tolerance.* The Trust has below-average risk tolerance and will continue to have it for many years, especially while Javier is alive.

Return Requirement

The return requirement reflects two major factors: the need to cover living expenses and the need to protect the portfolio from the adverse effects of inflation. Specifically, the Trust must generate a total before-tax return of at least 6.57 percent on an annual basis to meet these return requirements.

The living expenses, estimated at $78,000 per year, represent a $78,000/$3,000,000 = 2.6 percent spending rate. However, because the Trust is taxed at 30 percent, it will need to earn a pretax return of (2.6% + 2%)/(1 – 0.30) = 6.57 percent to meet Javier and Campbell's living expenses.

Changed Client Circumstances

Ten years have now passed, and the Javier–Campbell Trust portfolio returns over the previous 10 years have failed to meet expectations. Lower returns, coupled with Lisa Javier's and Andrew Campbell's living expenses and Campbell's college costs, have combined to reduce the value of the Trust portfolio to $2,000,000.

Javier, now 87, recently moved to an assisted-living care facility. With her health failing, doctors have determined she will live no longer than three years and will require full-time care for the remaining time until her death. Javier's medical expenses are covered by insurance, but her care and living expenses now require $84,000 per year (after tax and adjusted for inflation) from the Trust. Inflation is expected to be 3 percent annually over the next several years. Javier has no other support and depends on the Trust to meet her financial needs. She has continued to express her concern that the Trust will not provide enough distributions to cover her expenses during her remaining lifetime. She still wishes to retain the Newman Enterprises common stock, which now constitutes 15 percent of the Trust portfolio and has an expected annual yield of 2 percent over the next several years. Legal constraints have not changed, and the Trust still requires nine months of living expenses (on a pretax basis) to be held in reserve.

Campbell, now 22, is a recent college graduate and has accepted a job with Elkhorn Consulting Partners. In the job offer, Elkhorn agreed to pay the cost of Campbell's M.B.A. degree. Campbell also has the opportunity to buy a partnership stake in the company by making equal annual payments of $600,000 per year for five years. He will begin making those payments in ten years. Campbell's starting salary is sufficient to cover his living expenses.

Although Campbell is concerned about providing for Javier, he believes that with the appropriate asset allocation, the Trust assets should be sufficient to take care of her expenditures until she dies and to provide the growth he needs to meet his partnership obligations. Campbell views growth from the Trust to be essential in meeting his long-term goals. Assuming that Campbell lives longer than Javier, the individual assets in the Trust will be distributed to Campbell upon termination of the Trust; the Trust portfolio will become Campbell's portfolio.

The trustee believes that circumstances have changed enough to warrant revising certain components of the investment policy statements for Campbell and the Trust.

Formulate revised statements about the Javier–Campbell Trust's willingness to take risk that reflect the changed circumstances of both Javier and Campbell. Your response should include appropriate supporting justification.

5 A foundation holds an equally weighted portfolio of domestic equities, international equities, private equity, and inflation-protected bonds.

A Critique a percentage-of-portfolio discipline that involves establishing a corridor of target percentage allocation ± 5% for each asset class in the foundation's portfolio.

B Evaluate the implications of the following sets of facts on the stated corridor, given an all-else-equal assumption in each case:

i. The Foundation's risk tolerance has decreased. *Corridor for international equities.*

ii. Transaction costs in international equities are one-half those for private equity. *Corridor for inflation-protected bonds.*

iii. The correlation of private equity with the rest of the portfolio is lower than the correlation of domestic equities with the rest of the portfolio. *Corridor for private equity.*

iv. The volatility of domestic equities is higher than that of inflation-protected bonds. *Corridor for domestic equities.*

6 **A** Recommend an appropriate rebalancing discipline for an investor who cannot monitor portfolio values on a daily basis yet holds an above-average risk portfolio and low risk tolerance.

B How would the investment results of the recommended rebalancing discipline be affected if markets were nontrending?

7 Marvis University (MU) is a private, multiprogram US university with a $2 billion endowment fund as of fiscal year-end May 31, 2002. With little government support, MU is heavily dependent on its endowment fund to support ongoing expenditures, especially because the university's enrollment growth and tuition revenue have not met expectations in recent years. The endowment fund must make a $126 million annual contribution, which is indexed to inflation, to MU's general operating budget. The US Consumer Price Index is expected to rise 2.5 percent annually, and the US higher education cost index is anticipated to rise 3 percent annually. The endowment has also budgeted $200 million due on January 31, 2003, representing the final payment for construction of a new main library.

In a recent capital campaign, MU met its fundraising goal only with the help of one very successful alumna, Valerie Bremner, who donated $400 million of Bertocchi Oil and Gas common stock at fiscal year-end May 31, 2002. Bertocchi Oil and Gas is a large-capitalization, publicly traded US company. Bremner donated the stock on the condition that no more than 25 percent of the initial number of shares may be sold in any fiscal year. No substantial additional donations are expected in the future.

Given the large contribution to and distributions from the endowment fund, the fund's Investment Committee has decided to revise its investment policy statement.

In the revised IPS, the endowment portfolio manager established that MU's return requirement is 10 percent. MU's average ability to take risk restrains its risk tolerance.

Five years have passed, and the Marvis University endowment fund's willingness and ability to assume risk have increased. The endowment fund's Investment Committee asks its consultant, James Chan, to discuss and recommend a rebalancing strategy to incorporate the new risk tolerance. Chan anticipates a bull market in growth assets over the next three to five years. He also believes that volatility will be below historical averages during that same time period. The Investment Committee directs Chan to incorporate his views into his recommendation. The Committee also does not want the market value of the portfolio to decline more than 15 percent below its current market value.

A Describe the following *three* primary rebalancing strategies:

i. Buy and hold.

ii. Constant mix.

iii. Constant-proportion portfolio insurance.

B Determine which *one* of the three rebalancing strategies in Part A Chan should recommend for the Marvis University endowment fund. Justify your response with two reasons based on the circumstances described above.

Questions 8–15 relate to Heather Daniels, Duane Lee, and Janice Mirimi

Heather Daniels is a financial advisor who recently met with two prospective clients, Duane Lee and Janice Mirimi. Summary information for each prospective client is presented in Exhibit 1.

Exhibit 1 Client Summary Information

Lee Summary:

Duane Lee is 55 years old and has a portfolio valued at $2 million, with $1.6 million in domestic equities and $400,000 in Treasury bills. When he inherited the portfolio from his grandfather 20 years ago, 65% of the portfolio was invested in domestic equities with a cost basis of $500,000 and 35% was invested in Treasury bills. He has not rebalanced his portfolio since he inherited the portfolio.

Mirimi Summary:

Janice Mirimi is 32 years old and has a portfolio valued at $10.5 million. She recently received a large inheritance, and her willingness and her ability to assume risk has increased. Her previous financial advisor rebalanced her portfolio to the optimal strategic allocation whenever one of the asset classes moved outside its rebalancing thresholds.

Exhibit 2 presents the strategic asset allocations and rebalancing thresholds (defining corridors for rebalancing) that Daniels plans to recommend for each client.

Exhibit 2 Client Strategic Asset Allocation

	Duane Lee		Janice Mirimi	
Asset Class	**Allocation**	**Corridor**	**Allocation**	**Corridor**
Domestic equities	50%	0%	55%	±5.5%
International equities	0%	0%	15%	±1.5%
Domestic bond	0%	0%	30%	±3.0%
Treasury bills	50%	0%	0%	0%

Daniels provides the following information to each prospective client.

- Her firm projects a bull market for domestic and international equities for the next five years.
- The volatility of international and domestic equities has recently decreased and is expected to remain at historically low levels over the next several years.

- Transaction costs for domestic bonds are expected to increase in relation to the other asset classes.
- The correlation of domestic bonds with the other asset classes is expected to decrease.

Daniels notes that both prospective clients want to employ a rebalancing strategy. Select client statements pertaining to rebalancing are presented in Exhibit 3.

Exhibit 3 Client Rebalancing Statements

Lee Statement:

"I know I have an emotional attachment to my grandfather's portfolio; however, I am getting closer to retirement and my portfolio needs to be adjusted. I don't need my financial advisor to check my portfolio on a daily basis. I just want my portfolio to be adjusted to my target allocations on a regular basis, such as right before our quarterly meetings.

Mirimi Statement:

"I am comfortable giving my financial advisor flexibility to take advantage of tactical opportunities when it comes to rebalancing my portfolio, but I do want to minimize transaction costs which might occur. Although my risk tolerance has increased, I would like to be diversified across equities and bonds."

8 Based upon the information presented in Exhibit 1, the cost of rebalancing that is *most likely* to have the greatest effect on the value of Lee's portfolio is:

A tax costs.

B transaction costs.

C market impact costs.

9 Based upon the change in volatility of international equities noted by Daniels, the corridor for international equities for Mirimi's portfolio presented in Exhibit 2 would *most likely* be:

A indeterminate.

B wider than ± 1.5%.

C narrower than ± 1.5%.

10 Based upon both the change in transaction costs and the change in the correlation of domestic bonds noted by Daniels, the corridor for domestic bonds for Mirimi's portfolio presented in Exhibit 2 would *most likely* be:

A indeterminate.

B wider than ± 3%.

C narrower than ± 3%.

11 Based only upon the forecast for domestic equities and international equities provided by Daniels, which type of rebalancing strategy would result in the best relative return performance?

A Constant mix.

B Buy-and-hold.

C Constant-proportion portfolio insurance.

12 Based upon Mirimi's preferences noted in Exhibit 3, if one of the asset classes increases beyond its corridor for rebalancing, Daniels would *most likely*:

A rebalance the asset class to the allowable range.

B rebalance the asset class to the optimal target weight.

C pursue a passive strategy that reflects a drifting asset mix.

13 According to Lee's statements in Exhibit 3, what would be the *most likely* drawback associated with Lee's preferred rebalancing discipline?

A It is unrelated to market performance.

B It involves continuous monitoring of portfolio values.

C It does not account for differences in transaction costs and asset correlations.

14 Lee's preferred rebalancing strategy described in Exhibit 3 would result in which type of payoff diagram?

A Linear.

B Convex.

C Concave.

15 What type of rebalancing strategy would Daniels *most likely* recommend for Mirimi's portfolio?

A Constant mix.

B Buy-and-hold.

C Constant-proportion portfolio insurance.

SOLUTIONS

1 **A** Accumulating funds for the child's education is a new investment goal. Prior to the adoption, the couple's time horizon was two-stage (preretirement and postretirement). In their late 40s, they will have a period in which they need to pay for the cost of the child's education; this will involve substantial costs for which they must plan. The couple's multistage time horizon now includes the period up to the child's entering college, the child's college years, the remaining period to retirement, and retirement.

B Given the investor's circumstances, the decision to buy a house in one year's time makes the addition of a shortfall risk objective appropriate. He needs to earn at least 2 percent if he is to have sufficient funds to buy the house. An appropriate shortfall risk objective is to minimize the probability that the return on the portfolio falls below 2 percent over a one-year horizon. The decision also creates a liquidity requirement. The need for $102,000 in cash at the end of the investment period means that the investor cannot tie up his money in a way such that he does not have ready access to it in a year's time.

C The approval of the grant has created a liquidity requirement of €15,000,000 – €1,000,000 = €14,000,000.

2 The first action ("Revise the investment policy statement of the pension scheme to take into account a change in the forecast for inflation in the United Kingdom") is incorrect. The Investment Policy Statement depends on the client's particular circumstances, including risk tolerance, time horizon, liquidity and legal constraints, and unique needs. Therefore, a change in economic forecast would not affect the Investment Policy Statement. The Investment Policy Statement also considers a client's return requirement. This return requirement may change over the long term if the inflation outlook has changed over the long term. A change in the inflation outlook over a short period, such as in this question, would not necessitate a change in the return portion or any other aspect of the Investment Policy Statement.

The second action ("Reallocate pension assets from domestic [UK] to international equities because he also expects inflation in the United Kingdom to be higher than in other countries") is correct. A change in economic forecast might necessitate a change in asset allocation and investment strategy. An expectation of increased inflation in the United Kingdom might lead to expectations that UK equity performance will slow and would likely result in both weaker UK equity returns and stronger returns from overseas markets. This would justify an increased allocation to international equities.

The third action ("Initiate a program to protect the financial strength of the pension scheme from the effects of UK inflation by indexing benefits paid by the scheme") is incorrect. The implementation of an inflation index adjustment program would protect the plan participants, not the plan itself, from the effects of higher UK inflation. With an inflation index adjustment program, Summit's costs of funding the defined benefit scheme would actually increase (thereby weakening the plan's financial position) as UK inflation increases.

3 **A** The return requirement should be higher to:

- fund her additional living expenses, and
- meet her new retirement goals.

The following calculations are not required but provide basis for the statement that the return must be higher than the previous 7 percent to generate a retirement portfolio that will support the desired retirement spending level (at a reasonable retirement spending rate). The portfolio must now produce a return of approximately 9 percent, depending on the retirement spending rate assumption made.

Current Portfolio (Gross)	**$3,700,000**
Less surgery	$214,000
Less house down payment	$430,000
Less living expenses	$1,713,000
Current Portfolio (Net)	**$1,343,000**
After-tax return = Before-tax return (1 – T) = 9.0% (0.7) = 6.3% Years = 25	
Retirement portfolio	$6,185,967 = $1,343,000(1.063)^{25}
Retirement spending	$400,000
Spending rate	6.47% = $400,000/$6,185,967

Risk tolerance should be higher. Wisman's risk tolerance should be higher because:

- her husband's intention to work for another 25 years gives her the ability to assume more risk, and
- the increase in assets affords her the ability to assume more risk.

Her time horizon is still multistage, but the stages have changed. In the first stage expected to last 25 years, her husband will be working. The second stage is retirement.

The liquidity requirement should be higher. Wisman has a higher liquidity requirement because of the cost of the surgery for her son and the down payment for the house.

B **i.** The allocation to Spencer Design Stock (currently 39.1 percent) should be decreased. Having a large percentage of her portfolio in one risky and potentially illiquid equity security exposes the portfolio to unnecessary and significant security-specific risk.

ii. The allocation to cash (currently 2.4 percent) should be increased. Wisman needs $430,000 for a house down payment, $214,000 for her son's surgery, and the current year's portion of the $1,713,000 present value of ongoing living expenses.

iii. The allocation to the diversified bond fund (currently 30.5 percent) should be increased. The couple's portfolio must support the $1,713,000 present value of ongoing living expenses and can sustain only moderate portfolio volatility. The regular income stream and diversification benefits offered by bonds are consistent with those needs.

iv. The allocation to large-capitalization equities (currently 10.4 percent) should be increased. Wisman requires growth and inflation protection to meet her current and future spending needs. A diversified equity portfolio is likely to meet these requirements over time without imparting unacceptable volatility to principal values.

v. The allocation to emerging market equities (currently 11 percent) should be decreased. Wisman requires high returns but cannot afford to sustain large losses. Having a large percentage of total assets in volatile emerging markets securities is too risky for Wisman.

vi. The allocation to undeveloped commercial land (currently 6.6 percent) should be decreased. Wisman needs income and liquidity to meet ongoing portfolio disbursement requirements. Undeveloped land requires cash payments (taxes, etc.) and is often illiquid.

4 The Javier–Campbell Trust's willingness to take risk is now below average because of its need to have a high probability of covering Javier's living expenses during the remainder of her lifetime, which encompasses a short time horizon. Javier's below-average willingness to take risk (coupled with her short time horizon) dominates Campbell's above-average willingness (coupled with his long time horizon). Of course, once Javier is no longer living, the Trust can reflect Campbell's higher willingness to take risk.

5 A The suggested approach has several disadvantages:

- A fixed ±5% corridor takes no account of differences in transaction costs among the asset classes. For example, private equity has much higher transaction costs than inflation-protected bonds and should have a wider corridor, all else equal.
- The corridors do not take account of differences in volatility. Rebalancing is most likely to be triggered by the highest volatility asset class.
- The corridors do not take account of asset class correlations.

B i. The corridor for international equities should be narrower than it was previously.

ii. The corridor for inflation-protected bonds should be unaffected. The transaction costs should have an effect on the relative widths of the corridors for private equity and international equities.

iii. The corridor for private equity should be narrower than that for domestic equities.

iv. The corridor for domestic equities should be narrower than that for inflation-protected bonds.

6 A Calendar rebalancing at a relatively high frequency such as weekly or monthly would be appropriate. In contrast to percentage-of-portfolio rebalancing, calendar rebalancing does not require continuous monitoring of portfolio values. The riskiness of the portfolio suggests frequent rebalancing to control drift.

B Such markets tend to be characterized by reversal and enhance the investment results from rebalancing to the strategic asset allocation, according to Perold–Sharpe analysis.

7 A i. *Buy and hold.* The buy-and-hold strategy maintains an exposure to equities that is linearly related to the value of equities in general. The strategy involves buying, then holding, an initial mix (equities/bills). No matter what happens to relative values, no rebalancing is required; hence this is sometimes termed the "do nothing" strategy. The investor sets a floor below which he or she does not wish the portfolio's value to fall. An amount equal to the value of that floor is invested in some nonfluctuating asset (e.g., Treasury bills or money market funds). The payoff diagram for a buy-and-hold strategy is a straight line, so the portfolio's value rises (falls) as equity values rise (fall), with a slope equal to the equity proportion in the initial mix. The value of the portfolio will never fall below the specified floor, and the portfolio has unlimited upside potential. Increasing equity prices favor a buy-and-hold strategy; the greater the equity proportion in the initial mix, the better (worse) the strategy will perform when equities outperform (underperform) bills.

The strategy is particularly appropriate for an investor whose risk tolerance above the specified floor varies with wealth but drops to zero at or below that floor. After the initial portfolio transaction, transaction costs are not an issue. The strategy is tax efficient for taxable investors.

ii. *Constant mix.* The constant-mix strategy maintains an exposure to equities that is a constant percentage of total wealth. Periodic rebalancing to return to the desired mix requires the purchase (sale) of equities as they decline (rise) in value. This strategy, which generates a concave payoff diagram, offers relatively little downside protection and performs relatively poorly in up markets. The strategy performs best in relatively flat (but oscillating or volatile) markets and capitalizes on market reversals. The constant-mix strategy performs particularly well in a time period when equity values oscillate greatly but end close to their beginning levels; greater volatility around the beginning values accentuates the positive performance.

The constant-mix strategy is particularly appropriate for an investor whose risk tolerance varies proportionately with wealth; such an investor will hold equities at all levels of wealth. This strategy requires some rule to determine when rebalancing should take place; typical approaches avoid transaction costs until asset-class weights have changed by a given percentage. At this point, transaction costs are incurred to rebalance. Taxes can be material for taxable investors.

iii. *Constant-proportion portfolio insurance.* The constant-proportion portfolio insurance (CPPI) strategy maintains an exposure to equities that is a constant multiple greater than 1 of a "cushion" specified by the investor. The investor sets a floor below which he does not wish assets to fall. Under normal market conditions the value of the portfolio will not fall below this specified floor. As equity values rise (fall), the CPPI strategy requires the investor to purchase (sell) additional equities. Thus following this strategy keeps equities at a constant multiple of the cushion (assets – floor) and generates a convex payoff diagram. The CPPI strategy tends to give good downside protection and performs best in directional, especially up, markets; the strategy does poorly in flat but oscillating markets and is especially hurt by sharp market reversals.

The strategy is particularly appropriate for an investor who has zero tolerance for risk below the stated floor but whose risk tolerance increases quickly as equity values move above the stated floor. To control transaction costs, this strategy requires some rule to determine when rebalancing takes place. One approach avoids transaction costs until the value of the portfolio has changed by a given percentage. At this point, transaction costs are incurred to rebalance. Taxes can be a material consideration for taxable investors.

B The CPPI strategy is the most appropriate rebalancing strategy for the MU endowment fund, taking into account the major circumstances described: the endowment's increased risk tolerance, the outlook for a bull market in growth assets over the next five years, the expectation of lower than normal volatility, and the endowment's desire to limit downside risk.

The CPPI strategy is consistent with higher risk tolerance, because the strategy calls for purchasing more equities as equities increase in value; higher risk tolerance is reflected in the resulting increased allocation to equities over time.

- The CPPI strategy will do well in an advancing equities market; because equities are purchased as their values rise, each marginal purchase has a high payoff.
- The CPPI strategy would do poorly in a higher-volatility environment for equities, because the strategy would sell on weakness but buy on strength, only to experience reversals; conversely, the strategy does much better in the face of lower volatility.
- The CPPI strategy provides good downside protection, because the strategy sells on weakness and reduces exposure to equities as a given floor is approached.

In summary, given that MU receives little other funding, the endowment fund must produce the maximum return for a specified level of risk. Given that the level of acceptable risk is generally higher, although with a very specific downside floor, the market outlook suggests that the constant-proportion strategy is the endowment fund's best rebalancing strategy.

8 A is correct. Lee's market value of equities is $1.6 million and its cost basis is $500,000. He has not rebalanced his portfolio since he inherited the portfolio 20 years ago. Sale of appreciated assets will trigger a tax liability, which is the cost of rebalancing most likely to have the greatest effect on portfolio value if rebalancing occurs.

9 B is correct. Mirimi wants to follow a percentage-of-portfolio rebalancing program and the volatility of international equities is expected to decrease, thus the optimal rebalancing corridor for international equities can be wider than ± 1.5%.

10 A is correct. The increase in transaction costs point to widening the corridor for domestic bonds, but decreasing correlations point to narrowing it. The overall effect is indeterminate.

11 C is correct. The constant-proportion portfolio insurance (CPPI) strategy is expected to earn high returns in bull markets. The CPPI strategy is a convex strategy with portfolio returns increasing at an increasing rate with positive stock returns. Although the buy and hold strategy does well in bull markets, it is a linear investment strategy. Thus, a CPPI strategy outperforms a buy and hold strategy in bull markets.

12 A is correct. Mirimi states that she wants to minimize transaction costs and provide opportunities for tactical adjustments by her financial advisor, which would be appropriate for a strategy that rebalances to the allowable range rather than the optimal target weight.

13 A is correct. Lee prefers his portfolio to be rebalanced to its target weights each quarter, which is calendar rebalancing. The primary drawback to calendar rebalancing is that it is unrelated to market behavior.

14 C is correct. Exhibit 3 notes that Lee wants to rebalance his portfolio to the optimal strategic allocation each quarter, which is a constant mix rebalancing strategy. When following a constant mix strategy, portfolio returns increase at a decreasing rate with positive stock returns and decrease at an increasing rate with negative stock returns. Therefore, a constant mix strategy generates a concave payoff diagram.

15 C is correct. The constant-proportion portfolio insurance (CPPI) strategy is the most appropriate rebalancing strategy given Mirimi's preferences described in Exhibit 1 and Exhibit 3 and the information provided by Daniels. The CPPI strategy is consistent with higher risk tolerance, does well in strong bull markets, and also in markets characterized by lower than normal volatilities. These factors all indicate that the CPPI strategy would be the most appropriate.

PORTFOLIO MANAGEMENT
STUDY SESSION

17

Performance Evaluation

Performance evaluation addresses three questions that are essential in evaluating the results of the portfolio management process:

- What was the portfolio's performance?
- Why did the portfolio produce the observed performance?
- Was the portfolio's performance due to luck or skill?

These questions are answered by performance measurement, performance attribution, and performance appraisal, respectively. The information developed in performance evaluation provides key inputs to a) assessing compliance with investment policy and progress toward achieving client goals, b) determining whether an investment manager's performance has been consistent with the manager's stated investment discipline, and c) deciding whether to hire, retain, or dismiss an investment manager.

READING ASSIGNMENTS

Reading 33	Evaluating Portfolio Performance by Jeffery V. Bailey, CFA, Thomas M. Richards, CFA, and David E. Tierney

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

33

Evaluating Portfolio Performance

by Jeffery V. Bailey, CFA, Thomas M. Richards, CFA, and David E. Tierney

Jeffery V. Bailey, CFA, is at Target Corporation (USA). Thomas M. Richards, CFA (USA). David E. Tierney (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** demonstrate the importance of performance evaluation from the perspective of fund sponsors and the perspective of investment managers;
☐	**b.** explain the following components of portfolio evaluation: performance measurement, performance attribution, and performance appraisal;
☐	**c.** calculate, interpret, and contrast time-weighted and money-weighted rates of return and discuss how each is affected by cash contributions and withdrawals;
☐	**d.** identify and explain potential data quality issues as they relate to calculating rates of return;
☐	**e.** demonstrate the decomposition of portfolio returns into components attributable to the market, to style, and to active management;
☐	**f.** discuss the properties of a valid performance benchmark and explain advantages and disadvantages of alternative types of benchmarks;
☐	**g.** explain the steps involved in constructing a custom security-based benchmark;
☐	**h.** discuss the validity of using manager universes as benchmarks;
☐	**i.** evaluate benchmark quality by applying tests of quality to a variety of possible benchmarks;
☐	**j.** discuss issues that arise when assigning benchmarks to hedge funds;
☐	**k.** distinguish between macro and micro performance attribution and discuss the inputs typically required for each;

(continued)

Managing Investment Portfolios: A Dynamic Process, Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**l.** demonstrate and contrast the use of macro and micro performance attribution methodologies to identify the sources of investment performance;
☐	**m.** discuss the use of fundamental factor models in micro performance attribution;
☐	**n.** evaluate the effects of the external interest rate environment and active management on fixed-income portfolio returns;
☐	**o.** explain the management factors that contribute to a fixed-income portfolio's total return and interpret the results of a fixed-income performance attribution analysis;
☐	**p.** calculate, interpret, and contrast alternative risk-adjusted performance measures, including (in their *ex post* forms) alpha, information ratio, Treynor measure, Sharpe ratio, and M^2;
☐	**q.** explain how a portfolio's alpha and beta are incorporated into the information ratio, Treynor measure, and Sharpe ratio;
☐	**r.** demonstrate the use of performance quality control charts in performance appraisal;
☐	**s.** discuss the issues involved in manager continuation policy decisions, including the costs of hiring and firing investment managers;
☐	**t.** contrast Type I and Type II errors in manager continuation decisions.

1 INTRODUCTION

The *ex post* analysis of investment performance stands as a prominent and ubiquitous feature of modern investment management practice. Investing involves making decisions that have readily quantifiable consequences and that, at least on the surface, lend themselves to elaborate dissection and review. We broadly refer to the measurement and assessment of the outcomes of these investment management decisions as **performance evaluation**. At the institutional investor level, and to a lesser (but growing) extent on the individual investor level, a large industry has developed to satisfy the demand for performance evaluation services. Although some observers contend that performance evaluation is misguided, frequently misapplied, or simply unattainable with any reasonable degree of statistical confidence, we believe that analytic techniques representing best practices can lead to valid insights about the sources of past returns, and such insights can be useful inputs for managing an investment program.

The purpose of this reading is to provide an overview of current performance evaluation concepts and techniques. Our focus will be on how institutional investors—both fund sponsors and investment managers—conduct performance evaluation. Individual investors tend to use variations of the performance evaluation techniques employed by institutional investors. We define fund sponsors to be owners of large pools of investable assets, such as corporate and public pension funds, endowments, and foundations. These organizations typically retain multiple investment management

firms deployed across a range of asset categories. Fund sponsors have the challenge of evaluating not only the performance of the individual managers, but also the investment results within the asset categories and for their total investment programs.

In Section 2 we distinguish between the perspectives of the fund sponsor and the investment manager. Section 3 divides the broad subject of performance evaluation into three components: **performance measurement**, **performance attribution**, and **performance appraisal**. Under the topic of performance measurement, in Section 4 we discuss several methods of calculating portfolio performance. Section 5 introduces the concept of performance benchmarks. Turning to performance attribution, in Section 6 we consider the process of analyzing the sources of returns relative to a designated benchmark both from the total fund (fund sponsor) level and from the individual portfolio (investment manager) level. Our topic in Section 7 is performance appraisal, which deals with assessing investment skill. Section 8 addresses key issues in the practice of performance evaluation, and we conclude with a summary of the reading's key points.

THE IMPORTANCE OF PERFORMANCE EVALUATION 2

Performance evaluation is important from the perspectives of both the fund sponsor and the investment manager.

2.1 The Fund Sponsor's Perspective

A typical fund sponsor would consider its investment program incomplete without a thorough and regular evaluation of the fund's performance relative to its investment objectives. Applied in a comprehensive manner, performance evaluation is more than a simple exercise in calculating rates of return. Rather, it provides an exhaustive "quality control" check, emphasizing not only the performance of the fund and its constituent parts relative to objectives, but the sources of that relative performance as well.

Performance evaluation is part of the feedback step of the investment management process. As such, it should be an integral part of a fund's investment policy and documented in its investment policy statement. As discussed in Ambachtsheer (1986) and Ellis (1985), investment policy itself is a combination of philosophy and planning. On the one hand, it expresses the fund sponsor's attitudes toward a number of important investment management issues, such as the fund's mission, the fund sponsor's risk tolerance, the fund's investment objectives, and so on. On the other hand, investment policy is a form of longterm strategic planning. It defines the specific goals that the fund sponsor expects the fund to accomplish, and it describes how the fund sponsor foresees the realization of those goals.

Investment policy gives an investment program a sense of direction and discipline. Performance evaluation enhances the effectiveness of a fund's investment policy by acting as a feedback and control mechanism. It identifies an investment program's strengths and weaknesses and attributes the fund's investment results to various key decisions. It assists the fund sponsor in reaffirming a commitment to successful investment strategies, and it helps to focus attention on poorly performing operations. Moreover, it provides evidence to fund trustees, who ultimately bear fiduciary responsibility for the fund's viability, that the investment program is being conducted in an appropriate and effective manner.

Fund sponsors are venturing into nontraditional asset categories and hiring a larger assortment of managers exhibiting unique investment styles, with the addition of hedge fund managers representing the latest and perhaps most complex example

of this trend. Some fund sponsors are taking more investment decisions into their own hands, such as tactical asset allocation and style timing. Others are taking a quite different direction, giving their managers broad discretion to make asset allocation and security selection decisions. As a consequence of these developments, alert trustee boards are demanding more information from their investment staffs. The staffs, in turn, are seeking to better understand the extent of their own contributions and those of the funds' investment managers to the funds' investment results. The increased complexity of institutional investment management has brought a correspondingly greater need for sophisticated performance evaluation from the fund sponsor's perspective.

2.2 The Investment Manager's Perspective

Investment managers have various incentives to evaluate the performance of the portfolios that they manage for their clients. Virtually all fund sponsors insist that their managers offer some type of accounting of portfolio investment results. In many cases, performance evaluation conducted by the investment manager simply takes the form of reporting investment returns, perhaps presented alongside the returns of some designated benchmark. Other clients may insist on more sophisticated analyses, which the managers may produce in-house or acquire from a third party.

Some investment managers may seriously wish to investigate the effectiveness of various elements of their investment processes and examine the relative contributions of those elements. Managing investment portfolios involves a complex set of decision-making procedures. For example, an equity manager must make decisions about which stocks to hold, when to transact in those stocks, how much to allocate to various economic sectors, and how to allocate funds between stocks and cash. Numerous analysts and portfolio managers may be involved in determining a portfolio's composition. Just as in the case of the fund sponsor, performance evaluation can serve as a feedback and control loop, helping to monitor the proficiency of various aspects of the portfolio construction process.

3 THE THREE COMPONENTS OF PERFORMANCE EVALUATION

In light of the subject's importance to fund sponsors and investment managers alike, we want to consider the primary questions that performance evaluation seeks to address. In discussing performance evaluation we shall use the term "account" to refer generically to one or more portfolios of securities, managed by one or more investment management organizations. Thus, at one end of the spectrum, an account might indicate a single portfolio invested by a single manager. At the other end, an account could mean a fund sponsor's total fund, which might involve numerous portfolios invested by many different managers across multiple asset categories. In between, it might include all of a fund sponsor's assets in a particular asset category or the aggregate of all of the portfolios managed by an investment manager according to a particular mandate. The basic performance evaluation concepts are the same, regardless of the account's composition.

With the definition of an account in mind, three questions naturally arise in examining the investment performance of an account:

1. What was the account's performance?
2. Why did the account produce the observed performance?
3. Is the account's performance due to luck or skill?

In somewhat simplistic terms, these questions constitute the three primary issues of performance evaluation. The first issue is addressed by performance measurement, which calculates rates of return based on investment-related changes in an account's value over specified time periods. Performance attribution deals with the second issue. It extends the results of performance measurement to investigate both the sources of the account's performance relative to a specific investment benchmark and the importance of those sources. Finally, performance appraisal tackles the third question. It attempts to draw conclusions concerning the quality (that is, the magnitude and consistency) of the account's relative performance.

PERFORMANCE MEASUREMENT

4

To many investors, performance measurement and performance evaluation are synonymous. However, according to our classification, performance measurement is a component of performance evaluation. Performance measurement is the relatively simple procedure of calculating returns for an account. Performance evaluation, on the other hand, encompasses the broader and much more complex task of placing those investment results in the context of the account's investment objectives.

Performance measurement is the first step in the performance evaluation process. Yet it is a critical step, because to be of value, performance evaluation requires accurate and timely rate-of-return information. Therefore, we must fully understand how to compute an account's returns before advancing to more involved performance evaluation issues.

4.1 Performance Measurement without Intraperiod External Cash Flows

The rate of return on an account is the percentage change in the account's market value over some defined period of time (the evaluation period), after accounting for all external cash flows.[1] (External cash flows refer to contributions and withdrawals made to and from an account, as opposed to internal cash flows such as dividends and interest payments.) Therefore, a rate of return measures the relative change in the account's value due solely to investment-related sources, namely capital appreciation or depreciation and income. The mere addition or subtraction of assets to or from the account by the account's owner should not affect the rate of return. Of course, in the simplest case, the account would experience no external cash flows. In that situation, the account's rate of return during evaluation period t equals the market value (MV_1) at the end of the period less the market value at the beginning of the period (MV_0), divided by the beginning market value.[2] That is,

$$r_t = \frac{MV_1 - MV_0}{MV_0} \tag{1}$$

Example 1 illustrates the use of Equation 1.

1 The evaluation period in this sense can also be called the measurement period.

2 From the fund sponsor's perspective, the account's market value should reflect the impact of all fees and expenses associated with investing the account's assets. Many managers report the return on accounts that they manage without including the effect of various fees and expenses. This practice is often justified based on the fact that fees vary among clients.

EXAMPLE 1

Rate-of-Return Calculations When There Are No External Cash Flows

Winter Asset Management manages institutional and individual accounts, including the account of the Mientkiewicz family. The Mientkiewicz account was initially valued at $1,000,000. One month later it was worth $1,080,000. Assuming no external cash flows and the reinvestment of all income, applying Equation 1, the return on the Mientkiewicz account for the month is

$$r_t = \frac{\$1{,}080{,}000 - \$1{,}000{,}000}{\$1{,}000{,}000} = 8.0\%$$

Fund sponsors occasionally (and in some cases frequently) add and subtract cash to and from their managers' accounts. These external cash flows complicate rate-of-return calculations. The rate-of-return algorithm must deal not only with the investment earnings on the initial assets in the account, but also with the earnings on any additional assets added to or subtracted from the account during the evaluation period. At the same time, the algorithm must exclude the direct impact of the external cash flows on the account's value.

An account's rate of return may still be computed in a straightforward fashion if the external cash flows occur at the beginning or the end of the measurement period when the account is valued. If a contribution is received at the start of the period, it should be added to (or, in the case of a withdrawal, subtracted from) the account's beginning value when calculating the account's rate of return for that period. The external cash flow will be invested alongside the rest of the account for the full length of the evaluation period and will have the same investment-related impact on the account's ending market value and, hence, should receive a full weighting. Thus, the account's return in the presence of an external cash flow at the beginning of the evaluation period should be calculated as

$$r_t = \frac{\mathrm{MV}_1 - (\mathrm{MV}_0 + \mathrm{CF})}{\mathrm{MV}_0 + \mathrm{CF}} \tag{2}$$

If a contribution is received at the end of the evaluation period, it should be subtracted from (or, in the case of a withdrawal, added to) the account's ending value. The external cash flow had no opportunity to affect the investment-related value of the account, and hence, it should be ignored.

$$r_t = \frac{(\mathrm{MV}_1 - \mathrm{CF}) - \mathrm{MV}_0}{\mathrm{MV}_0} \tag{3}$$

EXAMPLE 2

Rate-of-Return Calculations When External Cash Flows Occur at the Beginning or End of an Evaluation Period

Returning to the example of the Mientkiewicz account, assume that the account received a $50,000 contribution at the beginning of the month. Further, the account's ending and beginning market values equal the same amounts previously stated, $1,080,000 and $1,000,000, respectively. Applying Equation 2, the rate of return for the month is therefore

$$r_t = \frac{\$1{,}080{,}000 - (\$1{,}000{,}000 + \$50{,}000)}{\$1{,}000{,}000 + \$50{,}000} = 2.86\%$$

If the contribution had occurred at month-end, using Equation 3, the account's return would be

$$r_t = \frac{(\$1{,}080{,}000 - \$50{,}000) - \$1{,}000{,}000}{\$1{,}000{,}000} = 3.00\%$$

Both returns are less than the 8% return reported when no external cash flows took place because we are holding the ending account value fixed at $1,080,000. In the case of the beginning-of-period contribution, the account achieves an ending value of $1,080,000 on a beginning value that is higher than in Example 1, so its return must be less than 8%. In the case of the end-of-period contribution, the return is lower than 8% because the ending value of $1,080,000 is assumed to reflect an end-of-period contribution that is removed in calculating the return. In both instances, a portion of the account's change in value from $1,000,000 to $1,080,000 resulted from the contribution; in Example 1, by contrast, the change in value resulted entirely from positive investment performance by the account.[3]

The ease and accuracy of calculating returns when external cash flows occur, if those flows take place at the beginning or end of an evaluation period, lead to an important practical recommendation: Whenever possible, a fund sponsor should make contributions to, or withdrawals from, an account at the end of an evaluation period (or equivalently, the beginning of the next evaluation period) when the account is valued. In the case of accounts that are valued on a daily basis, the issue is trivial. However, despite the increasing prevalence of daily valued accounts, many accounts are still valued on an audited basis once a month (or possibly less frequently), and the owners of those accounts should be aware of the potential for rate-of-return distortions caused by intraperiod external cash flows.

What does happen when external cash flows occur between the beginning and the end of an evaluation period? The simple comparison of the account's value relative to the account's beginning value must be abandoned in favor of more intricate methods.

3 Note that the account's reported return was lower when the contribution took place at the start of the month than at the end. This result occurs because the account had both a positive return and proportionately more assets to invest over the month when the contribution was received at the beginning as opposed to the end. If the account's return had been negative, then, given the same ending value, a contribution at the beginning of the month would have resulted in a less negative reported return than would have resulted from a contribution that occurred at the end of the month.

4.2 Total Rate of Return

Interestingly, widely accepted solutions to the problem of measuring returns in the presence of intraperiod external cash flows are relatively recent developments. Prior to the 1960s, the issue received little attention, largely because the prevailing performance measures were unaffected by such flows. Performance was typically measured on an income-only basis, thus excluding the impact of capital appreciation. For example, current yield (income-to-price) and yield-to-maturity were commonly quoted return measures.

The emphasis on income-related return measures was due to several factors:

- *Portfolio management emphasis on fixed-income assets.* Particularly in the low-volatility interest rate environment that existed prior to the late 1970s, bond prices tended to be stable. Generally high allocations to fixed-income assets made income the primary source of investment-related wealth production for many investors.
- *Limited computing power.* Accurately accounting for external cash flows when calculating rates of return that include capital appreciation requires the use of computers. Access to the necessary computing resources was not readily available. The income-related return measures were simpler and could be performed by hand.
- *Less competitive investment environment.* Investors, as a whole, were less sophisticated and less demanding of accurate performance measures.

As portfolio allocations to equity securities increased, as computing costs declined, and as investors (particularly larger institutional investors) came to focus more intently on the performance of their portfolios, the demand grew for rate-of-return measures that correctly incorporated all aspects of an account's investment-related increase in wealth. This demand led to the adoption of total rate of return as the generally accepted measure of investment performance.

Total rate of return measures the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized). The total rate of return implies that a dollar of wealth is equally meaningful to the investor whether that wealth is generated by the secure income from a 90-day Treasury bill or by the unrealized appreciation in the price of a share of common stock.

Acceptance of the total rate of return as the primary measure of investment performance was assured by a seminal study performed in 1968 by the Bank Administration Institute (BAI). The BAI study (which we refer to again shortly) was the first comprehensive research conducted on the issue of performance measurement. Among its many important contributions, the study strongly endorsed the use of the total rate of return as the only valid measure of investment performance. For our purposes, henceforth, it will be assumed that rate of return refers to the total rate of return, unless otherwise specified.

4.3 The Time-Weighted Rate of Return

We now return to considering the calculation of rates of return in the context of intraperiod external cash flows. To fully appreciate the issue at hand, we must think clearly about the meaning of "rate of return." In essence, the rate of return on an account is the investment-related growth rate in the account's value over the evaluation period. However, we can envision this growth rate being applied to a single dollar invested in the account at the start of the evaluation period or to an "average"

amount of dollars invested in the account over the evaluation period. This subtle but important distinction leads to two different measures: the time-weighted and the money-weighted rates of return.

The **time-weighted rate of return** (TWR) reflects the compound rate of growth over a stated evaluation period of one unit of money initially invested in the account. Its calculation requires that the account be valued every time an external cash flow occurs. If no such flows take place, then the calculation of the TWR is trivial; it is simply the application of Equation 1, in which the change in the account's value is expressed relative to its beginning value. If external cash flows do occur, then the TWR requires computing a set of subperiod returns (with the number of subperiods equaling one plus the number of dates on which external cash flows occur). These subperiod returns must then be linked together in computing the TWR for the entire evaluation period.

EXAMPLE 3

Calculating Subperiod Rates of Return

Returning again to the Mientkiewicz account, let us assume that the account received two cash flows during month *t*: a contribution of $30,000 on day 5 and a contribution of $20,000 on day 16. Further, assume that we use a daily pricing system that provides us with values of the Mientkiewicz account (inclusive of the contributions) of $1,045,000 and $1,060,000 on days 5 and 16 of the month, respectively. We can then calculate three separate subperiod returns using the rate-of-return computation applicable to situations when external cash flows occur at the end of an evaluation period, as given by Equation 3:

Subperiod 1 = Days 1–5

Subperiod 2 = Days 6–16

Subperiod 3 = Days 17–30

For subperiod 1:

$$\begin{aligned} r_{t,1} &= [(\$1{,}045{,}000 - \$30{,}000) - \$1{,}000{,}000]/\$1{,}000{,}000 \\ &= 0.0150 \\ &= 1.50\% \end{aligned}$$

For subperiod 2:

$$\begin{aligned} r_{t,2} &= [(\$1{,}060{,}000 - \$20{,}000) - \$1{,}045{,}000]/\$1{,}045{,}000 \\ &= -0.0048 \\ &= -0.48\% \end{aligned}$$

For subperiod 3:

$$\begin{aligned} r_{t,3} &= (\$1{,}080{,}000 - \$1{,}060{,}000)/\$1{,}060{,}000 \\ &= 0.0189 \\ &= 1.89\% \end{aligned}$$

The subperiod returns can be combined through a process called **chain-linking**. Chain-linking involves first adding 1 to the (decimal) rate of return for each subperiod to create a set of wealth relatives. A **wealth relative** can be thought of as the ending value of one unit of money (for example, one dollar) invested at each subperiod's rate of return. Next, the wealth relatives are multiplied together to produce a cumulative

wealth relative for the full period, and 1 is subtracted from the result to obtain the TWR. Note that this process of chain-linking implicitly assumes that the initially invested dollar and earnings on that dollar are reinvested (or compounded) from one subperiod to the next. The cumulative wealth relative from the chain-linking of the subperiod wealth relatives can be interpreted as the ending value of one dollar invested in the account at the beginning of the evaluation period. Subtracting 1 from this wealth relative produces the TWR for the account:

$$r_{\text{twr}} = (1 + r_{t,1}) \times (1 + r_{t,2}) \times \ldots \times (1 + r_{t,n}) - 1 \quad \textbf{(4)}$$

Note that unless the subperiods constitute a year, the time-weighted rate of return will not be expressed as an annual rate. Example 4 illustrates the calculation of a time-weighted rate of return.

EXAMPLE 4

Calculating the TWR

Continuing with the Mientkiewicz account, its TWR is

$$\begin{aligned} r_{\text{twr}} &= (1 + 0.0150) \times (1 + -0.0048) \times (1. + 0.0189) - 1 \\ &= 0.0292 \\ &= 2.92\% \end{aligned}$$

The TWR derives its name from the fact that each subperiod return within the full evaluation period receives a weight proportional to the length of the subperiod relative to the length of the full evaluation period. That relationship becomes apparent if each subperiod return is expressed as the cumulative return over smaller time units. In the Mientkiewicz account example, the return in the first subperiod is 0.015 over five days. On a daily compounded basis that return is 0.0030 [$= (1 + 0.015)^{1/5} - 1$]. Performing the same calculation for the other two subperiods yields the following:

$$\begin{aligned} r_{\text{twr}} &= (1 + 0.0030)^5 \times (1 + -0.0004)^{11} \times (1 + 0.0013)^{14} - 1 \\ &= 0.0292 = 2.92\% \text{ (allowing for rounding)} \end{aligned}$$

From this expression for the TWR, we can see that the subperiods 1, 2, and 3 receive compounding "weights" of 5/30, 11/30, and 14/30, respectively.

4.4 The Money-Weighted Rate of Return

The **money-weighted rate of return** (MWR) measures the compound growth rate in the value of all funds invested in the account over the evaluation period. In the corporate finance literature, the MWR goes by the name **internal rate of return**, or IRR. Of importance for performance measurement, the MWR is the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows. With MV_1 and MV_0 the values of the account at the end and beginning of the evaluation period, respectively, in equation form the MWR is the growth rate R that solves

$$\text{MV}_1 = \text{MV}_0(1 + R)^m + \text{CF}_1(1 + R)^{m-L(1)} + \ldots + \text{CF}_n(1 + R)^{m-L(n)} \quad \textbf{(5)}$$

where

m = number of time units in the evaluation period (for example, the number of days in the month)
CF_i = the ith cash flow
$L(i)$ = number of time units by which the ith cash flow is separated from the beginning of the evaluation period

Note that R is expressed as the return per unit of time composing the evaluation period. For example, in the case of monthly performance measurement, where the constituent time unit is one day, R would be the daily MWR of the account. Extending this thought, $[(1 + R)^m - 1]$ can be seen to be the account's MWR for the entire evaluation period, as $(1 + R)^m = (1 + r_{mwr})$. Therefore, in the case of no external cash flows, with some algebraic manipulation, Equation 5 reduces to Equation 1, the simple expression for rate of return:

$$\begin{aligned} MV_1 &= MV_0(1 + R)^m + 0 \\ (1 + R)^m &= MV_1/MV_0 \\ (1 + r_{mwr}) &= MV_1/MV_0 \\ r_{mwr} &= (MV_1 - MV_0)/MV_0 \\ &= r_t \end{aligned}$$

EXAMPLE 5

Calculating the MWR

Consider the Mientkiewicz account again. Its MWR is found by solving the following equation for R:

$$\$1{,}080{,}000 = \$1{,}000{,}000(1 + R)^{30} + \$30{,}000(1 + R)^{30-5} + \$20{,}000(1 + R)^{30-16}$$

There exists no closed-form solution for R. That is, Equation 5 cannot be manipulated to isolate R on the left-hand side. Consequently, R must be solved iteratively through a trial-and-error process. In our example, we begin with an initial guess of $R = 0.001$. The right-hand side of the equation becomes \$1,081,480. Thus our initial guess is too high and must be lowered. Next try a value $R = 0.0007$. In this case the right-hand side now equals \$1,071,941. Therefore our second guess is too low.

We can continue this process. Eventually, we will arrive at the correct value for R, which for the Mientkiewicz account is 0.0009536. Remember that this value is the Mientkiewicz account's daily rate of return during the month. Expressed on a monthly basis, the MWR is 0.0290 [$= (1 + 0.0009536)^{30} - 1$], or 2.90%.

As one might expect, a computer is best suited to perform the repetitious task of calculating the MWR. Spreadsheet software to perform these computations is readily available.

4.5 TWR versus MWR

The MWR represents the average growth rate of all money invested in an account, while the TWR represents the growth of a single unit of money invested in the account. Consequently, the MWR is sensitive to the size and timing of external cash flows to

and from the account, while the TWR is unaffected by these flows. Under "normal" conditions, these two return measures will produce similar results. In the example of the Mientkiewicz account, the MWR was 2.90% for the month and the TWR was 2.92%.

However, when external cash flows occur that are large relative to the account's value and the account's performance is fluctuating significantly during the measurement period, then the MWR and the TWR can differ materially.

EXAMPLE 6

When TWR and MWR Differ

Consider the Charlton account, worth $800,000 at the beginning of the month. On day 10 it is valued at $1,800,000 after receiving a $1,000,000 contribution. At the end of the month, the account is worth $3,000,000. As a result, the Charlton account's MWR is 87.5%, while its TWR is only 66.7%.

For subperiod 1:

$$r_{t,1} = [(\$1{,}800{,}000 - \$1{,}000{,}000) - \$800{,}000]/\$800{,}000$$
$$= 0.0 \text{ or } 0\%$$

For subperiod 2:

$$r_{t,2} = (\$3{,}000{,}000 - \$1{,}800{,}000)/\$1{,}800{,}000$$
$$= 0.6667 \text{ or } 66.7\%$$

Then

$$r_{\text{twr}} = (1 + 0) \times (1 + 0.667) - 1$$
$$= 0.667 \text{ or } 66.7\%$$

For MWR, we need to solve

$$\$3{,}000{,}000 = \$800{,}000(1 + R)^{30} + \$1{,}000{,}000(1 + R)^{30-10}$$

By trial and error, R comes out to be 0.020896. Expressed on a monthly basis, MWR is 0.859709 or 86.0% [$= (1 + 0.020896)^{30} - 1$].

If funds are contributed to an account prior to a period of strong performance (as in the case of the Charlton account in Example 6), then the MWR will be positively affected compared to the TWR, as a relatively large sum is invested at a high growth rate. That is, in the case of the Charlton account, a contribution was made just prior to a subperiod in which a dollar invested in the account earned 66.7%. In the prior subperiod the account earned 0.0%. Thus, on average, the account had more dollars invested earning 66.7% than it had dollars earning 0.0%, resulting in an MWR greater than the TWR. Conversely, if funds are withdrawn from the account prior to the strong performance, then the MWR will be adversely affected relative to the TWR. (The opposite conclusions hold if the external cash flow occurred prior to a period of weak performance.)

As noted, the TWR is unaffected by external cash flow activity. Valuing the account at the time of each external cash flow effectively removes the impact of those flows on the TWR. Consequently, the TWR accurately reflects how an investor would have fared over the evaluation period if he or she had placed funds in the account at the beginning of the period.

In most situations, an investment manager has little or no control over the size and timing of external cash flows into or out of his or her accounts. Therefore, practitioners generally prefer a rate-of-return measure that is not sensitive to cash flows if they want to evaluate how a manager's investment actions have affected an account's

value. This consideration led the authors of the Bank Administration Institute study to recommend that the TWR be adopted as the appropriate measure of account performance. That recommendation has received almost universal acceptance since the study's publication. (Note that the Global Investment Performance Standards [GIPS®] generally require a TWR methodology.)

However, one can readily conceive of situations in which the MWR may prove useful in evaluating the returns achieved by an investment manager. The most obvious examples are those situations in which the investment manager maintains control over the timing and amount of cash flows into the account. Managers of various types of private equity investments typically operate under arrangements that permit them to call capital from their investors at the managers' discretion and ultimately to determine when the original capital, and any earnings on that capital, will be returned to investors. In these "opportunistic" situations, it is generally agreed that the MWR is the more appropriate measure of account returns.[4]

4.6 The Linked Internal Rate of Return

Despite its useful characteristics, the TWR does have an important disadvantage: It requires account valuations on every date that an external cash flow takes place. Thus, calculation of the TWR typically necessitates the ability to price a portfolio of securities on a daily basis. Although daily pricing services are becoming more common, marking an account to market daily is administratively more expensive and cumbersome, and potentially more error-prone, than traditional monthly accounting procedures. For these reasons, use of pure TWR is not yet standard practice, with the prominent exception of the mutual fund industry.[5] The MWR, on the other hand, despite its sensitivity to the size and timing of external cash flows, requires only that an account be valued at the beginning and end of the evaluation period and that the amounts and dates of any external cash flows be recorded.

The complementary advantages and disadvantages of the TWR and the MWR led the authors of the BAI study to make an important recommendation: The TWR should be approximated by calculating the MWR over reasonably frequent time intervals and then chain-linking those returns over the entire evaluation period. This process is referred to as the Linked Internal Rate of Return (LIRR) method and originally was developed by Peter Dietz (1966). The BAI study estimated that if the LIRR method were applied to an account experiencing "normal" cash flow activity, then using monthly valuations and daily dating of external cash flows, the calculated rate of return on average would fall within 4 basis points per year of the true TWR.[6] Given the inaccuracies inherent in the pricing of even the most liquid portfolios, this slight difference appears immaterial.

4 For a discussion of the use of the MWR as a performance measure for opportunistic investments, see Tierney and Bailey (1997).

5 Nevertheless, for periods beginning 1 January 2010, firms will be required to value portfolios on the date of all large external cash flows to claim compliance with the GIPS standards. In the interim, the GIPS standards admit the use of acceptable daily weighted methods for estimating the time-weighted rate of return. These methods are presented in the reading on Global Investment Performance Standards.

6 Bank Administration Institute (1968), p. 22.

EXAMPLE 7

An Example of LIRR

Suppose, in a given month, the Mientkiewicz account's MWR is calculated each week. These MWRs are 0.021 in week 1, 0.0016 in week 2, –0.014 in week 3, and 0.018 in week 4. The LIRR is obtained by linking these rates:

$$R_{\text{LIRR}} = (1 + 0.021) \times (1 + 0.0016) \times (1 + -0.014) \times (1 + 0.018) - 1$$
$$= 0.0265 \text{ or } 2.65\%$$

The BAI study concluded that only under unusual circumstances would the LIRR fail to provide an acceptable representation of the TWR. Specifically, the LIRR would fail if both large external cash flows (generally over 10% of the account's value) and volatile swings in subperiod performance occurred during the evaluation period. With an evaluation period as short as one month, the chances of such a joint event occurring for an account are low. Nevertheless, if it should happen, the BAI study recommended valuing the account on the date of the intramonth cash flow.

4.7 Annualized Return

For comparison purposes, rates of return are typically reported on an annualized basis. As defined here, the annualized return represents the compound average annual return earned by the account over the evaluation period. The calculation is also known as the compound growth rate or geometric mean return. An annualized return is computed by employing the same chain-linking method used to calculate linked internal rates of return, except that the product of the linking is raised to the reciprocal of the number of years covering the evaluation period (or equivalently, taking the appropriate root of the linked product, where the root is the number of years in the measurement period).

EXAMPLE 8

Annualized Return

If in years 1, 2, and 3 of a three-year evaluation period an account earned 2.0%, 9.5%, and –4.7%, respectively, then the annualized return for the evaluation period would be

$$r_a = [(1 + 0.02) \times (1 + 0.095) \times (1 - 0.047)]^{1/3} - 1$$
$$= 0.021 \text{ or } 2.1\%$$

If twelve quarterly returns had been available for the account instead of three yearly returns, then those quarterly returns would have been similarly linked and the cube root of the product would have been calculated to produce the account's annualized return over the three-year period.

In general, with measurement periods shorter than a full year, it is inadvisable to calculate annualized returns. Essentially, the person calculating returns is extrapolating the account's returns over a sample period to the full year. Particularly for equity accounts, returns can fluctuate significantly during the remaining time in the evaluation period, making the annualized return a potentially unrealistic estimate of the account's actual return over the full year.

4.8 Data Quality Issues

The performance measurement process is only as accurate as the inputs to the process. Often performance report users fail to distinguish between rates of return of high and low reliability. In the case of accounts invested in liquid and transparently priced securities and experiencing little external cash flow activity, the reported rates of return are likely to be highly reliable performance indicators. They will accurately reflect the experience of an investor who entered such an account at the beginning of the evaluation period and liquidated his or her investment at the end of the period. Conversely, for accounts invested in illiquid and infrequently priced assets, the underlying valuations may be suspect, thereby invalidating the reported rates of return. For example, due to the inaccuracy inherent in estimation techniques, quarterly valuations of venture capital funds typically have limited economic content. An investor may not be able to enter or leave the account at a value anywhere near the reported valuations. As a result, monthly or even annual performance measurement of such funds should be viewed with caution.

Various services exist that collect data on recent market transactions for a wide range of fixed-income and equity securities. Particularly for many thinly traded fixed-income securities, a current market price may not always be available. In that case, estimated prices may be derived based on dealer-quoted prices for securities with similar attributes (for example, a security with a similar credit rating, maturity, and economic sector). This approach is referred to as **matrix pricing**. For highly illiquid securities, reasonable estimates of market prices may be difficult or impossible to obtain. Investment managers may carry these securities at cost or the price of the last trade in those securities. It is outside the scope of this discussion to address in detail the subject of account valuation. Suffice it to say that *caveat emptor*—"let the buyer beware"—should be the motto of any user of performance measurement reports who deals with securities other than liquid stocks and bonds.

In addition to obtaining accurate account valuations and external cash flow recognition, reliable performance measurement requires appropriate data collection procedures. For example, account valuations should be reported on a trade-date, fully accrued basis. That is, the stated value of the account should reflect the impact of any unsettled trades and any income owed by or to the account but not yet paid. Such a valuation process correctly represents the best available statement of the account's position at a point in time. Other methods, such as settlement date accounting and the exclusion of accrued income, incorrectly reflect the account's market value.

BENCHMARKS

5

Performance evaluation cannot be conducted in a vacuum. By its nature, performance evaluation is a relative concept. Absolute performance numbers mean little. Even so-called "absolute return" managers should provide some sense of how alternative uses of their clients' money would have performed if exposed to similar risks. Consider how one interprets a 7% return on a well-diversified common stock portfolio during a given month. If you knew that the broad stock market had declined 15% during the month, you might be impressed. Conversely, if the market had advanced 25%, you might be disappointed. If we are to conduct meaningful performance evaluation, then we must develop an appropriate benchmark against which an account's performance can be compared.

5.1 Concept of a Benchmark

The Merriam-Webster Dictionary defines a benchmark as a "standard or point of reference in measuring or judging quality, value, etc." Applying this general definition to investment management, a benchmark is a collection of securities or risk factors and associated weights that represents the persistent and prominent investment characteristics of an asset category or manager's investment process. At the asset category level, we can think of a benchmark as the collection of securities that the fund sponsor would own if the fund sponsor were required to place all of its investments within the asset category in a single, passively managed portfolio. (In other words, the benchmark is the fund sponsor's preferred index fund for the asset category.) At the manager level, we can think of a benchmark as a passive representation of the manager's investment style, incorporating the salient investment features (such as significant exposures to particular sources of systematic risk) that consistently appear in the manager's portfolios. More metaphorically, a manager's benchmark encompasses the manager's "area" of expertise. Just as an angler has a favorite fishing hole, an investment manager also has distinct preferences for certain types of securities and risk exposures. The opportunity set that represents the manager's area of expertise may be broad or narrow, reflecting the resources and investment processes that the manager brings to bear on the portfolio selection problem.

A little algebra succinctly conveys these concepts. Begin with the simple identity of an investment manager's portfolio; that is, any portfolio is equal to itself:[7]

$$P = P$$

Now, consider an appropriately selected benchmark B. If we add and subtract B from the right-hand side of this identity, effectively adding a zero to the relationship, the result is

$$P = B + (P - B)$$

Additionally, if we define the manager's active investment judgments as being the difference between the manager's portfolio P and the benchmark B so that $A = (P - B)$, then the equation just given becomes

$$P = B + A \tag{6}$$

Thus, the managed portfolio P can be viewed as a combination of 1) the benchmark B and 2) active management decisions A composed of a set of over-and underweighted positions in securities relative to the benchmark. We can extend this relationship by introducing a market index M. Adding and subtracting M from the right-hand side of Equation 6 gives

$$P = M + (B - M) + A$$

The difference between the manager's benchmark portfolio and the market index $(B - M)$ can be defined as the manager's investment style S. If we let $S = (B - M)$, then the equation just given becomes

$$P = M + S + A \tag{7}$$

Equation 7 states that a portfolio has three components: market, style, and active management.

There are several interesting applications of Equation 7. First, note that if the portfolio is a broad market index fund, then $S = (B - M) = 0$ (that is, no style biases) and $A = (P - B) = 0$ (that is, no active management). Consequently, Equation 7 reduces to $P = M$; the portfolio is equivalent to the market index.

7 The variables used in this section can be interpreted as either rates of return or weights assigned to securities that make up a portfolio.

Second, if we define the benchmark as the market index [that is, $S = (B - M) = 0$, or no style], then Equation 7 reduces to Equation 6 and substituting M for B gives

$$P = M + A$$

Because many managers and fund sponsors have been willing to define a manager's benchmark as a broad market index (for example, the S&P 500 in the case of US common stock managers), both parties are implicitly stating that they believe that the manager has no distinct investment style. However, most practitioners would agree that the vast majority of managers pursue specific investment styles. Specialization has become the hallmark of our postindustrial society, and it should not be surprising that, with respect to a subject as complex as portfolio management, many managers have chosen to focus their skills on certain segments of that subject.

EXAMPLE 9

Returns Due to Style and Active Management

Suppose the Mientkiewicz account earns a total return of 3.6% in a given month, during which the portfolio benchmark has a return of 3.8% and the market index has a return of 2.8%. Then the return due to the portfolio manager's style is

$$S = B - M = 3.8\% - 2.8\% = 1\%$$

and the return due to active management is

$$A = P - B = 3.6\% - 3.8\% = -0.2\%$$

5.2 Properties of a Valid Benchmark

Although in practice an acceptable benchmark is simply one that both the manager and the fund sponsor agree fairly represents the manager's investment process, to function effectively in performance evaluation, a benchmark should possess certain basic properties. A valid benchmark is:

- **Unambiguous**. The identities and weights of securities or factor exposures constituting the benchmark are clearly defined.
- **Investable**. It is possible to forgo active management and simply hold the benchmark.
- **Measurable**. The benchmark's return is readily calculable on a reasonably frequent basis.
- **Appropriate**. The benchmark is consistent with the manager's investment style or area of expertise.
- **Reflective of current investment opinions**. The manager has current investment knowledge (be it positive, negative, or neutral) of the securities or factor exposures within the benchmark.
- **Specified in advance**. The benchmark is specified prior to the start of an evaluation period and known to all interested parties.
- **Owned**. The investment manager should be aware of and accept accountability for the constituents and performance of the benchmark. It is encouraged that the benchmark be embedded in and integral to the investment process and procedures of the investment manager.

The failure of a benchmark to possess these properties compromises its utility as an effective investment management tool. A benchmark represents an equivalent risk opportunity cost to the fund sponsor. The properties listed merely formalize intuitive notions of what constitutes a fair and relevant performance comparison. It is interesting to observe that a number of commonly used benchmarks fail to satisfy these properties.

5.3 Types of Benchmarks

At the investment manager level, a benchmark forms the basis of a covenant between the manager and the fund sponsor. It reflects the investment style that the fund sponsor expects the manager to pursue, and it becomes the basis for evaluating the success of the manager's investment management efforts. Many different benchmarks may satisfy the criteria for an acceptable benchmark and, if agreed upon by both parties, could be implemented. In general, there are seven primary types of benchmarks in use.

Absolute An absolute return can be a return objective. Examples include an actuarial rate-of-return assumption or a minimum return target which the fund strives to exceed. Unfortunately, absolute return objectives are not investable alternatives and do not satisfy the benchmark validity criteria.[8]

Manager Universes Consultants and fund sponsors frequently use the median manager or fund from a broad universe of managers or funds as a performance evaluation benchmark. As discussed in more detail later, a median manager benchmark fails all the tests of benchmark validity except for being measurable.

Broad Market Indexes Many managers and fund sponsors use **broad market indexes** as benchmarks. Prominent examples of broad market indexes used by US investors include the S&P 500, Wilshire 5000, and Russell 3000 indexes for US common stocks; the Lehman Aggregate and the Citigroup Broad Investment-Grade (US BIG) Bond Indexes[9] for US investment-grade debt; and the Morgan Stanley Capital International (MSCI) Europe, Australasia, and Far East (EAFE) Index for non-US developed-market common stocks. Market indexes are well recognized, easy to understand, and widely available, and satisfy several properties of valid benchmarks. They are unambiguous, generally investable, and measurable, and they may be specified in advance. In certain situations, market indexes are perfectly acceptable as benchmarks, particularly as benchmarks for asset category performance or for "core" type investment approaches in which the manager selects from a universe of securities similar in composition to the benchmark. However, in other circumstances, the manager's style may deviate

8 As we have used the term, a benchmark is a means to differentiate managers or fund sponsors who add value through investment insights from those who do not. In this sense, a sponsor's liabilities may also be treated as a type of benchmark. That is, institutional investors such as defined-benefit pension plan sponsors and endowment and foundation executives seek to achieve rates of return enabling them, at a minimum, to meet liabilities as they come due without making greater-than-planned additions to fund assets. (Another way to express this financial objective is to say that institutional investors seek at least to maintain a stated level of fund surplus, defined as the present value of assets less the present value of liabilities.) In terms of asset-liability management, or surplus management, the fund's investment objective may be to achieve a rate of return on assets that meets or exceeds the "return" on liabilities—that is, the percentage change in the present value of the liabilities over the evaluation period. Moreover, because a liability, or a stream of liabilities, may be considered a financial asset held short, it is possible, in principle, to construct a custom index representing the fund's liabilities and to use that index as a benchmark at the level of the total fund.
9 Barclays acquired Lehman Brothers and maintained the family of Lehman Brothers indexes and the associated index calculation, publication, and analytical infrastructure and tools. Bloomberg has since acquired Barclays and now (2017) operates the Bloomberg Barclays Indices.

considerably from the style reflected in a market index. For example, assigning a micro-capitalization US growth stock manager an S&P 500 benchmark clearly violates the appropriateness criterion.

Style Indexes Broad market indexes have been increasingly partitioned to create **investment style indexes** that represent specific portions of an asset category: for example, subgroups within the US common stock asset category. Four popular US common stock style indexes are 1) large-capitalization growth, 2) large-capitalization value, 3) small-capitalization growth, and 4) small-capitalization value. (Mid-capitalization growth and value common stock indexes are also available.) The Frank Russell Company, Standard & Poor's, and Morgan Stanley Capital International produce the most widely used US common stock style indexes. International common stock style indexes are more recent developments.

Fixed-income style indexes are produced in a similar manner. In many ways, investment-grade bonds are a more convenient asset category for developing style indexes, because the broad market indexes are easily segregated into various types of securities. For example, broad bond market indexes, such as the Lehman Aggregate for US debt, can be broken up into their constituent parts, such as the Lehman Government/Credit Index, the Lehman Mortgage Index, and so on. The Lehman Aggregate can also be decomposed along the lines of maturity (or duration) and quality.

Similar to broad market indexes, investment style indexes are often well known, easy to understand, and widely available. However, their ability to pass tests of benchmark validity can be problematic. Some style indexes contain weightings in certain securities and economic sectors that are much larger than what many managers consider prudent. Further, the definition of investment style implied in the benchmark may be ambiguous or inconsistent with the investment process of the manager being evaluated. Differing definitions of investment style at times can produce rather extreme return differentials. In 1999, the S&P Large Value Index had a return of 12.72%, and the Russell Large Value Index had a return of 7.35%. These large return differences among indexes presumably designed to represent the results of the same investment style are disconcerting. Users of style indexes should closely examine how the indexes are constructed and assess their applicability to specific managers.

Factor-Model-Based Factor models provide a means of relating one or more systematic sources of return to the returns on an account.[10] As a result, a specified set of factor exposures could potentially be used as a **factor-model-based benchmark**. The simplest form of factor model is a one-factor model, such as the familiar **market model**. In that relationship, the return on a security, or a portfolio of securities, is expressed as a linear function of the return on a broad market index, established over a suitably long period (for example, 60 months):

$$R_p = a_p + \beta_p R_I + \varepsilon_p \tag{8}$$

where R_p represents the periodic return on an account and R_I represents the periodic return on the market index.[11] The market index is used as a proxy for the underlying systematic return factor (or factors). The term ε_p is the residual, or nonsystematic, element of the relationship. The term β_p measures the sensitivity of the returns on

10 Factor models are discussed in DeFusco, McLeavey, Pinto, and Runkle (2004) as well as in standard investment textbooks such as Sharpe, Alexander, and Bailey (1999).

11 Although the market model has some resemblances to the capital asset pricing model (CAPM), the market model is not an equilibrium model of asset pricing, as is the CAPM. Under a set of specific assumptions, the CAPM states that investors will act in a manner that generates a unique relationship between the beta of a security or portfolio and the return on the market portfolio. Any security or portfolio with the same beta is expected to produce the same return. The market model, on the other hand, is an empirical relationship between the return on a security or portfolio and a particular market index (as opposed to the market portfolio). See Markowitz (1984) for a discussion of this distinction.

the account to the returns on the market index; it is typically estimated by regressing the account's returns on those of the market index. The sensitivity term is called the beta of the account. Finally, the intercept a_p is the "zero factor" term, representing the expected value of R_p if the factor value was zero.

EXAMPLE 10

Returns from a Market Model

Consider an account with a zero-factor value of 2.0% and a beta of 1.5. Applying Equation 8, a return of 8% for the market index generates an expected return on the account of 14% (= 2.0% + 1.5 × 8%).

Some managers hold accounts that persistently display a beta greater than 1.0, while other managers hold accounts with betas persistently less than 1.0. Out of these patterns arises the concept of a benchmark with a "normal beta" consistent with these observed tendencies. For example, suppose that an analysis of past account returns, combined with discussions with the manager, suggests a normal beta of 1.2. This normal beta becomes the basis for the benchmark that specifies the level of return that the account would be expected to generate in the absence of any value added by active management on the part of the manager.

Incorporating multiple sources of systematic risk can enhance the richness of the factor model approach. That is, Equation 8 can be extended to include more than one factor. For example, a company's size, industry, growth characteristics, financial strength, and other factors may have a systematic impact on a portfolio's performance. Generalizing Equation 8 produces

$$R_p = a_p + b_1F_1 + b_2F_2 + \ldots + b_KF_K + \varepsilon_p$$

where $F_1, F_2, \ldots F_K$ represent the values of factors 1 through K, respectively. Numerous commercially available multifactor risk models have been produced. Rosenberg and Marathe (1975) pioneered the development of these models, and their work was extended to create performance evaluation benchmarks. The concept of a "normal beta" in a multifactor context leads to the concept of a normal portfolio. A **normal portfolio** is a portfolio with exposures to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Benchmarks based on factor exposures can be useful in performance evaluation. Because they capture the systematic sources of return that affect an account's performance, they help managers and fund sponsors better understand a manager's investment style. However, they are not always intuitive to the fund sponsor and particularly to the investment managers (who rarely think in terms of factor exposures when designing investment strategies), are not always easy to obtain, and are potentially expensive to use. In addition, they are ambiguous. We can build multiple benchmarks with the same factor exposures, but each benchmark can earn different returns. For example, we can construct two different portfolios, each with a beta of 1.2 ("normal beta"), but the portfolios can have materially different returns. Also, because the composition of a factor-based benchmark is not specified with respect to the constituent securities and their weights, we cannot verify all the validity criteria (the benchmark may not be investable, for example).

Returns-Based Sharpe (1988, 1992) introduced the concept of **returns-based benchmarks**. These benchmarks are constructed using 1) the series of a manager's account returns (ideally, monthly returns going back in time as long as the investment process has been in place) and 2) the series of returns on several investment style indexes over

the same period. These return series are then submitted to an allocation algorithm that solves for the combination of investment style indexes that most closely tracks the account's returns.[12]

For example, assume that we have ten years of monthly returns of a US equity mutual fund. Also, assume that we have the monthly returns of four US equity style indexes—1) large-cap growth, 2) large-cap value, 3) small-cap growth, and 4) small-cap value—over the same time period. If we submit these return series to a properly constructed allocation algorithm, we can solve for a particular set of allocation weights for the four style indexes that will track most closely the return series of the manager's actual portfolio. The returns-based benchmark is represented by these allocation weights.

Returns-based benchmarks are generally easy to use and are intuitively appealing. They satisfy most benchmark validity criteria, including those of being unambiguous, measurable, investable, and specified in advance. Returns-based benchmarks are particularly useful in situations where the only information available is account returns. One disadvantage of returns-based benchmarks is that, like the style indexes that underlie the benchmarks, they may hold positions in securities and economic sectors that a manager might find unacceptable. Further, they require many months of observation to establish a statistically reliable pattern of style exposures. In the case of managers who rotate among style exposures, such a pattern may be impossible to discern.

Custom Security-Based An investment manager will typically follow an investment philosophy that causes the manager to focus its research activities on certain types of securities. The manager will select those securities that represent the most attractive investment opportunities that the research process has identified. As the financial and investment characteristics of securities will change over time, a manager's research universe will similarly evolve.

A **custom security-based benchmark** is simply a manager's research universe weighted in a particular fashion. Most managers do not use a security weighting scheme that is exactly an equal weighting across all securities or one that exactly assigns weights according to market capitalization. Consequently, a custom benchmark reflecting a particular manager's unique weighting approach can be more suitable than a published index for a fair and accurate appraisal of that manager's performance.

The overwhelming advantage of a custom security-based benchmark is that it meets all of the required benchmark properties and satisfies all of the benchmark validity criteria, making it arguably the most appropriate benchmark for performance evaluation purposes. In addition, it is a valuable tool for managers to monitor and control their investment processes and for fund sponsors to effectively allocate or budget risk across teams of investment managers. One major disadvantage is that custom security-based benchmarks are expensive to construct and maintain. In addition, as they are not composed of published indexes, the perception of a lack of transparency can be of concern.

5.4 Building Custom Security-Based Benchmarks

A valid custom security-based benchmark is the product of discussions between the client or the client's consultant and the manager and of a detailed analysis of the manager's past security holdings. The construction of such a benchmark involves the following steps:

- Identify prominent aspects of the manager's investment process.

12 The ability to track the account's returns is typically measured by the standard deviation of the monthly return differences of the account and the benchmark, called the tracking error.

- Select securities consistent with that investment process.
- Devise a weighting scheme for the benchmark securities, including a cash position.
- Review the preliminary benchmark and make modifications.
- Rebalance the benchmark portfolio on a predetermined schedule.

For the purpose of custom benchmark construction, an analysis of the manager's past portfolios will identify prominent aspects of the manager's investment process. The selection of benchmark portfolio securities requires both a broad universe of potential candidates and a set of screening criteria consistent with the manager's investment process. Weighting schemes may include aspects of equal weighting and capitalization weighting, depending on the manager's investment process and client restrictions. Following these steps, a preliminary benchmark portfolio is selected. At this point, the benchmark's composition is reviewed and final modifications are made. Ultimately, keeping the benchmark portfolio current with the manager's investment process necessitates rebalancing the portfolio at regularly scheduled intervals.

These steps, though simple in appearance, constitute a complex task. A proper benchmark must make a fine distinction between the manager's "normal" or policy investment decisions and the manager's active investment judgments. Considerable resources are required, including a comprehensive security database, an efficient computer screening capability, a flexible security weighting system, and a means of maintaining the integrity of the benchmark over time.

5.5 Critique of Manager Universes as Benchmarks

Fund sponsors have a natural interest in knowing how their investment results compare to those achieved by similar institutions and how the returns earned by the managers they have selected compare to those earned by managers they might have engaged. To facilitate peer group comparisons, some consulting firms and custodial banks have developed databases or "universes" of account returns ranked in descending order. Fund sponsors often use the median account in a particular peer group as a return benchmark. For instance, the investment policy statement of a public fund might specify that the fund's objective is to perform in the top half of a certain universe of public funds, and the guidelines for a domestic large-cap equity account might state that the manager's results are expected to exceed those of the median account in a certain universe consisting of portfolios with large-cap value mandates or characteristics.

With the exception of being measurable, the median account in a typical commercially available universe does not have the properties of a valid benchmark described above. One of the most significant deficiencies is that, although the universe can be named, the median account cannot be *specified in advance*. Universe compilers can only establish the median account on an *ex post* basis, after the returns earned by all accounts have been calculated and ranked. Prior to the start of an evaluation period, neither the manager nor the fund sponsor has any knowledge of who the median manager will be at period end. In addition, different accounts will fall at the median from one evaluation period to another. For these reasons, the benchmark is not *investable* and cannot serve as a passive alternative to holding the account that is under analysis. Even after the evaluation period concludes, the identity of the median manager typically remains unknown, preventing the benchmark from satisfying the *unambiguous* property. The ambiguity of the median manager benchmark makes it impossible to verify its *appropriateness* by examining whether the investment style it represents adequately corresponds to the account being evaluated. The fund sponsor who chooses to employ universes for peer group comparisons can only rely on the

compiler's representations that accounts have been rigorously screened against well-defined criteria for inclusion, the integrity of the input data is scrupulously monitored, and a uniform return calculation methodology has been used for all accounts in all periods.

One other disadvantage merits attention. Because fund sponsors terminate underperforming managers, universes are unavoidably subject to "survivor bias." Consider the hypothetical universe represented in Exhibit 1, where a shaded cell indicates that a particular account existed for a given year and an X indicates that a rate of return can be calculated for the referenced evaluation period.

Exhibit 1 Survivor Bias in a Manager Universe

								Annualized Returns at End of Year 7			
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	1 Year	3 Years	5 Years	7 Years
Manager 1											
Manager 2								X	X	X	X
Manager 3								X			
Manager 4								X	X		
Manager 5											
Manager 6											
Manager 7								X	X	X	X
Manager 8								X	X	X	
Manager 9								X			
Manager 10											
Observations	6	6	7	7	7	5	6	6	4	3	2

In this example, there were six accounts in the universe at the end of Year 1, and there were six at the end of Year 7. They were not all the same accounts, however; in fact, only two have survived for the full period to achieve seven-year returns. The other four in the Year 1 cohort were no longer present because the sponsors reallocated funds or possibly because the managers' performance was unsatisfactory. In any event, it is likely that the two survivors were among the best-performing in the group of accounts that existed in Year 1; sponsors are naturally reluctant to dismiss strong performing managers. Because the survivors' returns were presumably high, the actual median seven-year return for this universe will be higher than the median of a hypothetical return distribution from which no accounts were removed.

Why are these deficiencies of the median manager benchmark of concern? From the perspective of performance evaluation, the question becomes, "To what is the manager expected to add value?" Without a valid reference point, superior performance remains an elusive notion. Placing above the median of a universe of investment managers or funds may be a reasonable investment *objective*, but the performance of a particular manager or fund is not a suitable performance benchmark that can be used to assess investment skill.[13]

13 Bailey (1992a) critiques in detail the use of manager universes as benchmarks. Beyond the failure to possess the properties of a valid benchmark and the issue of survivor bias, Bailey also discusses the failure of manager universes to pass tests of benchmark quality. The tests of benchmark quality are summarized in Section 5.6.

5.6 Tests of Benchmark Quality

In many organizations, benchmarks have become an important element of the investment management process. Moreover, benchmark use has expanded beyond performance evaluation. Benchmarks are now an integral part of risk management, at both the investment manager and fund sponsor levels. Most forms of risk budgeting use benchmarks to estimate the risks to which a fund sponsor's investment program is exposed at the asset category and investment manager levels.

Given the important uses of benchmarks, it is in the interests of all parties involved (fund sponsors, consultants, and managers) to identify good benchmarks and to improve or replace poor benchmarks. Good benchmarks increase the proficiency of performance evaluation, highlighting the contributions of skillful managers. Poor benchmarks obscure manager skills. Good benchmarks enhance the capability to manage investment risk. Poor benchmarks promote inefficient manager allocations and ineffective risk management. They also increase the likelihood of unpleasant surprises, which can lead to counterproductive actions and unnecessary expense on the part of the fund sponsor.

Bailey (1992b) presents a heuristic set of benchmark quality criteria designed to distinguish good benchmarks from poor benchmarks. These criteria are based on the fundamental properties of valid benchmarks discussed previously and on a logical extension of the purposes for which benchmarks are used. Although none of the criteria alone provides a definitive indicator of benchmark quality, taken together they provide a means for evaluating alternative benchmarks.

Systematic Biases Over time, there should be minimal systematic biases or risks in the benchmark relative to the account. One way to measure this criterion is to calculate the historical beta of the account relative to the benchmark; on average, it should be close to 1.0.[14]

Potential systematic bias can also be identified through a set of correlation statistics. Consider the correlation between $A = (P - B)$ and $S = (B - M)$. The contention is that a manager's ability to identify attractive and unattractive investment opportunities should be uncorrelated with whether the manager's style is in or out of favor relative to the overall market. Accordingly, a good benchmark will display a correlation between A and S that is not statistically different from zero.

Similarly, let us define the difference between the account and the market index as $E = (P - M)$. When a manager's style (S) is in favor (out of favor) relative to the market, we expect both the benchmark and the account to outperform (underperform) the market. Therefore, a good benchmark will have a statistically significant positive correlation coefficient between S and E.

Tracking Error We define tracking error as the volatility of A or $(P - B)$. A good benchmark should reduce the "noise" in the performance evaluation process. Thus, the volatility (standard deviation) of an account's returns relative to a good benchmark should be less than the volatility of the account's returns versus a market index or other alternative benchmarks. Such a result indicates that the benchmark is capturing important aspects of the manager's investment style.

---

14 The historical beta of the account relative to the benchmark is derived from a regression of the account's past returns on the past returns of the benchmark. The resulting slope of the regression line, termed the beta of the regression, indicates the sensitivity of the account's returns to those of the benchmark. Note that a benchmark may fail this test because the manager holds cash in the account, typically for transaction purposes, while the benchmark may reflect a zero cash position. If the account's beta relative to the benchmark would be 1.0 excluding the positive cash position, the overall beta of the account (including the cash position) will be less than 1.0. As a result, the account will have an unfavorable performance bias in an up market and a favorable bias in a down market. The simple solution is to hold cash in the benchmark at a level reflective of the manager's "neutral" cash position.

Risk Characteristics An account's exposure to systematic sources of risk should be similar to those of the benchmark over time.[15] The objective of a good benchmark is to reflect but not to replicate the manager's investment process. Because an active manager is constantly making bets against the benchmark, a good benchmark will exhibit risk exposures at times greater than those of the managed portfolio and at times smaller. Nevertheless, if the account's risk characteristics are always greater or always smaller than those of the benchmark, a systematic bias exists.

Coverage Benchmark coverage is defined as the proportion of a portfolio's market value that is contained in the benchmark. For example, at a point in time, all of the securities and their respective weights that are contained in the account and the benchmark can be examined. The market value of the jointly held securities as a percentage of the total market value of the portfolio is termed the coverage ratio. High coverage indicates a strong correspondence between the manager's universe of potential securities and the benchmark. Low coverage indicates that the benchmark has little relationship, on a security level, with the opportunity set generated by the manager's investment process.

Turnover Benchmark turnover is the proportion of the benchmark's market value allocated to purchases during a periodic rebalancing of the benchmark. Because the benchmark should be an investable alternative to holding the manager's actual portfolio, the benchmark turnover should not be so excessive as to preclude the successful implementation of a passively managed portfolio.

Positive Active Positions An active position is an account's allocation to a security minus the corresponding weight of the same security in the benchmark. For example, assume an account has a 3% weighting in General Electric (GE). If the benchmark has a 2% weighting in GE, then the active position is 1% (3% – 2%). Thus, the manager will receive positive credit if GE performs well. Actively managed accounts whose investment mandates permit only long positions contain primarily securities that a manager considers to be attractive. When a good custom security-based benchmark has been built, the manager should be expected to hold largely positive active positions for actively managed long-only accounts.[16]

Note that when an account is benchmarked to a published index containing securities for which a long-only manager has no investment opinion and which the manager does not own, negative active positions will arise. A high proportion of negative active positions is indicative of a benchmark that is poorly representative of the manager's investment approach.

5.7 Hedge Funds and Hedge Fund Benchmarks

Hedge funds have become increasingly popular among institutional and high-net-worth investors in recent years. Although the term "hedge fund" covers a wide range of investment strategies, there are some common threads that link these strategies. In general, **hedge funds** attempt to expose investors to a particular investment opportunity while minimizing (or hedging) other investment risks that could impact the outcome. In most cases, hedging involves both long and short investment positions.

15 Risk characteristics refer to factors that systematically affect the returns on many securities. We will return to the issue later in the discussion on performance attribution.

16 Violations of this quality criterion often occur when a benchmark is market capitalization weighted. Because many managers do not utilize a market-capitalization weighting scheme in building their portfolios, the possibility of negative active positions can arise when a capitalization-weighted benchmark is assigned.

The term "hedge fund" is believed to have originated as a description of an investment strategy developed by Alfred Winslow Jones.[17] The basic strategy involved shorting stocks that managers considered to be overvalued and using the proceeds to invest in stocks that were deemed to be undervalued. In addition, an incentive fee was established, and Jones committed his own capital to assure investors that his interests were aligned with their interests.

In essence, the Jones strategy is the same as the standard long-only strategy in that, relative to the benchmark, a long-only manager will overweight undervalued securities and underweight overvalued securities. The difference is that the long-only manager is limited to a minimum investment of zero in any security. As a result, the maximum "negative bet" that a long-only manager can place on a security that is rated as overvalued is not to hold it (a weight of zero). For example, because approximately 450 companies in the S&P 500 have weights less than 0.5%, a long-only manager with an S&P 500 benchmark and a negative opinion on any of these stocks would be limited to, at most, a –0.5% active position. By removing the zero weight constraint (that is, allowing shorting), a manager can further exploit overvalued stocks.

There are, however, performance measurement issues as well as numerous administrative and compliance issues that are created when there are short positions in an account. Recall that earlier in the reading (Equation 1), we stated that an account's rate of return is equal to its market value (MV_1) at the end of a period less its market value at the beginning of the period (MV_0), divided by the beginning market value:

$$r_t = \frac{MV_1 - MV_0}{MV_0}$$

In theory, the net assets of a long–short portfolio could be zero; the value of the portfolio's long positions equal the value of the portfolio's short positions. In this case, the beginning market value, MV_0, would be zero and the account's rate of return would be either positive infinity or negative infinity. In the real world of long–short investing, an account will typically have a positive net asset value due to various margin and administrative requirements. However, as the net asset value gets smaller and approaches zero, the account's return will become nonsensically extreme (large positive or large negative).

To address this problem, we need to revise our performance measurement methodology. One approach would be to think in terms of performance impact, which is discussed in more detail later in the reading. That is,

$$r_v = r_p - r_B \tag{9}$$

where

r_v = value-added return
r_p = portfolio return
r_B = benchmark return

17 See Koh, Lee, and Fai (2002).

Here, the term r_v is the value-added return on a long–short portfolio where the active weights sum to zero, which is the same situation as a zero-net asset hedge fund. Although the active weights sum to zero, a return can be determined by summing the performance impacts of the n individual security positions (both long and short).

$$\sum_{i=1}^{n} w_{vi} = \left(\sum_{i=1}^{n} w_{pi} - \sum_{i=1}^{n} w_{Bi}\right) = 0; \text{ and}$$

$$r_v = \sum_{i=1}^{n}\left[w_{vi} \times r_i\right] = \sum_{i=1}^{n}\left[\left(w_{pi} - w_{Bi}\right) \times r_i\right]$$

$$= \sum_{i=1}^{n}\left(w_{pi} \times r_i\right) - \sum_{i=1}^{n}\left(w_{Bi} \times r_i\right) = r_p - r_B$$

where w_{vi}, w_{pi}, and w_{Bi} are respectively the *active* weight of security i in the portfolio, the weight of security i in the portfolio, and the weight of security i in the benchmark. A return could be calculated for the period during which the individual security positions were maintained. Once an individual security position changed, the return period would end and a new return period would start.[18]

The application of benchmarks to long-only portfolios has reached a mature status. Issues regarding the quality of various benchmark designs and the concerns of overly constraining active management strategies by somehow tying performance too closely to benchmarks remain contentious issues. (For example, see Bernstein 2003.) Nevertheless, it is the rare fund sponsor or investment manager who does not make reference to account performance relative to some benchmark. The advent of hedge funds, however, added a new dynamic to the discussion of the use and design of benchmarks. Some practitioners eschew the use of benchmarks entirely for hedge fund managers, contending that the "absolute return" mandate associated with hedge funds implies that relative performance comparisons are meaningless.

The discussion of hedge fund benchmarks is confounded by the vagueness of the definition of hedge funds. A wide variety of active investment strategies fall under the category of hedge funds. The implications of that diversity for benchmark design are considerable. Underlying all long-only benchmark designs are references to the opportunity set available to the manager. Some hedge fund managers have very clearly definable investment universes composed of highly liquid, daily priced securities. For example, many long-short equity managers also manage long-only portfolios. The universe of securities from which they select on the short side often closely resembles the universe of securities from which they select on the long side. Given information regarding the historical returns and holdings of a long-short equity manager's long and short portfolios, we could use either returns-based or security-based benchmark building approaches to construct separate long and short benchmarks for the manager. These benchmarks could be combined in appropriate proportions to create a valid benchmark. Other hedge fund managers, such as macro hedge fund managers, take rapidly changing long-short leveraged positions in an array of asset categories ranging from equities to commodities, which present significant benchmark building challenges.

The ambiguity of hedge fund manager opportunity sets has led to the widespread use of the Sharpe ratio to evaluate hedge fund manager performance. As discussed later in this reading, the traditional Sharpe ratio is a measure of excess returns (over a risk-free return) relative to the volatility of returns; notably, it can be calculated

18 Another approach to determining a rate of return for a long–short portfolio would be to specify the numerator in Equation 1as the profit and/or loss resulting from the particular hedge fund strategy. The denominator could be specified as the asset base over which the strategy applies. This could be defined as the amount of assets at risk and could be approximated by the absolute value of all the long positions plus the absolute value of all the short positions.

without reference to the manager's underlying investment universe. Typically, a hedge fund's Sharpe ratio is compared to that of a universe of other hedge funds that have investment mandates assumed to resemble those of the hedge fund under evaluation. Unfortunately, this approach is exposed to the same benchmark validity criticisms leveled against standard manager universe comparisons. Further, the standard deviation as a measure of risk (the denominator of the Sharpe ratio) is questionable when an investment strategy incorporates a high degree of optionality (skewness), as is the case for the strategies of many hedge funds.

6 PERFORMANCE ATTRIBUTION

We now move to the second phase of performance evaluation, performance attribution. Fama (1972) proposed the first approach to analyzing the sources of an account's returns. Practitioners use various forms of performance attribution, but the basic concept remains the same: a comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns. Further, a unifying mathematical relationship underlies all performance attribution approaches: Impact equals weight times return. We will return to that relationship shortly.

Performance attribution provides an informed look at the past. It identifies the sources of different-from-benchmark returns (**differential returns**) and their impacts on an account's performance. Presuming that one of the objectives of performance attribution is to gain insights helpful for improving the portfolio management process, that process should dictate the method of attribution. The result will be information or a message that will directly relate to the inputs that have gone into the portfolio management process.

When performance attribution is conducted in this manner, the message will either 1) *reinforce* the effectiveness of the management process or 2) cause a *rethinking* of that process.

Effective performance attribution requires an appropriate analytical framework for decomposing an account's returns relative to those of the benchmark. There is no single correct approach. The appropriate framework will depend on the context of the analysis. In particular, the appropriate framework should reflect the decision-making processes of the organizations involved.

We will consider two basic forms of performance attribution from the standpoints of the fund sponsor and the investment manager. Each form seeks to explain the sources of differential returns. We refer to the performance attribution conducted on the fund sponsor level as **macro attribution**. Performance attribution carried out on the investment manager level we call **micro attribution**. The distinction relates to the specific decision variables involved, as opposed to which organization is actually conducting the performance attribution. While it is unlikely that an investment manager would be in a position to carry out macro attribution, one can easily envision situations in which a fund sponsor may wish to conduct both macro and micro attribution.

6.1 Impact Equals Weight Times Return

A manager can have a positive impact on an account's return relative to a benchmark through two basic avenues: 1) selecting superior (or avoiding inferior) performing assets and 2) owning the superior (inferior) performing assets in greater (lesser) proportions than are held in the benchmark. This simple concept underlies all types of performance attribution. The assets themselves may be divided or combined into all sorts of categories, be they economic sectors, financial factors, or investment strategies. In the end, however, the fundamental rule prevails that impact equals (active) weight times return.

The nature of this concept is illustrated through the following example.

EXAMPLE 11

An Analogy to the Expression for Revenue

Consider a business that sells widgets. Its total revenue is determined by the formula

Revenue = Price × Quantity sold

This year, revenue has risen. The company wants to know why. Based on the above formula, the increase in revenues can be attributed to changes in the unit prices or quantity sold or both (perhaps offsetting to a degree). Exhibit 2 displays the situation in which both price and quantity sold have risen. The old revenue was equal to $P_1 \times Q_1$. The new revenue is equal to $P_2 \times Q_2$. The difference in revenues is a bit more complicated, however. It is due in part to an increase in price [$(P_2 - P_1) \times Q_1$; Area 1], in part to an increase in quantity sold [$(Q_2 - Q_1) \times P_1$; Area 2], and in part to the interaction of both variables [$(P_2 - P_1) \times (Q_2 - Q_1)$; Area 3]. Making the connection to performance attribution, the change in quantity is roughly analogous to a difference in weights between securities held in the account and the benchmark, while the change in price represents the difference in returns between securities held in the account and the benchmark.

Exhibit 2 A Price–Quantity Analogy

6.2 Macro Attribution Overview

Let us assume for the moment that for a fund sponsor the term "account" refers to a total fund consisting of investments in various asset categories (for example, domestic stocks, international stocks, domestic fixed income, and so on) and that the investments are managed by various investment managers. For ease of exposition, we will call this particular account the "Fund." The fund sponsor controls a number of variables that have an impact on the performance of the Fund. For example, the fund sponsor determines the broad allocation of assets to stocks, bonds, and other types of securities. Further, because the fund sponsor retains multiple investment managers to invest the assets of the Fund, decisions must be made regarding allocations across the various investment styles offered by the managers and allocations to the individual managers themselves.

Macro attribution can be carried out solely in a rate-of-return metric. That is, the results of the analysis can be presented in terms of the effects of decision-making variables on the differential return. Most forms of macro attribution follow that approach. The analysis can be enriched by considering the impacts of the decision-making variables on the differential returns in monetary terms. Consider that it is one thing to report that a fund sponsor's active managers added, say, 0.30% to the Fund's performance last month. It is quite another thing to state that the 30 basis points of positive active management added US$5 million to the value of the Fund. Performance attribution expressed in a value metric (as opposed to a return metric) can make the subject more accessible not only to investment professionals, but particularly to persons not regularly exposed to the subtle issues of performance attribution. We will present examples of both approaches.

6.3 Macro Attribution Inputs

Three sets of inputs constitute the foundation of the macro attribution approach:

1. policy allocations;
2. benchmark portfolio returns; and
3. fund returns, valuations, and external cash flows.

With these inputs in hand we can decompose the Fund's performance from a macro perspective. In the following, we illustrate each concept with data for a hypothetical fund sponsor, the Michigan Endowment for the Performing Arts (MEPA). We use the data for MEPA in the subsequent section to illustrate a macro performance attribution analysis.

Policy Allocations As part of any effective investment program, fund sponsors should determine normal weightings (that is, policy allocations) to the asset categories within the Fund and to individual managers within the asset categories. By "normal" we mean a neutral position that the fund sponsor would hold in order to satisfy long-term investment objectives and constraints. Policy allocations are a function of the fund sponsor's risk tolerance, the fund sponsor's long-term expectations regarding the investment risks and rewards offered by various asset categories and money managers, and the liabilities that the Fund is eventually expected to satisfy.

Exhibit 3 displays the policy allocations of MEPA. It has divided the Fund's assets between two asset categories, with 75% assigned to domestic equities and 25% assigned to domestic fixed income. Within each asset category, MEPA has retained two active managers. It has allocated 65% of the domestic equities to Equity Manager #1 and the remaining 35% to Equity Manager #2. Similarly, the fund sponsor has assigned 55% of the domestic fixed income to Fixed-Income Manager #1 and 45% to Fixed-Income Manager #2.

Exhibit 3 Michigan Endowment for the Performing Arts Investment Policy Allocations

Asset Category	Policy Allocations	
Domestic equities		75.0%
Equity Manager #1	65.0	
Equity Manager #2	35.0	
Domestic fixed income		25.0
Fixed-Income Manager #1	55.0	
Fixed-Income Manager #2	45.0	
Total fund		100.0%

Benchmark Portfolio Returns We defined benchmarks earlier. Exhibit 4 presents the benchmarks that MEPA has selected for its two asset categories and the managers within those asset categories. The fund sponsor uses broad market indexes as the benchmarks for asset categories, while it uses more narrowly focused indexes to represent the managers' investment styles.[19]

Exhibit 4 Michigan Endowment for the Performing Arts Benchmark Assignments

Asset Category	Benchmark
Domestic equities	S&P 500
Equity Manager #1	Large-Cap Growth Index
Equity Manager #2	Large-Cap Value Index
Domestic fixed income	Lehman Govt./Credit Index
Fixed-Income Manager #1	Lehman Int. Govt./Credit Index
Fixed-Income Manager #2	Lehman Treasury Index

Returns, Valuations, and External Cash Flows Macro attribution in a return-only metric requires fund returns. These returns must be computed at the level of the individual manager to allow an analysis of the fund sponsor's decisions regarding manager selection. If macro attribution is extended to include a value-metric approach, then account valuation and external cash flow data are needed not only to calculate accurate rates of return, but also to correctly compute the value impacts of the fund sponsor's investment policy decision making.

For the month of June 20xx, Exhibit 5 shows the beginning and ending values, external cash flows, and the actual and benchmark returns for MEPA's total fund, asset categories, and investment managers.

19 Rather than using broad market indexes as asset category benchmarks, some fund sponsors and consultants construct asset category benchmarks by weighting the managers' benchmarks in accordance with their policy allocations. Under this approach, using the data given in Exhibits 3 and 4, the blended asset category benchmark for domestic equities would consist of a 65% weighting in Large-Cap Growth Index and a 35% weighting in Large-Cap Value Index. However, this approach impairs the sponsor's ability to evaluate the impact of "misfit returns" or "style bias" as described below.

Exhibit 5 Michigan Endowment for the Performing Arts Account Valuations, Cash Flows, and Returns June 20xx

Asset Category	Beginning Value	Ending Value	Net Cash Flows	Actual Return	Benchmark Return
Domestic equities	$143,295,254	$148,747,228	$(1,050,000)	4.55%	4.04%
Equity Mgr. #1	93,045,008	99,512,122	1,950,000	4.76	4.61
Equity Mgr. #2	50,250,246	49,235,106	(3,000,000)	4.13	4.31
Domestic fixed income	43,124,151	46,069,371	2,000,000	2.16	2.56
Fixed-Income Mgr. #1	24,900,250	25,298,754	0	1.60	1.99
Fixed-Income Mgr. #2	18,223,900	20,770,617	2,000,000	2.91	2.55
Total fund	$186,419,405	$194,816,599	$950,000	3.99%	3.94%

With the inputs for our hypothetical fund sponsor in hand, we turn to an example of a macro performance attribution analysis in the next section.

6.4 Conducting a Macro Attribution Analysis

One can envision a number of different variables of interest when evaluating the fund sponsor's decision-making process. Below, we present six levels or components of investment policy decision making into which the Fund's performance might be analyzed. We do not imply that these are the only correct variables—they are simply logical extensions of a typical fund sponsor's decision-making process.

Specifically, those levels (which we later refer to as "investment strategies" for reasons to become apparent shortly) are:

1. Net Contributions
2. Risk-Free Asset
3. Asset Categories
4. Benchmarks
5. Investment Managers
6. Allocation Effects

Macro attribution analysis starts with the Fund's beginning-of-period and end-of-period values. Simply put, the question under consideration is: How much did each of the decision-making levels contribute, in either a return or a value metric, to the Fund's change in value over an evaluation period? Macro attribution takes an incremental approach to answering this question. Each decision-making level in the hierarchy is treated as an investment strategy, and its investment results are compared to the cumulative results of the previous levels. That is, each decision-making level represents an unambiguous, appropriate, and specified-in-advance investment alternative: in other words, a valid benchmark. The fund sponsor has the option to place all of the Fund's assets in any of the investment strategies. The strategies are ordered in terms of increasing volatility and complexity. Presumably, the fund sponsor will move to a more aggressive strategy only if it expects to earn positive incremental returns. Macro attribution calculates the incremental contribution that the choice to move to the next strategy produces.

In the previous section we gave the inputs necessary to conduct a macro performance attribution analysis for a hypothetical fund sponsor, MEPA, for the month of June 20xx. We apply the macro attribution framework just outlined to MEPA in the following discussion. Exhibit 6 summarizes the results.

Exhibit 6 Michigan Endowment for the Performing Arts Monthly Performance Attribution June 20xx

Decision-Making Level (Investment Alternative)	Fund Value	Incremental Return Contribution	Incremental Value Contribution
Beginning value	$186,419,405	—	—
Net contributions	187,369,405	0.00%	950,000
Risk-free asset	187,944,879	0.31%	575,474
Asset category	194,217,537	3.36%	6,272,658
Benchmarks	194,720,526	0.27%	502,989
Investment managers	194,746,106	0.01%	25,580
Allocation effects	194,816,599	0.04%	70,494
Total fund	194,816,599	3.99%	8,397,194

We now examine each of the six levels in turn.

Net Contributions Exhibit 6 indicates that the starting point of the analysis is the Fund's beginning market value. In our example, at the beginning of June 20xx, the market value of the Fund was $186,419,405. During a given month, the Fund may experience contributions and/or withdrawals. The Net Contributions investment strategy specifies that the net inflows are invested at a zero rate of return and, therefore, the Fund's value changes simply by the total amount of these flows. During June 20xx, net contributions to the Fund were a positive $950,000. Adding this amount to the Fund's beginning value produces a value of $187,369,405 for the Fund under the Net Contributions investment strategy. Although no fund sponsor would deliberately follow this investment strategy, it provides a useful baseline to begin the analysis.

Risk-Free Asset One highly conservative (but certainly reasonable) investment strategy open to a fund sponsor is to invest all of the Fund's assets in a risk-free asset, such as 90-day Treasury bills.[20] Assuming that the Fund's beginning value and its net external cash inflows (accounting for the dates on which those flows occur) are invested at the risk-free rate, the Fund's value will increase by an additional amount over the value achieved under the Net Contributions investment strategy with its zero rate of return. The Risk-Free Asset investment strategy, using a risk-free rate during June 20xx of 0.31%, produces an incremental increase in value of $575,474 (= $187,944,879 – 187,369,405) over the results of the Net Contributions investment strategy, for a total fund value of $187,944,879.[21]

Asset Category Most fund sponsors view the Risk-Free Asset investment strategy as too risk-averse and therefore overly expensive. Instead, they choose to invest in risky assets, based on the widely held belief that, over the long run, the market rewards investors who bear systematic risk. The Asset Category investment strategy assumes that the Fund's beginning value and external cash flows are invested passively in a combination of the designated asset category benchmarks, with the specific allocation to each benchmark based on the fund sponsor's policy allocations to those asset categories.

20 Alternatively, a pension fund might identify the risk-free asset as a portfolio of bonds that best hedges its liabilities.

21 The increment of $575,474 cannot be replicated by multiplying $187,369,405 by 0.31% because the $950,000 net contribution (to obtain $187,369,405) was not a single, beginning-of-the-month cash flow.

In essence, this approach is a pure index fund approach. The Fund's value under this investment strategy will exceed or fall below the value achieved under the Risk-Free Asset investment strategy depending on whether the capital markets fulfill the expectation that risk-taking investors are rewarded. From a return-metric perspective, the incremental return contribution is

$$r_{AC} = \sum_{i=1}^{A} w_i \times \left(r_{Ci} - r_f\right) \tag{10}$$

where r_{AC} is the incremental return contribution of the Asset Category investment strategy, r_{Ci} is the return on the ith asset category, r_f is the risk-free return, w_i is the policy weight assigned to asset category i, and A is the number of asset categories. From a value-metric perspective, the incremental contribution of the Asset Category investment strategy is found by investing each asset category's policy proportion of the Fund's beginning value and all net external cash inflows at the differential rate between the asset category's benchmark rate of return and the risk-free rate, and then summing across all asset categories.

In the Fund's case, investing 75% of the Fund's beginning value and net external cash inflows in the S&P 500 and 25% in the Lehman Brothers Government/Credit Bond Index (for a combined return of 3.67% in the month, or 3.36% above the risk-free rate) increases the Fund's market value by $6,272,658 (= $194,217,537 – $187,944,879) over the value produced by the Risk-Free Asset investment strategy. As a result, the Fund's value totals $194,217,537 under the Asset Category investment strategy.

It would be entirely appropriate for a fund sponsor to stop at the Asset Category investment strategy. In fact, an efficient markets proponent might view this all-passive approach as the most appropriate course of action. Nevertheless, fund sponsors typically choose to allocate their funds within an asset category among a number of active managers, most of whom pursue distinctly different investment styles. Importantly for macro attribution, when fund sponsors hire active managers, they are actually exposing their assets to two additional sources of investment returns (and risks): investment style and active management skill.

An investment manager's performance versus the broad markets is dominated by the manager's investment style. With respect to US common stocks, for example, active managers cannot realistically hope to consistently add more than 2–3 percentage points (if that much) annually to their investment styles, as represented by appropriate benchmarks. Conversely, the difference in performance between investment styles can easily range from 15 to 30 percentage points per year.

Benchmarks The macro attribution analysis can be designed to separate the impact of the managers' investment styles (as represented by the managers' benchmarks) on the Fund's value from the effect of the managers' active management decisions. In this case, the next level of analysis assumes that the Fund's beginning value and net external cash inflows are passively invested in the aggregate of the managers' respective benchmarks. An aggregate manager benchmark return is calculated as a weighted average of the individual managers' benchmark returns. The weights used to compute the aggregate manager benchmark return are based on the fund sponsor's policy allocations to the managers. From a return-metric perspective,

$$r_{IS} = \sum_{i=1}^{A}\sum_{j=1}^{M} w_i \times w_{ij} \times \left(r_{Bij} - r_{Ci}\right) \tag{11}$$

where r_{IS} is the incremental return contribution of the Benchmarks strategy, r_{Bij} is the return for the jth manager's benchmark in asset category i, r_{Ci} is the return on the ith asset category, w_i is the policy weight assigned to the ith asset category, w_{ij} is the policy weight assigned to the jth manager in asset category i, and A and M are the

number of asset categories and managers, respectively.[22] (Note that summed across all managers and asset categories, $w_i \times w_{ij} \times r_{Bij}$ is the aggregate manager benchmark return.) From a value-metric perspective, the incremental contribution of the Benchmarks strategy is calculated by multiplying each manager's policy proportion of the total fund's beginning value and net external cash inflows by the difference between the manager's benchmark return and the return of the manager's asset category, and then summing across all managers.

In the case of the Fund, the aggregate manager benchmark return was 3.94% in June 20xx. Investing the Fund's beginning value and net external cash inflows at this aggregate manager benchmark return produces an incremental gain of $502,989 (= $194,720,526 – $194,217,537) over the Fund's value achieved under the Asset Category investment strategy. As a result, under the Investment Style investment strategy, the Fund's value grows to $194,720,526.

Paralleling the Asset Category investment strategy, the Benchmarks strategy is essentially a passively managed investment in the benchmarks of the Fund's managers. The difference in performance between the aggregate of the managers' benchmarks and the aggregate of the asset category benchmarks is termed "misfit return" or, less formally, "style bias." In June 20xx, the Fund's misfit return was (3.94% – 3.67%), or a positive 0.27%. Although the expected value of misfit return is zero, it can be highly variable over time. That variability can be particularly large for a fund sponsor who has retained investment manager teams within the fund's various asset categories that display sizeable style biases relative to their respective asset category benchmarks. Some fund sponsors employ special risk-control strategies to keep this misfit risk within acceptable tolerances.

Investment Managers or Value of Active Management In the next level of analysis, to discern the impact of the managers' active management decisions on the change in the Fund's value, macro attribution analysis calculates the value of the Fund as if its beginning value and net external cash flows were invested in the aggregate of the managers' actual portfolios. Again, the weights assigned to the managers' returns to derive the aggregate manager return will come from the policy allocations set by the fund sponsor. A relationship similar to Equation 11 describes the return-metric contribution of the Investment Managers strategy:

$$r_{IM} = \sum_{i=1}^{A}\sum_{j=1}^{M} w_i \times w_{ij} \times \left(r_{Aij} - r_{Bij}\right) \tag{12}$$

where r_{Aij} represents the actual return on the jth manager's portfolio within asset category i and the other variables are as defined previously.

The difference in the Fund's value under the Investment Managers strategy relative to the Benchmarks strategy will depend on whether the managers, in aggregate, exceeded the return on the aggregate benchmark. In the case of the Fund, the aggregate actual return of the managers (calculated using policy weights) was 3.95%, as opposed to 3.94% return on the aggregate manager investment style benchmark. This modestly positive excess return translates into an incremental increase in the fund's value of $25,580 (= $194,746,106 – $194,720,526) over the value produced under the Benchmarks strategy, for a total value of $194,746,106 under the Investment Managers investment strategy.

It should be emphasized that macro attribution calculates the value added by the Fund's managers based on the assumption that the fund sponsor has invested in each of the managers according to the managers' policy allocations. Of course, the actual allocation to the managers will likely differ from the policy allocations. However, if

22 Note: $\sum_{j=1}^{M} w_{ij} = 1$ for all i and $\sum_{i=1}^{A} w_i = 1$.

we wish to correctly isolate the contributions of the various levels of fund sponsor decision making, we must distinguish between those aspects of the Fund's investment results over which the fund sponsor does and does not have control. That is, the fund sponsor sets the allocation of assets to the Fund's managers but has no influence over their investment performance. Conversely, the managers have control over their investment performance, but they do not generally determine the amount of assets placed under their management.

In examining the value added by the Fund's managers, we should assume they were funded at their respective policy allocations and ask the question, "What would the managers have contributed to the Fund's performance if the fund sponsor consistently maintained the stated policy allocations?" On the other hand, in examining the contribution of the fund sponsor, it makes sense to calculate the impact of the differences between the managers' actual and policy allocations on the Fund's performance and thus ask the question, "How did the fund sponsor's decisions to deviate from investment manager policy allocations affect the Fund's performance relative to a strategy of consistently maintaining the stated policy allocations?" The analysis performed at the Investment Managers level attempts to answer the former question. The analysis done at the Allocation Effects level begins to answer the latter question.

Allocation Effects The final macro attribution component is Allocation Effects. In a sense, the Allocation Effects incremental contribution is a reconciling factor—by definition, it is the difference between the Fund's ending value and the value calculated at the Investment Managers level. If the fund sponsor had invested in all of the managers and asset categories precisely at the established policy allocations, then the Allocation Effects investment strategy's contribution would be zero. However, most fund sponsors deviate at least slightly from their policy allocations, thereby producing an allocation effect. The Fund's actual ending value was $194,816,599, which represents a $70,494 increase (= $194,816,599 – $194,746,106) over the value achieved through the Investment Managers investment strategy. By implication, then, MEPA's actual weightings of the asset categories and managers versus the policy weightings contributed positively to the Fund's value in the month of June 20xx.

6.5 Micro Attribution Overview

As implied by its name, micro attribution focuses on a much narrower subject than does macro attribution. Instead of examining the performance of a total fund, micro attribution concerns itself with the investment results of individual portfolios relative to designated benchmarks. Thus, let us define the term "account" to mean a specific portfolio invested by a specific investment manager which we will refer to as the "Portfolio." The Portfolio can be formed of various types of securities. Our illustrations will initially be based on a portfolio of US common stocks. We shall address fixed-income attribution in Section 6.8, below.

Over a given evaluation period, the Portfolio will produce a return that is different from the return on the benchmark. This difference is typically referred to as the manager's value-added or active return. As shown earlier in Equation 9, a manager's value-added can be expressed as

$$r_v = r_p - r_B$$

Because the return on any portfolio is the weighted sum of the returns on the securities composing the portfolio, Equation 9 can be rewritten as

$$r_v = \sum_{i=1}^{n} w_{pi} r_i - \sum_{i=1}^{n} w_{Bi} r_i \tag{13}$$

where w_{pi} and w_{Bi} are the proportions of the Portfolio and benchmark, respectively, invested in security i, r_i is the return on security i, and n is the number of securities.[23]

Rearranging the last equation demonstrates that the manager's value-added is equal to the difference in weights of the Portfolio and benchmark invested in a security times the return on that security, summed across all n securities in the Portfolio and benchmark:

$$r_v = \sum_{i=1}^{n}\left[\left(w_{pi} - w_{Bi}\right) \times r_i\right]$$

With further manipulation,[24] it can be shown that

$$r_v = \sum_{i=1}^{n}\left[\left(w_{pi} - w_{Bi}\right) \times \left(r_i - r_B\right)\right] \tag{14}$$

where r_B is the return on the Portfolio's benchmark.

Equation 14 offers the simplest form of micro performance attribution: a security-by-security attribution analysis. In this analysis, the manager's value-added can be seen to come from two sources: the weights assigned to securities in the Portfolio relative to their weights in the benchmark and the returns on the securities relative to the overall return on the benchmark.

There are four cases of relative-to-benchmark weights and returns for security i to consider. Exhibit 7 gives those cases and their associated performance impacts versus the benchmark.

Exhibit 7 Relative-to-Benchmark Weights and Returns

	$w_{pi} - w_{Bi}$	$r_i - r_B$	Performance Impact versus Benchmark
1.	Positive	Positive	Positive
2.	Negative	Positive	Negative
3.	Positive	Negative	Negative
4.	Negative	Negative	Positive

A manager can add value by overweighting (underweighting) securities that perform well (poorly) relative to the benchmark. Conversely, the manager can detract value by overweighting (underweighting) securities that perform poorly (well) relative to the benchmark.

Security-by-security micro attribution generally is unwieldy and typically provides little in the way of useful insights. The large number of securities in a well-diversified portfolio makes the impact of any individual security on portfolio returns largely uninteresting. A more productive form of micro attribution involves allocating the value-added return to various sources of systematic returns.

23 For simplicity we assume that the Portfolio's securities are chosen from among the securities in the benchmark. Otherwise n needs to represent the number of securities in the union of the benchmark and the Portfolio.

24 Note that the sum of the security weights in any portfolio must equal 1.0, or, equivalently, $\sum_{i=1}^{n}\left(w_{pi} - w_{Bi}\right) = 0$. Because zero multiplied by a constant equals zero, $\sum_{i=1}^{n}\left(w_{pi} - w_{Bi}\right) \times r_B = 0$, where r_B is the known return on the benchmark (the constant). Subtracting this expression from the right-hand side of the equation just given yields $r_v = \sum_{i=1}^{n}\left[\left(w_{pi} - w_{Bi}\right) \times \left(r_i - r_B\right)\right]$.

Underlying most micro attributions is a factor model of returns. A factor model assumes that the return on a security (or portfolio of securities) is sensitive to the changes in various factors. These factors represent common elements with which security returns are correlated. Factors can be defined in a number of ways: They might be sector or industry membership variables; they might be financial variables, such as balance sheet or income statement items; or they might be macroeconomic variables, such as changes in interest rates, inflation, or economic growth.

The market model, introduced previously, relates a security's or portfolio's return to movements of a broad market index, with the exposure to that index represented by the beta of the security. Recall that Equation 8 provides one expression of the market model:

$$R_p = a_p + \beta_p R_I + \varepsilon_p$$

Example 12 illustrates the calculation of value-added (active return) relative to a one-factor model.

EXAMPLE 12

Active Return Relative to a One-Factor Model

Assume that the Portfolio has a zero-factor value of 1.0% and a beta of 1.2 at the beginning of the evaluation period. During the period, the return on the market index was 7%. The market model, expressed in Equation 8, states that the Portfolio should return 9.4% (= 1.0% + 1.2 × 7%). Further, assume that the Portfolio was assigned a custom benchmark with its own market model parameters, a zero-factor value of 2.0% and a beta of 0.8, and which thus has an expected return of 7.6% (= 2.0% + 0.8 × 7%). If the Portfolio's actual return was 10.9%, then the differential return of 3.3% could be attributed in part to the Portfolio's differential expected returns. That is, the Portfolio held a zero factor of 1.0 versus the 2.0 of the benchmark, while the Portfolio had a beta of 1.2 versus the benchmark's beta of 0.8. The incremental expected return of the Portfolio versus the benchmark was 1.8% [= (1.0% – 2.0%) + (1.2 – 0.8) × 7%]. The remaining 1.5% of differential return would be attributed to the investment skill of the manager.

6.6 Sector Weighting/Stock Selection Micro Attribution

Many investment managers employ analysts to research securities and portfolio managers to then build portfolios based on that research. With this investment process, managers are interested in an attribution analysis that will disaggregate the performance effects of the analysts' recommendations and the portfolio managers' decisions to over- and underweight economic sectors and industries.

We can define the returns on the Portfolio and its benchmark to be the weighted sums of their respective economic sector returns. Therefore, just as Equation 13 expressed the manager's value-added return as the difference between the weighted average return on the securities in the Portfolio and the benchmark, the manager's value-added return can similarly be expressed as the difference between the weighted average return on the economic sectors in the Portfolio and the benchmark:

$$r_v = \sum_{j=1}^{S} w_{pj} r_{pj} - \sum_{j=1}^{S} w_{Bj} r_{Bj} \tag{15}$$

where

w_{pj} = Portfolio weight of sector j
w_{Bj} = benchmark weight of sector j
r_{pj} = Portfolio return of sector j
r_{Bj} = benchmark return of sector j
S = number of sectors

Continuing with the example of one of MEPA's investment managers, Exhibit 8 shows the results of a micro attribution analysis based on partitioning a manager's value-added into a part due to skill in sector selection and a part due to skill in security selection. In this example, the return on the Portfolio for a selected one-month period was 1.12%. During that same month the benchmark return was 0.69%, generating a value-added return of 0.43%.

Exhibit 8 Results of a Micro Attribution Analysis

Economic Sectors	Portfolio Weight (%)	Sector Benchmark Weight (%)	Portfolio Return (%)	Sector Benchmark Return (%)	Performance Attribution			Total Value-Added
					Pure Sector Allocation	Allocation/ Selection Interaction	Within-Sector Selection	
Basic materials	5.97	5.54	–0.79	–0.67	–0.01	0.00	–0.01	–0.01
Capital goods	7.82	7.99	–3.60	–3.95	0.01	0.00	0.03	0.04
Consumer durables	2.90	2.38	0.46	–0.21	0.00	0.00	0.02	0.01
Consumer nondurables	31.78	34.75	1.92	1.97	–0.04	0.00	–0.02	–0.05
Energy	7.15	6.01	0.37	0.14	–0.01	0.00	0.01	0.01
Financial	22.47	20.91	2.92	2.05	0.02	0.01	0.18	0.22
Technology	12.14	16.02	2.00	–0.30	0.04	–0.09	0.37	0.32
Utilities	8.64	6.40	0.46	–0.37	–0.02	0.02	0.05	0.05
Cash and equivalent	1.13	0.00	0.14		–0.01	0.00	0.00	–0.01
Buy/hold + cash	100.00	100.00	1.26	0.69	–0.02	–0.05	0.64	0.57
Trading and other			–0.14					–0.14
Total portfolio			1.12	0.69				0.43

Note that this is a holdings-based or "buy-and-hold" attribution. Each sector's contribution to the total allocation and selection effects depends upon the beginning portfolio and benchmark weights in that sector and the constituent securities' returns due to price appreciation and dividend income. The buy-and-hold approach, which disregards the impact of transactions during the evaluation period, has an important practical advantage: Only the holdings and their returns need be input to the attribution system. There is, however, a disadvantage: The account's buy-and-hold return will not equal its time-weighted total return. For that reason, the attribution analysis shown above includes a reconciling item captioned "Trading and Other." In the example shown in Exhibit 8, "Trading and Other" is the negative 14 basis point (–0.14%) difference between the account's Buy/Hold return of 1.26% and the actual portfolio return of 1.12%. The imputed "trading and other" factor reflects the net impact of cash flows

and security purchases and sales during the evaluation period. In actively managed accounts with high turnover, the "trading and other" factor can be significant. Where this is a concern, transaction-based attribution analysis can be employed.[25]

The value-added return can be segmented into the impact of assigning the assets of the portfolio to various economic sectors and the impact of selecting securities within those economic sectors. Equation 15 can be rearranged to form the following relationship:[26]

$$r_v = \underbrace{\sum_{j=1}^{S}\left(w_{pj} - w_{Bj}\right)\left(r_{Bj} - r_B\right)}_{\textit{Pure Sector Allocation}} + \underbrace{\sum_{j=1}^{S}\left(w_{pj} - w_{Bj}\right)\left(r_{pj} - r_{Bj}\right)}_{\textit{Allocation/Selection Interaction}} + \underbrace{\sum_{j=1}^{S} w_{Bj}\left(r_{pj} - r_{Bj}\right)}_{\textit{Within-Sector Selection}} \tag{16}$$

where S is the number of sectors and r_B is the return on the Portfolio's benchmark.

In Equation 16 the **Pure Sector Allocation return** equals the difference between the allocation (weight) of the Portfolio to a given sector and the Portfolio's benchmark weight for that sector, times the difference between the sector benchmark's return and the overall Portfolio's benchmark return, summed across all sectors. The pure sector allocation return assumes that within each sector the manager held the same securities as the benchmark and in the same proportions. Thus, the impact on relative performance is attributed only to the sector-weighting decisions of the manager.

EXAMPLE 13

The Pure Sector Allocation Return for Consumer Nondurables

Exhibit 8 indicates that at the beginning of the month the Portfolio had a 31.78% weight in consumer nondurables, while the benchmark had a 34.75% weight. Because the return of the benchmark consumer nondurables sector was 1.97% and the return of the overall benchmark was 0.69%, the performance impact due to the consumer nondurables sector allocation is –0.04% [= (31.78% – 34.75%) × (1.97% – 0.69%)]. That is, the decision to underweight a sector that performed better than the overall benchmark resulted in a negative contribution to the performance of the Portfolio relative to the overall benchmark. The Pure Sector Allocation return is typically the responsibility of the portfolio managers who determine the Portfolio's relative allocations to economic sectors and industries.

The **Within-Sector Selection return** equals the difference between the return on the Portfolio's holdings in a given sector and the return on the corresponding sector benchmark, times the weight of the benchmark in that sector, summed across all sectors. The Within-Sector Selection return implicitly assumes that the manager weights each sector in the Portfolio in the same proportion as in the overall benchmark,

25 See Spaulding (2003). Transaction-based attribution analysis is outside the scope of the present discussion.
26 Equation 16 covers performance attribution in the single-period case. Multiperiod performance attribution, while an extension of the single-period approach, involves considerably more complexity. For a discussion of some of the issues involved in multiperiod performance attribution, see Menchero (2004) and Frongello and Bay (2002).

although *within the sector* the manager may hold securities in different-from-benchmark weights. Thus, the impact on relative performance is now attributed only to the security selection decisions of the manager.

EXAMPLE 14

The Within-Sector Allocation Return for Technology

Exhibit 8 shows that the return of the portfolio's technology sector was 2.00%, while the return of the benchmark's technology sector was –0.30%. Consequently, the performance impact of security selection within the technology sector was +0.37% {= 16.02% × [2.00% – (–0.30%)]}, where 16.02% is the weight of the benchmark's holdings in the technology sector. During the month, the Portfolio held technology stocks that in total performed better than the aggregate performance of the technology stocks contained in the sector benchmark, thereby contributing positively to the Portfolio's performance relative to the overall benchmark. The Within-Sector Selection impact is often the responsibility of the security analysts. Among the securities that they research, they are expected to identify significantly misvalued securities and recommend appropriate action.

The **Allocation/Selection Interaction return** is a more difficult concept, because it involves the joint effect of the portfolio managers' and security analysts' decisions to assign weights to both sectors and individual securities. The Allocation/Selection Interaction equals the difference between the weight of the Portfolio in a given sector and the Portfolio's benchmark for that sector, times the difference between the Portfolio's and the benchmark's returns in that sector, summed across all sectors.

EXAMPLE 15

The Allocation/Selection Interaction Return for Technology

Again referring to Exhibit 8, we can see that the Portfolio's relative underweight in the Technology sector of –3.88% (= 12.14% – 16.02%) and the Portfolio's positive relative performance in the Technology sector of 2.30% [= 2.00% – (–0.30%)] produced an Allocation/Selection Interaction effect of –0.09% during the month.

A decision to increase the allocation to a particular security adds not only to the weight in that security but also to the weight of the sector to which the security belongs, unless there is an offsetting adjustment to securities within that sector. Unless the portfolio manager is careful to make offsetting adjustments, security selection decisions can inadvertently drive sector-weighting decisions. In general, the Allocation/Selection Interaction impact will be relatively small if the benchmark is appropriate—that is, one that is devoid of any material systematic biases. Because the Allocation/Selection Interaction impact is often the source of some confusion and is usually the result of security selection decisions, some practitioners consolidate the Allocation/Selection Interaction impact with the Within-Sector Selection impact.

6.7 Fundamental Factor Model Micro Attribution

As we have noted, some type of factor model underlies virtually all forms of performance attribution. Economic sectors and industries represent only one potential source of common factor returns. Numerous practitioners and academics (for example, see Sharpe 1982 and Fama and French 1992) have investigated other common factor return sources. For example, with respect to common stocks, a company's size, its industry, its growth characteristics, its financial strength, and other factors seem to have an impact on account performance. Often these factors are referred to as fundamental factors. They may be combined with economic sector factors to produce multifactor models that can be used to conduct micro attribution.

As with any form of performance attribution, the exposures of the Portfolio and the benchmark to the factors of the fundamental factor model must be determined at the beginning of the evaluation period. The benchmark could be the risk exposures of a style or custom index, or it could be a set of normal factor exposures that were typical of the manager's portfolio over time. Finally, the performance of each of the factors must be determined.

EXAMPLE 16

Fundamental Factor Model Micro Attribution

Exhibit 9 provides an example of a fundamental factor model micro attribution analysis where a US growth stock manager invests the Portfolio. The performance attribution example covers a one-month period, and during that time the Portfolio generated a 6.02% rate of return, while the normal portfolio and the market index produced returns of 5.85% and 6.09%, respectively. During this particular month, growth stocks performed less well than the market index, largely explaining why the normal portfolio (representing the manager's investment style) underperformed the return on the market index by –0.24%. The performance difference between the Portfolio (6.02%) and the normal portfolio (5.85%) is a measure of the portfolio manager's investment skill (0.17%) or value-added.

The micro attribution analysis shown in Exhibit 9 attributes the manager's investment skill or value-added to four primary sources: 1) market timing, 2) exposures to fundamental factors, 3) exposures to economic sectors, and 4) a specific or unexplained return component. The market-timing component is made up of two performance impacts; one is due to the Portfolio's cash position, and the other relates to the Portfolio's beta. In the example, the combination of these two effects had a negative impact of –0.09%. The second primary performance attribute involves the exposures to the fundamental factors. The Portfolio's fundamental factor exposures are contrasted with "normal" fundamental factor exposures, represented by the manager's benchmark.[27] The Portfolio's actual factor exposures versus its "normal" exposures resulted in a negative return impact of –0.61%. Similarly, the Portfolio's economic sector allocations are contrasted with the Portfolio's "normal" allocations to produce performance attribution impacts. In this case, the active sector weights had a positive impact of 0.15%. Finally, the fundamental factor model was unable to explain a portion

27 Exposure to a fundamental factor in this case is measured in terms of standard deviations from the mean, where the mean is determined by the average value of the particular factor for a group of capitalization-weighted stocks.

of the Portfolio's return; in this case, the Portfolio had a specific or unexplained return of +0.72%.[28] This specific return that cannot be explained by the factor model is attributed to the investment manager.

Exhibit 9 Micro Attribution Using a Fundamental Factor Model

	Portfolio Exposure	Normal Exposure	Active Exposure	Active Impact	Return
Market return					6.09%
Normal portfolio return					5.85
Cash timing	2.36	0.00	2.36	–0.13	
Beta timing	1.02	1.00	0.02	0.04	
Total market timing					–0.09
Growth	1.12	0.85	0.27	–0.15	
Size	–0.26	0.35	–0.61	–0.35	
Leverage	–0.33	–0.60	0.27	0.11	
Yield	–0.03	–0.12	0.09	–0.22	
Total fundamental risk factors					–0.61
Basic industry	14.10	15.00	–0.90	0.04	
Consumer	35.61	30.00	5.61	–0.07	
Energy	8.36	5.00	3.36	0.05	
Financials	22.16	20.00	2.16	–0.02	
Technology	17.42	25.00	–7.58	0.16	
Utilities	2.35	5.00	–2.65	–0.01	
Total economic sectors					0.15
Specific (unexplained)					0.72
Actual portfolio return					6.02%

6.8 Fixed-Income Attribution

The sector weighting/stock selection approach to micro attribution is applicable to fixed-income as well as equity accounts. We mentioned in our remarks on fixed-income style indexes in Section 5.3 that broad fixed-income market indexes may be segregated into their constituent market segments. Accordingly, the sector weighting/stock selection equity attribution analysis can also be adapted for use with fixed-income

28 Although this type of performance attribution analysis provides valuable insights to investment practitioners, there is a serious limitation. It involves the ambiguity of the benchmark. If the benchmark is based solely on a set of exposures to investment risk factors, then the benchmark is ambiguous. That is, we can construct multiple portfolios that have the same risk characteristics, but they will not have the same investment return. For example, many portfolios might have the same beta, but they will have different investment returns. The solution to this limitation is to base the attribution analysis on the risk exposures of an appropriate benchmark portfolio, i.e., a portfolio with specified securities and weights. In this case, the benchmark portfolio will have a specific or unexplained return component. The difference between it and the portfolio's specific return is attributed to the investment manager.

accounts by substituting market segments such as government bonds, agency and investment-grade corporate credit bonds, high-yield bonds, and mortgage-backed securities, among others, for the economic sectors such as energy, financial, or utilities.

Nonetheless, bonds are unlike stocks, and an approach that merely isolates allocation and selection effects among bond market sectors will be of limited value in analyzing the sources of fixed-income account returns. Useful attribution analysis captures the return impact of the manager's investment decisions, and fixed-income managers weigh variables that differ in important ways from the factors considered by equity portfolio managers. In the interests of mathematical brevity, we will limit our discussion of fixed-income micro performance attribution to a conceptual overview.[29]

Major determinants of fixed-income results are changes in the general level of interest rates, represented by the government (default-free) yield curve, and changes in sector, credit quality, and individual security differentials, or nominal spreads, to the yield curve. As a general rule, fixed-income security prices move in the opposite direction of interest rates: If interest rates fall, bond prices rise, and vice versa. In consequence, fixed-income portfolios tend to have higher rates of return in periods of falling interest rates and, conversely, lower rates of return in periods of rising interest rates. Consider the example displayed in Exhibit 10, where the US Treasury spot rate yield curve shifted upward across all maturities during the nine-month period ending 30 June 2004, and where the return for the Lehman Brothers US Government Index for the nine-month period was –0.56%. Comparing the yield curves for 30 September 2004 and 30 June 2004, we see that in the third quarter of 2004 the change in the US Treasury yield curve was more complex: Short-term rates rose, while the yields on government securities with terms to maturity longer than two years fell. Reflecting the decline in intermediate and long-term yields, the return on the Lehman Brothers US Government Index for the three-month period was 3.11%.

Exhibit 10 Interest Rate Term Structure (US Government Issues—3-Month to 30-Year Maturity)

For fixed-income securities that are subject not only to default-free yield-curve movements but also to credit risk, spread changes represent an additional source of interest rate exposure. Companies operating within the same industry face the same business environment, and the prices of the securities they issue have a general tendency to move in the same direction in response to environmental changes. All airlines, for example, are affected by changes in business and leisure travel patterns

29 A more rigorous treatment of this discussion of fixed-income micro attribution can be found in Fong, Pearson, and Vasicek (1983).

and the cost of fuel, among other economic factors. In the corporate bond market, such commonalities are reflected in sector spreads, which widen when investors require higher yields in compensation for higher perceived business risk. In addition, rating agencies evaluate the creditworthiness of corporate bond issues, and credit quality spreads vary with changes in the required yields for fixed-income securities of a given rating. Exhibit 11 shows the combined market-based yield effect of the spot rate yield-curve and nominal spread changes for an investor holding AA-rated 10-year industrial bonds. For example, for the nine-month period ending 30 June 2004, increases in the 10-year spot rate and the 10-year AA spread of 0.64 percent and 0.12 percent, respectively, combined to result in a total change of 0.76 percent in the yield of AA-rated 10-year industrial bonds.

Exhibit 11 Yield Curve and Nominal Spread Changes

	10-Year Yield Change	10-Year AA Industrial Spread Change	Total Change
9 Months Ended 30 Jun. 2004	0.64%	0.12%	0.76%
3 Months Ended 30 Sep. 2004	–0.46%	0.01%	–0.45%
12 Months Ended 30 Sep. 2004	0.18%	0.13%	0.31%

Exhibit 12 shows the total returns of the Lehman US Government and the Lehman AA Industrials Indexes for the same evaluation periods. The AA Industrials Index modestly underperformed the Government Index in the nine-month period ended 30 June 2004, when the yield curve rose and the nominal spread widened, and significantly outperformed in the subsequent quarter, when the yield curve fell and the nominal spread was essentially unchanged. In addition, of course, the spreads of individual 10-year AA-rated industrial bonds may vary from the average reflected by the sector index, and those differences, too, will be reflected in the actual performance of a specific portfolio.

Exhibit 12 Total Returns Data

	Total Returns	
	Lehman US Government Index (%)	Lehman AA Industrials Index (%)
9 months ended 30 June 2004	–0.56	–0.58
3 months ended 30 September 2004	3.11	3.71
12 months ended 30 September 2004	2.52	3.11

The impact of interest rate and spread movements on the investment performance of a given portfolio depends upon the nature of the market changes and the interest-sensitive characteristics of the portfolio. We have already seen two types of yield-curve changes: An upward (although nonparallel) shift in the nine-month period ended 30 June 2004, and a twist in the third quarter of 2004 when short-term rates rose and long-term rates fell. Additionally, in both cases, the slope of the yield curve changed. An indicator of the slope is the difference between the 2-year and the 10-year yield-curve rates. The difference was 2.48% on 30 September 2003, 1.90% on 30 June 2004, and 1.52% on 30 September 2004. Thus, over this time frame, the US government spot rate yield curve flattened from one measurement point to the next.

The external interest rate environment is not under the control of the manager; the manager can dictate only the composition of the Portfolio. Subject to the constraints established by the investment mandate and the pertinent policies or guidelines, the manager can adjust the Portfolio's interest-sensitive characteristics in anticipation of forecasted yield-curve and spread changes. Different fixed-income instruments and portfolios will respond diversely to yield-curve movements like those shown above. For example, the resulting adjustment in the valuation of a mortgage-backed portfolio will not be the same as the valuation change of a government bond portfolio. Even portfolios made up of the same types of fixed-income securities (for instance, traditional investment-grade corporate bonds) will have different outcomes, depending upon factors including the maturity, coupon, and option features of their constituent holdings. The manager will modify the Portfolio's interest rate risk profile so as to benefit from expected advantageous movements or to attenuate the return impact of expected adverse changes.

In addition to such interest rate management, other management factors contributing to total portfolio return are the allocation of assets among market segments, economic sectors, and quality grades, and the selection of specific securities within those categories. Trading activity during the evaluation period will also have an impact.

These sources of return are displayed in Exhibit 13.[30] The forward interest rates referred to in this exhibit can be calculated from the points along the spot rate government yield curve at the beginning and the end of the performance evaluation period.

Exhibit 13 Sources of the Total Return of a Fixed-Income Portfolio

The total return of a fixed-income portfolio can be attributed to the external interest rate effect, on one hand, and the management effect, on the other. The return due to the external interest rate environment is estimated from a term structure analysis of a universe of Treasury securities and can be further separated into the return from the implied forward rates (the expected return) and the difference between the actual

30 Fong, Pearson, and Vasicek (1983).

realized return and the market implied return from the forward rates (the unexpected return). The overall external interest rate effect represents the performance of a passive, default-free bond portfolio.

The management effect is calculated by a series of repricings and provides information about how the management process affects the portfolio returns. The management effect can be decomposed into four components:

- **Interest rate management effect**: Indicates how well the manager predicts interest rate changes. To calculate this return, each security in the portfolio is priced as if it were a default-free security. The interest rate management contribution is calculated by subtracting the return of the entire Treasury universe from the aggregate return of these repriced securities. The interest rate management effect can be further broken down into returns due to duration, convexity, and yield-curve shape change, as shown in Exhibit 14.
- **Sector/quality effect**: Measures the manager's ability to select the "right" issuing sector and quality group. The sector/quality return is estimated by repricing each security in the portfolio using the average yield premium in its respective category. A gross return can be then calculated based on this price. The return from the sector/quality effect is calculated by subtracting the external effect and the interest rate management effect from this gross return.
- **Security selection effect**: Measures how the return of a specific security within its sector relates to the average performance of the sector. The security selection effect for each security is the total return of a security minus all the other components. The portfolio security selection effect is the market-value weighted average of all the individual security selection effects.
- **Trading activity**: Captures the effect of sales and purchases of bonds over a given period and is the total portfolio return minus all the other components.

Exhibit 14 Performance Attribution Analysis of Two Fixed-Income Managers for the Windsor Foundation, Year Ending 31 December 20xx

	Evaluation Period Returns (%)		
	Broughton Asset Management	Matthews Advisors	Bond Portfolio Benchmark
I. Interest Rate Effect			
1. Expected	0.44	0.44	0.44
2. Unexpected	0.55	0.55	0.55
Subtotal	0.99	0.99	0.99
II. Interest Rate Management Effect			
3. Duration	0.15	–0.13	0.00
4. Convexity	–0.03	–0.06	0.00
5. Yield-curve shape change	0.04	0.13	0.00
Subtotal (options adjusted)	0.16	–0.06	0.00
III. Other Management Effects			
6. Sector/quality	–0.09	1.15	0.00
7. Bond selectivity	0.12	–0.08	0.00

(continued)

Exhibit 14 (Continued)

	Evaluation Period Returns (%)		
	Broughton Asset Management	Matthews Advisors	Bond Portfolio Benchmark
8. Transaction costs	0.00	0.00	0.00
Subtotal	0.03	1.07	0.00
IV. Trading activity return	0.10	0.08	0.00
V. Total return (sum of I, II, III, and IV)	1.28	2.08	0.99

Quantifying the absolute return contributions due to the management effect by means of serial portfolio repricings is data- and computation-intensive, and conducting value-added performance attribution relative to a fixed-income benchmark is still more challenging. Fixed-income investment management organizations often use commercially developed performance measurement and attribution systems. The vendor-provided systems available vary substantially in methodology and level of analytical sophistication, and selecting a system is not a trivial exercise, but most models attempt to isolate and measure the impact of environmental and management factors like those discussed here.

The output of a representative fixed-income attribution system can be demonstrated through a brief illustration. Let us consider the case of the investment officer of the Windsor Foundation, whose consultant has analyzed the performance of two of the foundation's external fixed-income managers, Broughton Asset Management and Matthews Advisors. The consultant has prepared an attribution analysis, shown in Exhibit 14, for a particular evaluation period.

The consultant also included in the analysis the following summary of the investment management strategies of the two firms:

- Broughton Asset Management states that its investment strategy relies on active interest rate management decisions to outperform the benchmark index. Broughton also seeks to identify individual issues that are mispriced.
- Matthews Advisors states that its investment strategy is to enhance portfolio returns by identifying undervalued sectors while maintaining a neutral interest rate exposure relative to the benchmark index. Matthews believes it is not possible to enhance returns through individual bond selection on a consistent basis.

Does the consultant's attribution analysis validate the two firms' self-descriptions of their investment strategies?

In fact, the foundation officer and the consultant can *preliminarily* conclude on the basis of the single year under review that approximately one-half of the incremental return due to Broughton's management process can be attributed to relying on active interest rate management decisions. The total performance contribution for the interest rate management effect—the primary indicator of effective active interest rate management decisions in this analysis—was 16 basis points out of a total of 29 basis points due to the manager's active management process. In addition, the performance contribution for bond selectivity—here, the most direct measure of success in

security selection—was 12 basis points. Therefore, nearly all of Broughton's positive performance of 29 basis points (1.28% versus 0.99%) was a result of its stated strategies of interest rate management (16 basis points) and security selection (12 basis points).

Interestingly, a substantial portion of Matthews' performance results are attributable to the firm's success in identifying undervalued sectors. The positive performance contribution for sector and quality was 1.15%, representing a large proportion of Matthews' return relative to the benchmark and indicating success over the evaluation period.

Fixed-income performance attribution is receiving increasing attention from plan sponsors and consultants, but it remains primarily the province of investment managers who have access to the requisite capital market data services as well as the scale of operations to justify the expense and the expertise needed to interpret the results in depth.

PERFORMANCE APPRAISAL

7

The final phase of the performance evaluation process is performance appraisal. The two preceding phases supplied information indicating how the account performed and quantifying the sources of that performance relative to a designated benchmark. Ultimately, however, fund sponsors are concerned with whether the manager of the account has displayed investment skill and whether the manager is likely to sustain that skill. The goal of performance appraisal is to provide quantitative evidence that the fund sponsor can use to make decisions about whether to retain or modify portions of its investment program.

That said, perhaps no issue elicits more frustration on the part of fund sponsors than the subject of appraising manager investment skill. The problem stems from the inherent uncertainty surrounding the outcome of active management decisions. Even the most talented managers can underperform their benchmarks during any given quarter, year, or even multiyear period due to poor luck. Conversely, ineffective managers at times may make correct decisions and outperform their benchmarks simply by good fortune. We will return to this concept later.

What do we mean by the term "investment skill"? We define **investment skill** as the ability to outperform an appropriate benchmark consistently over time. As discussed previously, a manager's returns in excess of his or her benchmark are commonly referred to as the manager's value-added return or active return. Because no manager is omniscient, every manager's value-added returns, regardless of the manager's skill, will be positive in some periods and negative in others. Nevertheless, a skillful manager should produce a larger value-added return more frequently than his or her less talented peers.

We emphasize that a skillful manager may produce a small value-added return very frequently or a larger value-added return less frequently. It is the magnitude of the value-added returns relative to the variability of value-added returns that determines a manager's skill.

When evaluating managers, many fund sponsors focus solely on the level of value-added returns produced while ignoring value-added return volatility. As a consequence, superior managers may be terminated (or not hired) and inferior managers may be retained (or hired) on the basis of statistically questionable performance data.

7.1 Risk-Adjusted Performance Appraisal Measures

Risk-adjusted performance appraisal methods can mitigate the natural fixation on rates of return. There are a number of appraisal measures that explicitly take the volatility of returns into account. A widely accepted principle of investment management theory and practice is that investors are risk averse and therefore require additional expected return to compensate for increased risk. Thus, it is not surprising that measures of performance appraisal compare returns generated by an account manager with the account's corresponding risk. Two types of risk are typically applied to deflate *ex post* returns: the account's market (or systematic) risk, as measured by its beta, and the account's total risk, as measured by its standard deviation.

Three risk-adjusted performance appraisal measures have become widely used: ***ex post* alpha** (also known as Jensen's alpha), the Treynor measure (also known as reward-to-volatility or excess return to nondiversifiable risk), and the **Sharpe ratio** (also known as reward-to-variability). Another measure, M^2, has also received some acceptance. A thorough discussion of these measures can be found in standard investment texts such as Sharpe, Alexander, and Bailey (1999), but we present a summary here. We consider these measures in their *ex post* (after the fact) form used to appraise a past record of performance.

***Ex Post* Alpha** The *ex post* alpha (also known as the *ex post* Jensen's alpha—see Jensen 1968, 1969) uses the *ex post* Security Market Line (SML) to form a benchmark for performance appraisal purposes. Recall that the capital asset pricing model (CAPM) developed by Sharpe (1966), Lintner (1965), and Mossin (1966), from which the *ex post* SML is derived, assumes that on an *ex ante* (before the fact) basis, expected account returns are a linear function of the risk-free return plus a risk premium that is based on the expected excess return on the market portfolio over the risk-free return, scaled by the amount of systematic risk (beta) assumed by the account. That is, over a single period, the *ex ante* CAPM (SML) is

$$E(R_A) = r_f + \beta_A[E(R_M) - r_f] \tag{17}$$

where

$E(R_A)$ = the expected return on the account, given its beta
r_f = the risk-free rate of return (known constant for the evaluation period)
$E(R_M)$ = the expected return on the market portfolio
β_A = the account's beta or sensitivity to returns on the market portfolio, equal to the ratio of covariance to variance as $\text{Cov}(R_A, R_M)/\text{Var}(R_M)$

With data on the actual returns of 1) the account, 2) a proxy for the market portfolio (a market index), and 3) the risk-free rate, we can produce an *ex post* version of the CAPM relationship. Rearranging Equation 17, a simple linear regression can estimate the parameters of the following relationship:

$$R_{At} - r_{ft} = \alpha_A + \beta_A(R_{Mt} - r_{ft}) + \varepsilon_t \tag{18}$$

where for period t, R_{At} is the return on the account, r_{ft} is the risk-free return, and R_{Mt} is the return on the market proxy (market index).[31] The term α_A is the intercept of the regression, β_A is the beta of the account relative to the market index, and ε is the random error term of the regression equation. The estimate of the intercept term α_A is the *ex post* alpha. We can interpret *ex post* alpha as the differential return of the account compared to the return required to compensate for the systematic risk assumed by the account during the evaluation period. The level of the manager's demonstrated

31 The *ex post* alpha relationship can be expanded to incorporate other sources of risk (for example, the three-factor model developed by Fama and French). See Carhart (1997) for further discussion.

skill is indicated by the sign and value of the *ex post* alpha. Left unsaid is whether the fund sponsor prefers a manager with a large (positive) but highly variable alpha to one that produces a smaller (positive) but less variable alpha.

Treynor Measure The Treynor measure (see Treynor 1965) is closely related to the *ex post* alpha. Like the *ex post* alpha, the Treynor measure relates an account's excess returns to the systematic risk assumed by the account. As a result, it too uses the *ex post* SML to form a benchmark, but in a somewhat different manner than the *ex post* alpha. The calculation of the Treynor measure is

$$T_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\beta}_A} \tag{19}$$

$\bar{R}_A$ and $\bar{r}_f$ are the average values of each variable over the evaluation period. The Treynor measure has a relatively simple visual interpretation, given that the beta of the risk-free asset is zero. The Treynor measure is simply the slope of a line, graphed in the space of mean *ex post* returns and beta, which connects the average risk-free return to the point representing the average return and beta of the account. When viewed alongside the *ex post* SML, the account's benchmark effectively becomes the slope of the *ex post* SML. Thus, a skillful manager will produce returns that result in a slope greater than the slope of the *ex post* SML.

Both the *ex post* alpha and the Treynor measure will always give the same assessment of the existence of investment skill. This correspondence is evident from the fact that any account with a positive *ex post* alpha must plot above the *ex post* SML. Therefore, the slope of a line connecting the risk-free rate to this account must be greater than the slope of the *ex post* SML, the indication of skill under the Treynor measure.

Sharpe Ratio Both the *ex post* alpha and Treynor measure compare excess returns on an account relative to the account's systematic risk. In contrast, the Sharpe ratio (see Sharpe 1966) compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. The *ex post* Sharpe ratio is traditionally given by

$$S_A = \frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A} \tag{20}$$

The benchmark in the case of the Sharpe ratio is based on the *ex post* capital market line (CML). The *ex post* CML is plotted in the space of returns and standard deviation of returns and connects the risk-free return and the point representing the mean return on the market index and its estimated standard deviation during the evaluation period. As with the Treynor measure, a skillful manager will produce returns that place the account above the CML, and hence the slope of the line connecting the risk-free rate and the account will lie above the *ex post* CML. Such a manager is producing more average return relative to the risk-free rate per unit of volatility than is a passive investment in the market index.

***M*²** Like the Sharpe ratio, M^2 (see Modigliani and Modigliani 1997) uses standard deviation as the measure of risk and is based on the *ex post* CML. M^2 is the mean incremental return over a market index of a hypothetical portfolio formed by combining the account with borrowing or lending at the risk-free rate so as to match the standard deviation of the market index. M^2 measures what the account would have returned if it had taken on the same total risk as the market index. To produce that benchmark, M^2

scales up or down the excess return of the account over the risk-free rate by a factor equal to the ratio of the market index's standard deviation to the account's standard deviation.

$$M_A^2 = \bar{r}_f + \left(\frac{\bar{R}_A - \bar{r}_f}{\hat{\sigma}_A}\right)\hat{\sigma}_M \tag{21}$$

Visually, we can consider a line from the average risk-free rate to the point representing the average return and standard deviation of the account. Extending (or retracing) this line to a point corresponding to the standard deviation of the market index allows us to compare the return on the account to that of the market index at the same level of risk. A skillful manager will generate an M^2 value that exceeds the return on the market index.

M^2 will evaluate the skill of a manager exactly as does the Sharpe ratio. Further, as we discussed, the Jensen's alpha and the Treynor measure will produce the same conclusions regarding the existence of manager skill. However, it is possible for the Sharpe ratio and M^2 to identify a manager as not skillful, although the *ex post* alpha and the Treynor measure come to the opposite conclusion. This outcome is most likely to occur in instances where the manager takes on a large amount of nonsystematic risk in the account relative to the account's systematic risk. In that case, one can see by comparing Equations 19 and 20 that while the numerator remains the same, increased nonsystematic risk will lower the Sharpe ratio but leave the Treynor measure unaffected. As the market index, by definition, has no nonsystematic risk, the account's performance will look weaker relative to the market index under the Sharpe ratio than under the Treynor measure (and Jensen's alpha).

Information Ratio The Sharpe ratio can be used to incorporate both risk-adjusted returns and a benchmark appropriate for the manager of the account under evaluation. In its traditional form, the numerator of the Sharpe ratio is expressed as the returns on the account in excess of the risk-free rate. Similarly, the denominator is expressed as the standard deviation of the difference in returns between the account and the risk-free return. However, by definition, in a single-period context the risk-free rate has no variability, and hence, the denominator can be stated as the variability in the account's returns.

Because the Sharpe ratio is based on a differential return, it represents the results of a self-financing strategy. A certain dollar amount can be viewed as being invested in the account, with this long position funded by short-selling the risk-free asset; that is, borrowing at the risk-free rate is assumed to fund the investment in the account. In order to provide a relevant context for performance appraisal using the traditional form, we must identify an appropriate benchmark and compute the Sharpe ratio for that benchmark as well as the account. A higher Sharpe ratio for the account than for the benchmark indicates superior performance.

There is no reason, however, for insisting on appraising performance in the context of borrowing at the risk-free rate to fund the investment in the account. Instead, the Sharpe ratio can be generalized to directly incorporate a benchmark appropriate to the account manager's particular investment style. Equation 20 can be rewritten to show the long position in the account is funded by a short position in the benchmark:

$$\mathrm{IR}_A = \frac{\bar{R}_A - \bar{R}_B}{\hat{\sigma}_{A-B}} \tag{22}$$

where $\hat{\sigma}_{A-B}$ is the standard deviation of the difference between the returns on the account and the returns on the benchmark. The Sharpe ratio in this form is commonly referred to as the **information ratio**, defined as the excess return of the account over the benchmark relative to the variability of that excess return. The numerator is often

referred to as the **active return** on the account, and the denominator is referred to as the account's **active risk**. Thus, from this perspective, the information ratio measures the reward earned by the account manager per incremental unit of risk created by deviating from the benchmark's holdings.

Criticisms of Risk-Adjusted Performance Appraisal Methods A number of criticisms of risk-adjusted performance measures have surfaced over the years, and we will return to some of those arguments later in the discussion. Perhaps the most prominent criticisms have involved the reliance of the *ex post* alpha and the Treynor measure on the validity of the CAPM. The CAPM has come under attack for a variety of reasons, most notably the appropriateness of its underlying assumptions and the single-index nature of the model. If assets are valued according to some other equilibrium pricing model, then beta-based performance measures may give inaccurate appraisals.

Critics (for example, Roll 1978) have also pointed to problems raised by the use of surrogates (such as the S&P 500) for the true market portfolio. Roll showed that slight changes in the market portfolio surrogate can yield significantly different performance appraisal answers.

Even those appraisal methods not tied to the CAPM face implementation problems. For example, the use of a market index or custom benchmark in the appraisal of investment performance is open to criticism in that it is difficult in most cases for the account manager to replicate precisely the benchmark's return over time (see French and Henderson 1985). Transaction costs associated with initially creating and then later rebalancing the benchmark, as well as the costs of reinvesting income flows, mean that the benchmark's reported returns overstate the performance that a passive investor in the benchmark could earn.

Stability of the parameters and the estimation error involved in the risk-adjusted appraisal measures is also an issue. Even if the assumptions underlying the appraisal measures hold true, the *ex post* calculations are merely estimates of the true parameters of the actual risk–return relationships. If the estimates are recalculated over another period, they may well show conclusions that conflict with the earlier estimates, even if those relationships are stable over time. Further, that stability cannot be taken for granted; the aggressiveness of the account manager may change rapidly over time in ways that cannot be captured by the estimation procedures.

7.2 Quality Control Charts

Conveying the essence of performance appraisal to decision makers is a difficult task. A vast quantity of data needs to be synthesized into a relatively few graphs and tables if information overload is to be avoided. Yet this summary process should not come at the expense of sound data analysis. In particular, it should not preclude a consideration of the statistical and economic significance of the performance results. One effective means of presenting performance appraisal data is through the use of **quality control charts**.

Exhibit 15 presents an example of a quality control chart. It illustrates the performance of an actively managed account versus a selected benchmark. The straight horizontal line emanating from the vertical axis at zero represents the performance of the benchmark. The jagged line is the portfolio's cumulative annualized performance relative to the benchmark (that is, the manager's value-added return). The funnel-shaped lines surrounding the horizontal lines form a confidence band, a statistical concept about which we will have more to say shortly. The confidence band offers a means to evaluate the statistical significance of the account's performance relative to the benchmark.

Exhibit 15 Quality Control Chart: Cumulative Annualized Value-Added Illustrating Manager Performance within Expectations

Underlying the quality control chart's construction are three assumptions concerning the likely distribution of the manager's value-added returns. The primary assumption (and one that we will subsequently test) is referred to as the null hypothesis. The null hypothesis of the quality control chart is that the manager has no investment skill; thus, the expected value-added return is zero. With respect to Exhibit 15, we expect that the manager's value-added return line will coincide with the benchmark line.

Of course, at the end of an evaluation period it is highly unlikely that the account's return will precisely equal that of the benchmark. The account's actual return will be either above or below the benchmark's return. The null hypothesis, however, suggests that those *ex post* differences have no directional biases and are entirely due to random chance.

Our second assumption states that the manager's value-added returns are independent from period to period and normally distributed around the expected value of zero. The third assumption is that the manager's investment process does not change from period to period. Among other things, this third assumption implies that the variability of the manager's value-added returns remains constant over time.

Now consider the manager whose investment results are shown in Exhibit 15. Employing the three assumptions described above, we can completely describe the expected distribution of the manager's value-added returns, as illustrated in Exhibit 16. Corresponding to our second assumption of normally distributed value-added returns, the shape of the distribution is the familiar bell-shaped curve. Under our first assumption of no skill (the null hypothesis), the center (or mean) of the distribution is located at 0 percent. Finally, given our third assumption that the manager does not alter his or her investment process over time, we can use the manager's past performance to estimate the dispersion of the value-added return distribution. That dispersion is measured by the standard deviation of the value-added returns, which in this case is an annualized 4.1 percent. We therefore expect that two-thirds of the time, the manager's annual value-added return results will be within ±4.1 percentage points of the zero mean.

Exhibit 16 Expected Distribution of the Manager's Value-Added Returns

Given this information, we can compute a confidence band associated with the expected distribution of the manager's value-added returns. Based on our three assumptions, the **confidence band** indicates the range in which we anticipate that the manager's value-added returns will fall a specified percentage of the time.

In our example, suppose that we wished to determine a confidence band designed to capture 80 percent of the manager's value-added return results. Based on the properties of a normal distribution, we know that 1.28 standard deviations around the mean will capture *ex ante* 80 percent of the possible outcomes associated with a normally distributed random variable. With a 4.1 percent annual standard deviation of value-added returns, the 80 percent confidence band in our example therefore covers a range from approximately –5.2 percent to approximately +5.2 percent around the manager's expected value-added return of zero.

This range, however, corresponds to only one time period: one year from the start of the analysis. To create the confidence band at other points in time, we must transform the standard deviation of the manager's value-added returns to address annualized cumulative value-added returns. This transformation produces the funnel-shaped lines shown in Exhibit 15.

The standard deviation of annualized cumulative value-added returns decreases at a rate equal to the square root of time. As a result, the standard deviation of annualized cumulative value-added returns at two years is $1/\sqrt{2}$ of the one-year value, at three years it is $1/\sqrt{3}$ of the one-year value, and so on. Because the width of the confidence band depends on the standard deviation of value-added returns, as time passes, the confidence band will narrow, converging on the benchmark line.

Intuitively, that convergence means that as we collect more observations on the manager's value-added returns, the cumulative annualized results should lie closer to our expected value of zero. That is, as time passes, it becomes increasingly likely that the manager's random positive and negative value-added returns will offset one another. Therefore, the chances that the manager will produce a "large" cumulative annualized value-added return, on either side of the mean, declines over time.

7.3 Interpreting the Quality Control Chart

Statistical inference by its nature can be a baffling exercise in double negatives. For example, we do not *accept* the null hypothesis. Rather, lacking evidence to the contrary, we *fail to reject* it. Nevertheless, the equivocal nature of this type of analysis is well suited to the world of investments, where luck often masquerades as skill and skill is frequently overwhelmed by random events.

For example, do the data presented in Exhibit 15 tell us anything about the manager's investment skill? The answer in this case is inconclusive. Over the full period of analysis, the manager has outperformed the benchmark by about 1.0 percent per year. Based on this outcome, we might be tempted to certify the manager as being truly skillful. Before leaping to that conclusion, however, recall that our null hypothesis is that the manager has no skill. What we are really asking is, "Do the manager's performance results warrant rejecting the null hypothesis?" Remember that we assume the manager's value-added returns are normally distributed with a constant annual standard deviation of 4.1 percent. Given those assumptions, under the zero-value-added return null hypothesis, there exists a strong possibility that the manager could possess no skill and yet produce the results shown in Exhibit 15.

The quality control chart analysis provides a likely range of value-added return results for a manager who possesses no skill and who displays a specified level of value-added return variability. For a manager whose investment results are within that range (confidence band), we have no strong statistical evidence to indicate that our initial assumption of no skill is incorrect. Thus we are left with the rather unsatisfying statement, "We cannot reject the null hypothesis that the manager has no skill."

It may be true that the manager in Exhibit 15 has skill and that the 1 percent value-added return was no fluke. Unfortunately, over the limited time that we have to observe the manager, and given the variability of the manager's value-added returns, we cannot classify the manager as unambiguously skillful. Even if the manager could actually produce a 1 percent value-added return over the long run, his or her talents are obscured by the variability of his or her short-run results. That performance "noise" makes it difficult to distinguish his or her talents from those of an unskillful manager.

Now let us consider another manager who generates the value-added return series shown in Exhibit 17. The confidence interval is again designed to capture 80 percent of the potential value-added return outcomes for a zero-value-added return manager with a specified level of value-added return variability. In this case, the manager has breached the confidence band on the upside, outperforming the benchmark by about 5 percent per year over the evaluation period. How should we interpret this situation? One view is that the manager has no skill and was simply lucky. After all, there is a 2-in-10 chance that a zero-value-added return manager might produce results that lie somewhere outside the confidence band (actually, a 1-in-10 chance of lying above and a 1-in-10 chance of lying below the confidence band).

On the other hand, we could reject the null hypothesis. That is, there is only a 20 percent chance that a zero-value-added return manager would produce results that lie outside the confidence band. Therefore, the occurrence of such an event might indicate that our initial assumption that the manager has no skill is incorrect. Note that our statement would then be, "We reject the null hypothesis that the manager's expected value-added return is zero." By implication, then, we accept a strategy hypothesis that the manager's expected value-added return is not zero.[32]

32 Of course, the assumptions underlying the statistical test may not hold. For example, the manager's investment process may have become more aggressive, and hence, the variability of his value-added returns may have increased.

Exhibit 17 Quality Control Chart: Cumulative Annualized Value-Added Illustrating Manager Performance Significantly Greater than Benchmark

The quality control chart analysis is similar on the downside. That is, suppose that the manager produces a cumulative negative value-added return yet lies above the lower edge of the confidence band. In that situation, we should not reject the null hypothesis that the manager's expected value-added return is zero. The manager might be a negative value-added return investor (that is, be unable to earn back his or her management fees and trading costs). On the other hand, the manager might be skillful and simply be having a poor run of investment luck. In such a case, the relatively small negative value-added return compared to the variability of that value-added return would make it difficult to reject the null hypothesis.

Conversely, piercing the confidence interval on the downside might lead us to reject the null hypothesis that the manager's expected value-added return is zero. The unstated implication is that the manager is systematically incapable of recapturing the costs of doing business and should be classified as an "underperformer."

THE PRACTICE OF PERFORMANCE EVALUATION

8

The three components of performance evaluation provide the quantitative inputs required to evaluate the investment skill of an account's manager. However, regardless of the amount of performance data compiled, the process of performance evaluation is fraught with imprecision. Performance evaluation is ultimately a forward-looking decision, and the connection between past performance and future performance is tenuous at best.[33] Indiscriminate use of quantitative data can lead to counterproductive decisions.

As a result, in evaluating investment managers, most fund sponsors follow a procedure that incorporates both quantitative and qualitative elements, with the latter typically receiving more weight than the former. For example, in selecting investment managers, many fund sponsors follow a relatively standard set of procedures. For

33 See Carhart (1997).

the sake of exposition, we consider a "typical" fund sponsor. The fund sponsor has a several-person staff that carries out the fund's day-to-day operations. The fund sponsor may retain a consultant to assist in the search for new managers. The staff continually scans the marketplace for promising investment managers. The staff may become aware of a manager through such means as visits from the manager to the staff's office, attendance at various conferences, discussions with peers at other fund sponsor organizations, meetings with consulting firms, and the financial press. The staff maintains files on those managers who have attracted interest, collecting historical return data, portfolio compositions, manager investment process descriptions, and other pertinent data. Upon deciding to hire a new manager, the staff will research its files and select a group of managers for extensive review. This initial cut is an informal decision based on the staff's ongoing survey of the manager marketplace.

The review of the "finalist" group is a much more formal and extensive process. The staff requests that each finalist submit detailed data concerning virtually all aspects of its organization and operations. We broadly group this data into six categories, as shown in Exhibit 18.

Exhibit 18 Criteria for Manager Selection

Criteria	Importance (%)
Physical	5
Organizational structure, size, experience, other resources	
People	25
Investment professionals, compensation	
Process	30
Investment philosophy, style, decision making	
Procedures	15
Benchmarks, trading, quality control	
Performance	20
Results relative to an appropriate benchmark	
Price	5
Investment management fees	

The staff assigns weights or relative importance to each of these criteria. Exhibit 18 shows one possible set of weights. The staff does not apply these criteria and weights in a mechanical manner. Its ultimate decisions are actually quite subjective. The important point is that the staff considers a broad range of quantitative and qualitative factors in arriving at a selection recommendation. No single factor dominates the decision: performance data are only one component in the ultimate evaluation decision.

In addition to collecting written information, the staff meets personally with the key decision makers from each of the finalist managers. In those meetings the staff engages in a broad discussion, the purpose of which is to focus on specific aspects of the managers' operations as highlighted by the selection criteria.

After meeting with all of the finalists, the staff compares notes and selects a manager (or managers) to recommend to the fund sponsor's investment committee, which makes the final decision. The committee members are much more performance-oriented than the staff. Nevertheless, they usually support the staff's well-researched recommendations.

8.1 Noisiness of Performance Data

The goal of evaluating prospective or existing managers is to hire or keep the best managers and to eliminate managers likely to produce inferior future results. If past performance were closely tied to future performance, then it would be desirable to rely heavily on past performance in evaluating managers. The problem is that empirical evidence generally does not support such a relationship.

The confusion results from the uncertain, or stochastic, nature of active management. Active managers are highly fallible. While we may expect a superior manager to perform well over any given time period, we will observe that the superior manager's actual performance is quite variable. Even sophisticated investors tend to focus on expected returns and ignore this risk element.

EXAMPLE 17

The Influence of Noise on Performance Appraisal

Suppose that we know in advance that a manager is superior and will produce an annual value-added return of 2 percent, on average. The variability of that superior performance is 5 percent per year. Our hypothetical manager has an information ratio of 0.40 (2% ÷ 5%), which by our experience is a high figure. (Hence our assertion that this manager is a superior manager.) Exhibit 19 shows the probability of managers outperforming their benchmarks over various evaluation periods, given the information ratios.

Exhibit 19 Probability of a Manager Outperforming a Benchmark Given Various Levels of Investment Skill

	Information Ratio					
Years	**0.20**	**0.30**	**0.40**	**0.67**	**0.80**	**1.00**
0.5	55.63%	58.40%	61.14%	68.13%	71.42%	76.02%
1.0	57.93	61.79	65.54	74.75	78.81	84.03
3.0	63.81	69.83	***75.58***	87.59	91.71	95.84
5.0	67.26	74.88	81.45	93.20	96.32	98.73
10.0	73.65	82.86	89.70	98.25	99.43	99.92
20.0	81.70	91.01	96.32	99.86	99.98	99.99

Perhaps surprisingly, Exhibit 19 shows that the manager has a 1-in-4 chance of underperforming the benchmark over a period as long as three years, as seen by the boxed cell in the exhibit. Remember, we have defined this manager in advance to be a superior manager. Other value-added managers with less skill than this one have a greater chance of underperforming their benchmarks over typical evaluation periods.

Most fund sponsors hire more than one manager. Consider a group of ten superior managers whose investment skills equal those of the manager in Example 17 (who has an information ratio of 0.40) and assume independence of decision-making processes. Exhibit 20 shows the probability of a given number of this group simultaneously underperforming their benchmarks over a three-year period. As we can see, a fund sponsor using a simple decision rule of firing any manager who underperforms

his or her benchmark over a three-year period can expect to follow a busy manager search schedule. Moreover, these probabilities are conservatively low. Few of the fund sponsor's managers will have the investment skill with which we have endowed our hypothetical managers.

Exhibit 20 Probability of Superior Managers Jointly Underperforming Their Benchmarks over a Three-Year Period

Managers below Benchmark	Probability
0	6.10%
1	19.68
2	28.59
3	24.60
4	13.90
5	5.38
6	1.45
7	0.27
8	0.03
9	0.00
10	0.00

In summary, using past performance to evaluate existing managers is statistically problematic. In the long run, superior managers will outperform inferior managers. However, due to the inherent uncertainty of investment management, over typical evaluation periods (3–5 years) the odds that superior managers will underperform their benchmarks (and, conversely, that inferior managers will outperform their benchmarks) are disturbingly high. Expensive, incorrect decisions may frequently result from relying on past performance to evaluate investment managers.

8.2 Manager Continuation Policy

Frequent manager firings based on recent performance might seem to be merely a waste of a fund sponsor's time if not for the expenses associated with manager transitions. Fired managers' portfolios must be converted to the hired managers' portfolios. This conversion requires buying and selling securities, which in turn involves trading costs. Making assumptions about the cost of trading securities is a tenuous business at best, because many factors influence that cost. For US large-capitalization common stocks, it is reasonable to assume transaction costs of 0.50 percent (one way), and for small company stocks and stocks of companies traded in less liquid markets, those costs can be much higher. A substantial percentage of the fired manager's portfolio may need to be liquidated in the process of moving the assets to a new manager, particularly when the managers' styles are not closely similar. Moreover, this tally of the expenses of converting a manager's portfolio considers only direct monetary costs. For most fund sponsors, replacing managers involves significant time and effort.[34]

34 The costs associated with manager hiring and firing decisions are discussed in Goyal and Wahal (2005).

In an attempt to reduce the costs of manager turnover yet systematically act on indications of future poor performance, some fund sponsors have adopted formal, written **manager continuation policies** (MCP) to guide their manager evaluations. The purpose of an MCP is severalfold:

- to retain superior managers and to remove inferior managers, preferably before the latter can produce adverse results;
- to ensure that relevant nonperformance information is given significant weight in the evaluation process;
- to minimize manager turnover; and
- to develop procedures that will be consistently applied regardless of investment committee and staff changes.

An MCP can be viewed as a two-part process. The first part we refer to as **manager monitoring**, while the second part we call **manager review**. Exhibit 21 displays a flow chart description of an MCP.

Exhibit 21 Manager Continuation Policy

Manager Monitoring The ongoing phase of an MCP is manager monitoring. The goal of MCP manager monitoring is to identify warning signs of adverse changes in existing managers' organizations. It is a formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations. The key is that the fund sponsor regularly asks the same important questions, both in written correspondence and in face-to-face meetings.

There is no firm set of appropriate manager monitoring criteria. Each fund sponsor must determine for itself the issues that are relevant to its own particular circumstances. Monitoring criteria may even vary from manager to manager. Regardless, the fund sponsor should clearly articulate its established criteria at the time a manager is hired, rather than formulate them later in a haphazard manner.

As part of the manager monitoring process, the fund sponsor periodically receives information from the managers, either in written form or through face-to-face meetings. This information is divided into two parts. The first part covers operational matters, such as personnel changes, account growth, litigation, and so on. The staff should flag significant items and discuss them in a timely manner with the respective managers.

The second part of the responses contains a discussion of the managers' investment strategies, on both a retrospective and a prospective basis. The fund sponsor should instruct the managers to explain their recent investment strategies relative to their respective benchmarks and how those strategies performed. The managers should follow this review with a discussion of their current strategies relative to the benchmark and why they believe that those strategies are appropriate. The goal of these discussions is to assure the fund sponsor that the manager is continuing to pursue a coherent, consistent investment approach. Unsatisfactory manager responses may be interpreted as warning signs that the manager's investment approach may be less well-defined or less consistently implemented than the staff had previously believed.

As part of the manager monitoring process, the staff should regularly collect portfolio return and composition data for a performance attribution analysis. The purpose of such a periodic analysis is to evaluate not how well the managers have performed, but whether that performance has been consistent with the managers' stated investment styles. The staff should address questions arising from this analysis directly to the managers.

Typically, the results of the MCP manager monitoring stage reveal nothing of serious concern. That is, the managers' organizations remain stable, and the managers continue to follow their stated investment approaches regardless of the near-term success or failure of their particular active strategies. While the managers should be able to explain why particular strategies failed, the mere occurrence of isolated periods of poor performance should typically not be a cause for concern, unless the staff finds related nonperformance problems.

Manager Review Occasionally, manager monitoring may identify an item of sufficient concern to trigger a manager review. For example, a recently successful small manager might experience excessive growth in accounts and assets. Despite discussions with the manager, the staff might be convinced that such growth threatens the manager's ability to produce superior returns in the future. At this point, a formal manager review becomes necessary.

The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired. We can view this manager review as a zero-based budgeting process (a budgeting process in which all expenditures must be justified each new period). We want to answer the question, "Would we hire the manager again today?"

As with the initial selection of a manager, the fund sponsor should collect the same comprehensive data and meet face-to-face with the manager in a formal interview setting. The manager's key personnel should attend, with the advance understanding that they must persuade the staff to "rehire" them. On conclusion of the interview, the staff should meet to compare observations, weighing the evaluation criteria in the same manner that it would if it were initially considering the manager. As part of these deliberations, the fund sponsor should also review the information that led to the manager's hiring in the first place.

The primary differences between hiring a new manager and retaining a manager under review are that the fund sponsor once had enough confidence in the manager to entrust a large sum of money to the manager's judgment and that there is a sizable cost associated with firing the manager. Thus, the fund sponsor should address the following questions:

- What has fundamentally changed in the manager's operation?
- Is the change significant?
- What are the likely ramifications of the change?
- Are the costs of firing the manager outweighed by the potential benefits?

8.3 Manager Continuation Policy as a Filter

For many reasons, investment skill does not readily lend itself to rigid "good" or "bad" interpretations. For discussion purposes, however, we will arbitrarily divide the investment manager community into three categories: positive-, zero-, and negative-value-added managers. Assume that positive-value-added managers beat their benchmarks (after all fees and expenses) by 2 percent per year, on average. Zero-value-added managers exhibit just enough skill to cover their fees and expenses and thereby match the performance of their benchmarks. Finally, negative-value-added managers lose to their benchmarks by 1 percent per year, on average, due primarily to the impact of fees and expenses.

We have no firm evidence as to how the manager community is apportioned among these three categories, although if we follow the logic of Grossman and Stiglitz (1980) and Sharpe (1994), the zero- and negative-value-added managers must predominate, with the former outnumbering the latter. Nevertheless, we speculate that out of five managers hired, a fund sponsor would be fortunate to hire two positive-value-added managers, two zero-value-added managers, and one negative-value-added manager. Therefore, in aggregate, this successful fund sponsor's managers are expected to outperform their benchmarks by 60 basis points per year, net of all costs [$0.6\% = (2\% \times 0.4) + (0\% \times 0.4) + (-1\% \times 0.2)$].

We can view a MCP as a statistical filter designed to remove negative-value-added managers and retain positive-value-added managers. Zero-value-added managers, much to the consternation of fund sponsors, always present a problem for a MCP, because they are so numerous and because they are statistically difficult to distinguish from positive- and negative-value-added managers.

We begin our MCP analysis with the null hypothesis that the managers under evaluation are at best zero-value-added managers. Then, as with any filter, two types of decision errors may occur:

- **Type I error**—keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct.)
- **Type II error**—firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect.)

In implementing a MCP, the fund sponsor must determine how fine a filter to construct. A coarse filter will be conducive to Type I errors. For example, a fund sponsor may choose to overlook many violations of its manager monitoring guidelines, with the expectation that most problems experienced by managers are temporary and that they will eventually work themselves out. While this policy will avoid firing some positive-value-added managers, the fund sponsor could have identified in advance some managers who will provide mediocre long-term performance.

Conversely, a fine filter will lead the sponsor to commit more Type II errors. For example, a fund sponsor might apply its manager monitoring guidelines rigidly and automatically fire any manager who loses a key decision maker. While this policy will remove some managers whose operations will be disrupted by personnel turnover, it will also eliminate some managers possibly anticipated to recover from that turnover and to continue with superior results.

Exhibit 22 presents the four possible results from testing the null hypothesis that a manager has no investment skill. Referring back to the quality control chart, if in truth the manager has no skill and we reject the null hypothesis because the manager's value-added returns fall outside of the confidence band (particularly, in this case, on the upside), then we have committed a Type I error. Conversely, if the manager is indeed skillful yet we fail to reject the null hypothesis because the manager's value-added returns fall inside the confidence band, then we have committed a Type II error.

Exhibit 22 Null Hypothesis: Manager Has No Skill; Alternative Hypothesis: Manager Is Skillful

	Reality	
	Value-Added = 0	Value-Added > 0
Reject	Type I	Correct
Do Not Reject	Correct	Type II

Both Type I and Type II errors are expensive. The art of a MCP is to strike a cost-effective balance between the two that avoids excessive manager turnover yet eliminates managers likely to produce inferior performance in the future. We can control the probabilities of committing Type I and Type II errors by adjusting the width of the confidence band within the quality control chart. For example, suppose that we widened the confidence band to encompass 95% of a manager's possible value-added return outcomes. Now it will be less likely than in our earlier examples that a zero-value-added return manager will generate returns that lie outside the confidence band. We thus reduce the chances of a Type I error. However, it will also now be less likely that a truly skillful manager will come to our attention by generating returns that fall outside that manager's confidence band. By continuing not to reject the null hypothesis for such a manager, we commit a Type II error.

Due to the high costs and uncertain benefits of replacing managers, it would seem advisable for fund sponsors to develop manager evaluation procedures that are tolerant toward Type I errors in order to reduce the probability of Type II errors. That is, it may be preferable to endure the discomfort of keeping several unskillful managers to avoid the expense of firing a truly superior manager. However, there is no right answer to this dilemma, and fund sponsors must undertake their own cost–benefit analyses, weighing the chances of committing one type of error versus the other. The quality control chart approach, however, provides fund sponsors with an objective framework with which to address this issue.

SUMMARY

Performance evaluation is as important as it is challenging. Decisions reached concerning manager skill can affect the attainment of investment objectives. It therefore benefits investors and their advisors to be up-to-date in their knowledge of this field.

- From the fund sponsor's perspective, performance evaluation serves as a feedback mechanism to a fund's investment policy. It identifies strengths and weaknesses, attributes results to key decisions, and focuses attention on poor performance. It provides evidence to fund trustees on whether the investment program is being conducted effectively. From the investment manager's perspective, performance evaluation permits an investigation of the effectiveness of various elements of the investment process and the contributions of those elements to investment results.
- Performance evaluation is composed of three parts: 1) performance measurement, 2) performance attribution, and 3) performance appraisal.
- The rate of return on an asset is typically defined as the investment-related growth in the asset's value over the evaluation period. When there are intraperiod cash flows, the rate of return can be measured as the growth rate applied to a single dollar invested at the start of the period (time-weighted rate of return, or TWR) or to an "average" amount of dollars invested over the evaluation period (money-weighted rate of return, or MWR). The MWR is sensitive to the size and timing of cash flows, but the TWR is not. Because investment managers rarely have control over the size or timing of cash flows, the TWR is the most commonly used performance measure.
- When the investment manager has control over the size and timing of cash flows into an account, the MWR may be an appropriate performance measure.
- When the MWR is calculated over reasonably frequent time periods and those returns are chain-linked over the entire evaluation period, which could be of any length, an approximation of the TWR for the period, called the Linked Internal Rate of Return (LIRR), is obtained.
- If external funds are added to an account prior to a period of strong performance, the MWR will give a higher rate of return than the TWR. If a large amount is withdrawn prior to a period of strong performance, the MWR will yield a lower rate of return than the TWR. The opposite effect is experienced during periods of weak performance.
- Data quality is important in determining the accuracy of rates of return. Rates of return for large-capitalization securities are likely to be more accurate than those for illiquid and infrequently priced assets.
- A valid benchmark should meet the following criteria: It should be unambiguous, investable, measurable, and appropriate for the manager's style and area of expertise; reflect current investment opinions; be specified in advance; and exhibit ownership by the investment manager.
- The types of benchmarks in common use are: absolute return, manager universes, broad market indexes, style indexes, factor-model-based, returns-based, and custom security-based. A custom security-based benchmark meets all fundamental and quality-based benchmark criteria, making it the most appropriate benchmark to use.
- The median manager or median fund, though intuitively appealing, lacks the following desirable benchmark properties: It is not specified in advance, it is not investable, and it cannot serve as a passive investment.

- Steps in creating a custom security-based benchmark are: Identify prominent aspects of the manager's investment process; select securities consistent with that investment process; devise a weighting scheme for the benchmark securities, including a cash position; review the preliminary benchmark and make modifications; rebalance the benchmark portfolio on a predetermined schedule.
- Good benchmarks should generally display the following characteristics: minimal systematic bias between the account and the benchmark, less tracking error of the account relative to the benchmark when compared to alternative benchmarks, strong correspondence between the manager's universe of potential securities and the benchmark, and low turnover.
- When a factor model is used as a benchmark, an analysis of past portfolios gives a sense of typical exposures (betas) to various systematic sources of return. A "normal" portfolio is one where the factor sensitivities are set to these "normal" betas.
- Performance attribution compares account and benchmark performance and identifies and quantifies sources of differential returns. It requires an appropriate framework for decomposing an account's returns relative to those of the benchmark.
- A manager has two basic avenues for superior performance relative to the benchmark: 1) selecting superior (or avoiding inferior) performing assets and 2) owning the superior (inferior) assets in greater (lesser) proportions than are held in the benchmark.
- Performance attribution conducted at the fund sponsor level is called macro attribution. It has three sets of inputs: 1) policy allocations to asset categories within the fund and to individual managers within asset categories; 2) benchmark portfolio returns; and 3) account returns, valuations, and external cash flows.
- Several decision-making levels can be of interest when evaluating a fund sponsor's decision-making process. These decision levels include: net contributions, the risk-free asset, asset categories, investment style, investment managers, and allocation effects.
- Micro attribution is concerned with the investment results of individual portfolios rather than the entire fund. Over a given period, the difference between the portfolio return and the benchmark return is the manager's value-added return, or active return. Because security-by-security micro attribution is unwieldy, a more productive method uses a factor model of returns to assign value-added return to sources of systematic returns.
- The common stock manager's value-added can be expressed as the difference between the weighted average return on the economic/industry sectors in the portfolio and the benchmark. This value-added return can be further divided into 1) a pure sector allocation component, 2) a within-sector selection component, and 3) an allocation/selection interaction.
- For common stocks, fundamental factors such as company size, industry, and growth characteristics seem to have a systematic impact on account performance. These factors can be combined with economic sector factors to conduct micro attribution.
- Fixed-income portfolio returns may be decomposed to show the contributions from the external interest rate environment, on one hand, and the management effect, on the other.

- The widely accepted tenet that investors are risk averse leads to risk-adjusted performance appraisal methods which compare returns with an account's corresponding risk. Two types of risk measures are typically used: the account's systematic risk (beta) and the account's standard deviation of returns.
- There are several measures of the return relative to the risk of a portfolio. The *ex post* alpha measures the account's excess return over the risk-free rate relative to the excess return of the market proxy over the risk-free rate scaled by the account's beta. The intercept, or alpha, from the estimating regression is a measure of the manager's skill. The Treynor measure is similar to the *ex post* alpha measure and will always give the same assessment of investment skill. It is the account's average return less the average risk-free rate divided by the account's beta. Unlike the *ex post* alpha and Treynor measures, which compare returns on an account relative to its systematic risk, the Sharpe ratio measures returns relative to the account's standard deviation of returns. The Sharpe ratio is an account's average return less the average risk-free rate divided by the account's standard deviation. The M^2 measure is equal to the Sharpe measure multiplied by the standard deviation of the market index and then added to the average risk-free rate.
- The Sharpe ratio can be generalized to directly compare the performance of an account to that of a specific benchmark. In this general form, the Sharpe ratio is called the information ratio and is defined as the excess return of the account over the benchmark, divided by the standard deviation of the excess returns.
- Roll's critique is a major issue when using methods based on the CAPM to evaluate performance. Slight changes in the market portfolio surrogate can yield significantly different performance appraisal answers.
- Quality control charts are an effective way of illustrating performance appraisal data. In simple terms, a quality control chart plots a portfolio manager's performance over time and relative to a benchmark within a statistically derived confidence band. The confidence band indicates whether the manager's performance was statistically different from that of the benchmark.
- Fund sponsors adopt manager continuation policies (MCPs) to guide their manager evaluations. A MCP seeks to develop consistent procedures designed to retain good managers and remove inferior ones based on both quantitative and qualitative information.
- If we begin with the null hypothesis that all managers under evaluation are zero-value-added managers (have no investment skill) and our goal is to identify and separate positive-value-added managers from those without skill, then two types of error can occur. A Type I error results when we keep or hire managers because we believe they are superior when in fact they are not. A Type II error causes us to not reject the null hypothesis when it is incorrect, thus firing or not hiring skillful managers.

PRACTICE PROBLEMS

1 Paul Joubert retired from his firm. He has continued to hold his private retirement investments in a portfolio of common stocks and bonds. At the beginning of 2002, when he retired, his account was valued at €453,000. By the end of 2002, the value of his account was €523,500. Joubert made no contributions to or withdrawals from the portfolio during 2002. What rate of return did Joubert earn on his portfolio during 2002?

2 Frederic Smith works for the Swanson Manufacturing Company and participates in the savings plan at work. He began the month with a balance in his account of £42,000. When he got paid on the last day of the month, the company deposited 10% of his gross salary into his savings plan account (£5,000 gross salary). The ending balance in his account at the end of the month was £42,300.

A What was the rate of return for the month in Smith's savings plan?

B What would be the rate of return for the month if Swanson had paid Smith and deposited 10% of his salary on the first rather than the last day of the month, holding all else constant?

3 Mary Nesbitt has an investment account with a local firm, and she makes contributions to her account as funds become available. Self-employed, Mary receives money from her clients on an irregular basis. She began the month of September with a balance in her account of $100,000. She received funds in the amount of $3,000 and made a deposit into her account on September 14th. Next, she received a payment of $2,500 on September 21st and made another contribution. The value of her account after the first contribution was $105,000, and the account value was $108,000 after the second contribution. The account was valued at $110,000 at the end of the month. Mary believes that it will be difficult, if not impossible, to determine an accurate rate of return for her account, since her cash flows do not occur on a regular basis.

A State and justify whether an accurate rate of return can be calculated.

B If an accurate rate of return can be calculated, determine that rate of return.

4 An investment manager has time-weighted returns for the first six months of the year as follows:

January	1.25%
February	3.47%
March	–2.36%
April	1.89%
May	–2.67%
June	2.57%

A Calculate a time-weighted rate of return for the investment manager by chain-linking the monthly time-weighted returns.

B Compare and contrast the time-weighted rate of return with a calculation involving adding the monthly rates of return.

Practice Problems and Solutions: *Managing Investment Portfolios: A Dynamic Process,* Third Edition, John L. Maginn, CFA, Donald L. Tuttle, CFA, Jerald E. Pinto, CFA, and Dennis W. McLeavey, CFA, editors. © 2007 CFA Institute. All rights reserved.

5 Compare and contrast the time-weighted rate of return with the money-weighted rate of return. In general terms, how is each calculated? Are there certain situations that would cause the two methods to have drastic differences in the calculated rates of return?

6 A pension portfolio manager is about to upgrade his performance calculation software. Currently, his performance software will only calculate his performance on a quarterly basis. For the year 2005, the quarterly performance numbers are as shown below:

Quarter 1	5.35%
Quarter 2	–2.34%
Quarter 3	4.62%
Quarter 4	1.25%

These values were calculated on a money-weighted rate-of-return basis.

A Explain how you would approximate a time-weighted rate of return for the entire year (2005).

B Determine the approximate time-weighted rate of return.

7 Swennson, who manages a domestic equities portfolio of Swedish shares, has had fairly volatile returns for the last five years. Nevertheless, Swennson claims that his returns over the long run are good. Another Swedish equity manager, Mattsson, has had less volatile returns. Their records are as follows:

Year	Swennson	Mattsson
1	27.5%	5.7%
2	–18.9%	4.9%
3	14.6%	7.8%
4	–32.4%	–6.7%
5	12.3%	5.3%

Assume no interim cash flows.

A Calculate the annualized rates of return for Swennson and Mattsson.

B State which manager achieved a higher return over the five-year period.

8 A US large-cap value portfolio run by Anderson Investment Management returned 18.9% during the first three quarters of 2003. During the same time period, the Russell 1000 Value Index had returns of 21.7% and the Wilshire 5000 returned 25.2%.

A What is the return due to style?

B What is the return due to active management?

C Discuss the implications of your answers to Parts A and B for assessing Anderson's performance relative to the benchmark and relative to the market.

9 You have selected a US domestic equity manager for a small-cap mandate. Your consultant has suggested that you use the Russell 2000® Index as a benchmark. You find the following information on the Russell website:

Russell 3000® Index

The Russell 3000 Index offers investors access to the broad US equity universe representing approximately 98% of the US market. The Russell 3000 is constructed to provide a comprehensive, unbiased, and stable barometer of the broad market and is completely reconstituted annually to ensure new and growing equities are reflected.

Russell 2000® Index

The Russell 2000 Index offers investors access to the small-cap segment of the US equity universe. The Russell 2000 is constructed to provide a comprehensive and unbiased small-cap barometer and is completely reconstituted annually to ensure larger stocks do not distort the performance and characteristics of the true small-cap opportunity set. The Russell 2000 includes the smallest 2000 securities in the Russell 3000.

As of the latest reconstitution, the average market capitalization was approximately $607.1 million; the median market capitalization was approximately $496 million. The index had a total market-capitalization range of approximately $1.6 billion to $175.8 million.

What analysis could you conduct to verify that the Russell 2000® Index is appropriate for the small-cap manager?

10 The information in the table below pertains to a New Zealand pension plan sponsor.

New Zealand Pension Plan Sponsor Account Returns Year of 2002

Asset Category	Actual Return	Benchmark Return
Domestic equities	4.54%	4.04%
Equity Mgr A	4.76	4.61
Equity Mgr B	4.13	4.31
International equities	6.39	5.96
Int'l Equity Mgr A	6.54	5.82
Int'l Equity Mgr B	6.20	6.02
Domestic fixed income	1.94	2.56
Fixed-Income Mgr A	1.60	1.99
Fixed-Income Mgr B	2.41	2.55
Total fund	4.33	4.22

Based on the information given in the table, address the following:

A Which asset classes and managers have done relatively well and which have done relatively poorly as judged by returns alone?

B Characterize the overall performance of the pension plan sponsor.

C Assuming that relative outperformance or underperformance as indicated in the table is representative of performance over a substantial time period, would you recommend any changes? If so, what changes would you consider?

11 Briefly discuss the properties that a valid benchmark should have.

12 Kim Lee Ltd., an investment management firm in Singapore managing portfolios of Pacific Rim equities, tells you that its benchmark for performance is to be in the top quartile of its peer group (Singapore managers running portfolios of Pacific Rim equities) over the previous calendar year. Is this a valid benchmark? Why or why not?

13 Susan Jones is a US domestic equities investor. Her portfolio has a zero-factor value of 0.5 and a beta of 1.15 at the beginning of the investment period. During the first quarter of 2003, the return on the Wilshire 5000, a broad US equity market index, was 5.9%.

Jones has just been hired by a large plan sponsor. The sponsor is sophisticated in its use of benchmarks. It has developed a custom benchmark for her portfolio. This benchmark has a zero-factor value of 1.5 and a beta of 0.95.

Calculate the expected return on the portfolio and the benchmark. What is the incremental expected return of the portfolio versus the benchmark? If the portfolio actually returned 8.13% during the period, what is the total differential return, and how much of this can be attributed to the value-added investment skill of Jones?

14 A plan sponsor is considering two UK investment managers, Manchester Asset Management and Oakleaf Equities, for the same mandate. Manchester will produce on average an annual value-added return of 1.5% over the benchmark, with variability of the excess returns of 2.24%. Oakleaf is expected to produce a higher annual value-added return of 4%, but with variability of excess returns around 10%. Using the information in the following table, determine which manager has a larger chance of underperforming the benchmark over periods of 1, 5, and 10 years. Explain the factor(s) causing the manager you identify to have a larger chance of underperforming for a given time period.

Probability of a Manager Outperforming a Benchmark Given Various Levels of Investment Skill

	Information Ratio					
Years	**0.20**	**0.30**	**0.40**	**0.67**	**0.80**	**1.00**
1.0	57.93	61.79	65.54	74.75	78.81	84.03
5.0	67.26	74.88	81.45	93.20	96.32	98.73
10.0	73.65	82.86	89.70	98.25	99.43	99.92
20.0	81.70	91.01	96.32	99.86	99.98	99.99

15 You are a plan sponsor trying to decide between two equity portfolio managers. As you review the information you have gathered during your search, you notice that the two managers have similar investment styles and similar returns for the equity portion of their portfolios. However, the first manager, Acorn Asset Management, keeps its cash level very low, typically around 1% of assets. But the second manager, Zebra Investments, has much more cash in the portfolio and usually keeps approximately 10% in cash for clients' accounts.

Contrast Zebra and Acorn in terms of cash level in the accounts relative to overall portfolio performance. Are there time periods when higher or lower cash levels could be beneficial to an equity portfolio?

16 Briefly explain the challenges inherent in performance measurement and performance evaluation for a long–short hedge fund. If traditional performance measurement and evaluation are not appropriate in a long–short environment, are there other options that may be useful?

17 Compare and contrast macro attribution with micro attribution. What is the difference between using a return metric and using a dollar metric? Briefly discuss the inputs and methodology that could be used with a macro analysis.

Questions 18–25 relate to William Denker College

William Denker College (Denker) is a small, liberal arts college in southwestern Pennsylvania with an endowment of $1 billion. Denker outsources the management of their endowment and brought in DBC Advisors (DBCA) to manage a portion of their domestic equity allocation.

DBCA is a small boutique investment firm that specializes in US equities. Denker is their largest client. Denker utilizes DBCA specifically for the large cap value segment of their US equity allocation. On April 1, the account had a market value of $25,000,000.

Chad Driver, CFA, is a recently hired portfolio manager for DBCA. DBCA asks Driver to take over the Denker account from the previous manager, Erik Tarler, who was fired for consistently underperforming his benchmark.

Driver assumes management of the Denker account on April 1 and immediately discovers that Tarler had been using an inappropriate benchmark. Had Tarler been using an appropriate benchmark, DBA would have seen that he had actually been adding value rather than underperforming.

As a result, Driver's first order of business is to develop a new, more appropriate benchmark portfolio. He considers one of the following three options for the benchmark:

Option 1 Absolute return based on a minimum return target of 9.5%

Option 2 Manager universe based on the median of the US Large Cap Core Equity universe

Option 3 Custom security-based

After selecting the benchmark, Driver implements the portfolio. The account activity for his first month is shown in Exhibit 1.

Exhibit 1 Denker's Large Cap Value Account Activity for April

Date	Beginning Market Value	Contribution/ (Withdrawal)	Ending Market Value
April 1	$25,000,000		
April 10		$1,000,000	$25,800,000
April 20		$(500,000)	$25,600,000
April 30			$26,000,000

Statistical measures related to the account and benchmark portfolio for May are displayed in Exhibit 2.

Exhibit 2 Statistical Measures for Denker's Account and the Benchmark Portfolio for the Month of May

	Denker Account	Benchmark Portfolio	Market Index
Return (%)	2.0	2.1	2.5
Beta (β)	0.8	0.8	1.00
Standard Deviation (%)	1.1	1.3	1.4
30-Day US T-bill (%)	0.2	0.2	0.2

In July, Denker requested an update on the performance of their account. As a result, DBCA asked Driver to prepare a micro performance attribution analysis only for the month June. The June return figures by sector for the portfolio and the benchmark are shown in Exhibit 3.

Exhibit 3 Denker's Large Cap Value Portfolio—Return by Sector for the Month of June

Market Value of Portfolio on June 1: $26,520,000

Economic Sectors	Portfolio Weight (%)	Sector Benchmark Weight (%)	Portfolio Return (%)	Sector Benchmark Return (%)
Basic Materials	3.56	6.03	–2.40	–1.61
Communication	1.53	2.33	–0.13	–0.13
Consumer Cyclical	8.69	5.97	4.10	4.62
Consumer Defensive	13.92	18.80	3.08	3.03
Energy	8.46	6.69	4.42	4.05
Financial Services	14.52	18.36	–0.05	–1.43
Healthcare	15.55	12.59	3.65	4.49
Industrials	3.71	2.40	0.12	0.10
Real Estate	6.76	5.44	–1.84	0.13
Technology	15.72	13.52	3.55	3.57
Utilities	4.96	7.87	0.10	0.07
Cash and Equivalents	2.62	0.00	0.12	
Buy/hold + cash	**100.00**	**100.00**	**2.08**	**1.82**
Trading and other			–0.12	
Total Portfolio			**1.96**	**1.82**

18 The DBCA's employment decision related to Tarler and the Denker account represents which type of error?

A Type I error.

B Type II error.

C No error was made.

19 Which of the following properties of a valid benchmark do benchmark Option 1 and Option 2 possess?

A Investible

B Measurable

C Unambiguous

20 Based upon Exhibit 1, the time-weighted return for Driver's portfolio from April 1 to April 30 is *closest* to:

A 1.92%.

B 1.96%.

C 2.00%.

21 Based upon the data shown in Exhibit 2, the return due to the portfolio manager's style is *closest* to:

A –0.5%.

B –0.4%.

C –0.1%.

22 Based on the data in Exhibit 2, the Sharpe ratio and Treynor measure for the Denker portfolio and benchmark portfolio *most likely* indicate that, in comparison to the benchmark portfolio, the Denker portfolio had:

A inferior risk-adjusted performance.

B superior risk-adjusted performance.

C risk-adjusted performance that was not clearly inferior or superior.

23 The data in Exhibit 3 shows Driver *most likely* achieved a positive Pure Sector Allocation return for the month of June from the economic sector in:

A Real Estate.

B Consumer Cyclical.

C Consumer Defensive.

24 The data in Exhibit 3 shows Driver *most likely* achieved the highest Within-Sector Selection return during June from the economic sector in:

A Basic Materials.

B Communication.

C Financial Services.

25 The data in Exhibit 3 shows the total value added (in dollar terms) that Driver contributed to the Denker account for the month of June is *closest* to:

A $31,824.

B $37,128.

C $68,952.

SOLUTIONS

1 In this simplest rate-of-return calculation, the portfolio experiences no external cash flows. In this situation, the account's rate of return during evaluation period t equals the market value (MV_1) at the end of the period less the market value at the beginning of the period (MV_0), divided by the beginning market value:

$$r_t = \frac{MV_1 - MV_0}{MV_0}$$

or (€523,500 – €453,000)/€453,000 = 0.1556 = 15.56%

Joubert earned a 15.56% rate of return on his portfolio during the year 2002.

2 A The contribution was received at the end of the evaluation period, and it should be subtracted from the account's ending value. The external cash flow had no opportunity to affect the investment-related value of the account, and hence, it should be ignored.

$$r_t = \frac{(MV_1 - CF) - MV_0}{MV_0} \text{ or}$$

$$r_t = \frac{(42{,}300 - 500) - 42{,}000}{42{,}000} = -0.48\%$$

Even though Smith actually ended up with a larger amount in his account at the end of the period as compared to the beginning of the period (£42,300 versus £42,000), he actually lost money on his investments. His rate of return was –0.48%. The slight increase in his account balance was due to the contribution at the end of the month rather than to a positive return.

B In this case, the contribution was received at the beginning of the evaluation period, and it should be added to the account's beginning value. This sum is then subtracted from the ending value of the account, and the result is divided by the same sum (see formula below). In this case, the external cash flow did have an opportunity to affect the investment-related value of the account and it should be included in the calculation.

$$r_t = \frac{MV_1 - (MV_0 + CF)}{MV_0 + CF}$$

$$r_t = \frac{42{,}300 - (42{,}000 + 500)}{(42{,}000 + 500)} = -0.47\%$$

This rate of return is slightly higher (a smaller negative number) than the –0.48% return calculated in Part A. The slight increase in investment performance was due to the contribution made at the beginning of the month. In this case, the numerator of the formula yields an identical answer to that of Part A (–£200). But the denominator is larger (£42,500 vs. £42,000), giving a slightly higher return than in Part A.

3 A Yes, an accurate rate of return can be calculated. The appropriate calculation is the time-weighted rate of return. The time-weighted rate of return (TWR) reflects the investment growth in the account as if the account began with one dollar. Its calculation requires that the account be valued every time an external cash flow occurs. If no cash flows take place, then the calculation of the TWR is simple; the change in the account's value is expressed relative to

its beginning value. If external cash flows do occur, then the TWR requires computing a set of subperiod returns. These subperiod returns must then be linked together to compute the TWR for the entire evaluation period.

B First, we determine the appropriate subperiods by reviewing the dates of the contributions to the account. Contributions were made on September 14th and 21st. The appropriate subperiods are as shown:

Subperiod 1 = Days 1 through 14

Subperiod 2 = Days 15 through 21

Subperiod 3 = Days 22 through 30

Next, we calculate the rate of return for each subperiod:

For subperiod 1:

$$r_{t,1} = \left[(\$105{,}000 - \$3{,}000) - \$100{,}000\right]/\$100{,}000$$
$$= 0.02 \text{ or } 2.00\%$$

For subperiod 2:

$$r_{t,2} = \left[(\$108{,}000 - \$2{,}500) - \$105{,}000\right]/\$105{,}000$$
$$= 0.0048 \text{ or } 0.48\%$$

For subperiod 3:

$$r_{t,3} = (\$110{,}000 - \$108{,}000)/\$108{,}000$$
$$= 0.0185 \text{ or } 1.85\%$$

Converting the subperiod returns into decimal form, we use the following expression to compute the time-weighted rate of return:

$$r_{twr} = (1 + r_{t,1}) \times (1 + r_{t,2}) \times \ldots \times (1 + r_{t,n}) - 1$$

In the case of Mary's portfolio:

$$r_{\text{twr}} = (1 + 0.02) \times (1 + 0.0048) \times (1 + 0.0185) - 1$$
$$= 0.0439 \text{ or } 4.39\%$$

4 **A** The time-weighted rate of return for the investment manager is

$$r_{\text{twr}} = (1 + 0.0125)(1 + 0.0347)(1 + [-0.0236])(1 + 0.0189)$$
$$(1 + [-0.0267])(1 + 0.0257) - 1$$
$$= 0.0405 \text{ or } 4.05\%$$

B Adding the subperiod rates of return gives 0.0125 + 0.0347 + (–0.0236) + 0.0189 + (–0.0267) + 0.0257 = 0.0415 or 4.15%.

Characteristically, the additive calculation gives a higher return number (4.15%) than the time-weighted calculation (4.05%). In general, the time-weighted rate of return is a better indicator of long-term performance because it takes account of the effects of compounding.

5 The time-weighted rate of return (TWR) reflects the investment growth of one unit of money initially invested in the account. If external cash flows occur, then the account must be valued as of the date of each of these cash flows; the calculation of the TWR then requires computing a series of subperiod returns for the subperiods defined by the external cash flows. The subperiod returns are then combined by chain-linking, and 1 is subtracted from the result to arrive at the TWR.

The money-weighted rate of return (MWR) measures the compound growth rate in the value of all funds invested in the account over the evaluation period. The MWR also goes by the name Internal Rate of Return, or IRR. The MWR is the growth rate that will link the ending value of the account to its beginning value plus all external cash flows. The MWR is computed using an iterative procedure.

The MWR represents the average growth rate of all dollars invested in an account, while the TWR represents the growth of a single unit of money invested in the account. Consequently, the MWR is sensitive to the size and timing of external cash flows contributed to and withdrawn from the account, while the TWR is not affected by the cash flows. Under "normal" conditions, these two return measures will produce similar results. However, when external cash flows occur that are large relative to the account's value (rule of thumb: greater than 10%) and the account's performance fluctuates significantly, then the MWR and the TWR can differ substantially.

6 **A** The correct methodology for approximating a time-weighted rate of return for the entire year of 2005 is to use a Linked Internal Rate of Return (LIRR) approach. This approach takes the money-weighted rate-of-return values and then chain-links the returns over the entire evaluation period.

B The calculation is

$$\begin{aligned} r_{\text{LIRR}} &= (1 + 0.0535) \times (1 + [-0.0234]) \times (1 + 0.0462) \\ &\quad \times (1 + 0.0125) - 1 \\ &= 0.0898 \text{ or } 8.98\% \end{aligned}$$

7 **A** For Swennson, the annualized rate of return is:

$$\begin{aligned} r_a &= \left[(1 + 0.275)(1 - 0.189)(1 + 0.146)(1 - 0.324)\right. \\ &\quad \left.(1 + 0.123)\right]^{1/5} - 1 \\ &= -0.0209 = -2.09\% \end{aligned}$$

For Mattsson, the annualized rate of return is:

$$\begin{aligned} r_a &= \left[(1 + 0.057)(1 + 0.049)(1 + 0.078)(1 - 0.067)\right. \\ &\quad \left.(1 + 0.053)\right]^{1/5} - 1 \\ &= 0.0327 \text{ or } 3.27\% \end{aligned}$$

B Mattsson's annualized rate of return of 3.27% was higher than Swennson's at −2.09%.

8 In this problem, the Wilshire 5000 represents the market index for US equities, the Russell 1000 Value Index represents the portfolio benchmark, and Anderson's account is the portfolio.

A The return due to style is the difference between the benchmark and the market index, or S = (B − M) = (21.7% − 25.2%) = −3.5%.

B The return due to active management is the difference between the portfolio and the benchmark, or $A = (P - B)$ = (18.9% − 21.7%) = −2.8%.

C The implication of the style calculation is that large-cap value is out of favor: i.e., the Russell 1000 Value Index underperformed the Wilshire 5000 by 3.5%. In and of itself, this should not be a large concern for an investor with a properly diversified portfolio. Certain styles will periodically outperform and underperform the market index.

The implication of the active management calculation is that Anderson is not adding value as compared to the benchmark, since its portfolio underperformed the portfolio benchmark. If Anderson is indeed a large-cap value manager and the Russell 1000 Value Index is an appropriate benchmark, then the client may be better off investing in the passive alternative. Of course, one period is not enough to make a judgment such as this. However, sustained underperformance of an active manager as compared to an appropriate benchmark should be cause for concern.

9 To verify the choice of the benchmark, a potential client could compare the market capitalization (median, average, weighted average) of the subject portfolio with the respective benchmark index. This can help identify a good match (or mismatch) based on the size (market capitalization) of the stocks in the portfolio versus the index. In addition, the historical beta of the portfolio can be calculated relative to the potential benchmark. On average, it should be close to 1.0. If the beta is significantly larger (smaller) than the benchmark, it would indicate that the portfolio is substantially riskier (less risky) than the benchmark.

10 A Overall, the domestic equities asset class has performed well relative to the benchmark (4.54% vs. 4.04%). However, only one of the two domestic equities managers has outperformed his respective benchmark. Equity manager A has outperformed by 15 basis points, while equity manager B has underperformed by 18 basis points.

The international equity asset class as a whole has outperformed its benchmark. In addition, both international equity managers have also outperformed their respective benchmarks.

The fixed-income asset class underperformed its benchmark. Both fixed-income managers have underperformed their respective benchmarks as well.

B Overall, the total fund has outperformed its benchmark by 11 basis points. Nevertheless, the fund may be able to improve its relative performance by considering some changes to the manager lineup.

C For each manager that underperformed his or her assigned benchmark (equity manager B and both fixed-income managers), the plan sponsor should first verify that the benchmarks in place are appropriate for the particular managers' investment styles. If the benchmarks are appropriate, and if performance is not expected to improve (based on many factors, including quality of people, organizational issues, etc.), then the plan sponsor may consider replacing these managers with other active managers following similar investment disciplines, or perhaps replacing them with passive investment alternatives corresponding to the benchmarks those managers are being measured against.

11 In practice, an acceptable benchmark is one that both the investment manager and the plan sponsor agree represents the manager's investment process. However, in order to function effectively in performance evaluation, a benchmark should possess certain basic properties. It should be

- **Unambiguous**. The names of securities and their corresponding weights in the benchmark should be clearly noted.
- **Investable**. The benchmark should be available as a passive option.
- **Measurable**. It should be possible to calculate the benchmark's return on a timely basis, for various time periods (e.g., monthly, quarterly, annually).

- **Appropriate**. The benchmark should be consistent with the manager's investment style or area of expertise.
- **Reflective of current investment opinions**. The manager should have opinions and investment knowledge of the individual securities within the benchmark.
- **Specified in advance**. The benchmark should be specified prior to the beginning of an evaluation period and known to both the investment manager and the fund sponsor.
- **Owned**. The investment manager should be aware of and accept accountability for the constituents and performance of the benchmark.

12 Kim Lee Ltd.'s benchmark is not valid. The chief criticism of this type of benchmark is that it is not, and cannot be, specified in advance. Furthermore, since no one knows who the top-quartile managers will be at the beginning of an evaluation period, the benchmark is not investable; i.e., there is no passive option for investment. Kim Lee Ltd. can inform existing and prospective clients where the firm's past performance has ranked in its peer group, but the universe should not be used *ex ante* as a performance benchmark. Furthermore, the firm should disclose sufficient information about the composition of the peer group for recipients to evaluate the meaningfulness of the firm's *ex post* ranking.

13 A one-factor model can be used to predict the return on Jones' portfolio and the benchmark. In this case, the returns can be expressed as a linear function of the return on the entire US equity market (as represented in the problem statement by the Wilshire 5000), as shown below:

$$R_p = a_p + \beta_p R_I + \varepsilon_p$$

where R_p is the return on the portfolio and R_I is the return on US equities. The term ε_p is the residual, or nonsystematic, element of the relationship. Finally, the term β_p measures the sensitivity of the portfolio to the return on the US equities market.

Calculating the expected return on Jones' portfolio gives:

$$R_{\text{Jones}} = 0.5 + 1.15(5.9) = 7.29\%$$

Calculating the expected return on the custom benchmark gives:

$$R_{\text{Benchmark}} = 1.5 + 0.95(5.9) = 7.11\%$$

The incremental expected return of the portfolio versus the benchmark is 0.18%. This can be calculated by computing the difference between the two expected returns. It can also be calculated by combining the two formulas as shown below:

$$R_{\text{Difference}} = (0.5 - 1.5) + (1.15 - 0.95)(5.9) = 0.18\%$$

Since the portfolio actually returned 8.13% during the period, the total differential return is 1.02% (the difference between the actual return of 8.13% and the expected benchmark return of 7.11%). However, based on the one-factor model, an outperformance of 0.18% was expected. The difference between the 1.02% and the 0.18% (or 0.84%) can be attributed to the value-added investment skill of Susan Jones.

14 We begin by calculating the information ratio for each of the two managers. The formula for the information ratio is:

$$\text{IR}_A = \frac{\bar{R}_A - \bar{R}_B}{\hat{\sigma}_{A-B}}$$

In our problem statement, the value-added for Manchester (1.5%) is the numerator in this formula, and the variability of excess returns (2.24%) is the denominator. Thus, for Manchester we can calculate an information ratio of 0.67.

Similarly, for Oakleaf we can calculate an information ratio of 0.4 (4% excess returns divided by 10% variability).

When we review our table, it gives the probability of outperformance. Since the question refers to underperformance, we must subtract the values in the table from 1 to determine the probability of underperformance.

Year	Manchester Outperformance	Manchester Underperformance	Oakleaf Outperformance	Oakleaf Underperformance
1	74.75%	25.25%	65.54%	34.46%
5	93.20	6.80	81.45	18.55
10	98.25	1.75	89.70	10.30

In this case, Oakleaf has a larger chance of underperforming the benchmark at all three time periods: 1, 5, and 10 years. This is interesting, since Oakleaf has a much larger expected value-added return (4% annually versus 1.5% for Manchester). However, the much larger variability of excess returns (10% for Oakleaf versus 2.24% for Manchester) clearly is an important factor in this situation.

15 In general terms, equity will earn higher returns than cash on average over the long term. However, there are periods of declining equity performance when cash may outperform equities.

In the case of Acorn and Zebra, Acorn would be preferable over Zebra, all else but the cash levels being equal. During most time periods when equities are outperforming cash, it would be better to have less cash and more equities in the portfolio. But during the time periods when equities are declining, it may be preferable to have more cash. Unfortunately, it is extremely difficult to forecast ahead of time when these time periods of declining equity performance will occur.

16 There are performance measurement issues that are created when there are short positions in a portfolio. The basic equation for the return on an account is

$$r_t = \frac{\text{MV}_1 - \text{MV}_0}{\text{MV}_0}$$

In theory, the net assets of a long-short portfolio could be zero. If the value of the portfolio's long positions is equal to the value of the portfolio's short positions, then the beginning market value, MV_0, would be zero and the account's rate of return would be either positive infinity or negative infinity.

To address this problem, we need to revise our performance measurement methodology. One approach would be to determine returns by summing the performance impacts of the individual security positions (both long and short). A return could be calculated for the period that the individual security positions were maintained. Once an individual security position changed, the return period would end and a new return period would start.

Regarding performance evaluation, if we have information regarding the historical returns and holdings of a long–short equity manager's long and short portfolios, we could use either returns-based or security-based benchmark building approaches to construct separate long and short benchmarks for the manager. These benchmarks could then be combined in appropriate proportions to create an appropriate benchmark for the manager.

Another possible option for performance evaluation is the use of the Sharpe ratio to evaluate hedge fund manager performance. It can be calculated without reference to the manager's underlying investment universe. Typically, a hedge fund manager's Sharpe ratio is compared to that of a universe of other hedge fund managers whose investment mandates are similar to those of the manager under evaluation.

17 Both macro attribution and micro attribution are different facets of performance attribution. The basic tenet behind performance attribution is that an account's performance is compared to a designated benchmark, then the sources of differential returns are identified and quantified. The main difference between macro and micro attribution is the definition of which "account's" performance we are analyzing. Macro attribution is done at the fund sponsor level; that is, analysis is typically done for a grouping of investment managers or investment accounts. Micro attribution is carried out at the level of the individual investment manager.

There are three main inputs to the macro attribution approach:

1. policy allocations;
2. benchmark portfolio returns; and
3. fund returns, valuations, and external cash flows.

Fund sponsors determine policy allocations, or "normal" weightings, for each asset class and individual manager. These are typically determined after some sort of asset liability analysis and/or determination of the risk tolerance of the governing body of the fund.

Benchmark portfolio returns are an important factor in determining the value added by the fund. If the benchmarks do not adequately match the managers' investment styles, the performance attribution will have little value. Fund sponsors may use broad market indexes as the benchmarks for asset categories (the Wilshire 5000 as the benchmark for overall US domestic equities, for example) and may use more focused indexes to represent managers' investment styles (such as the Russell 2000 Value Index for a small-cap value manager).

Fund returns, valuations, and external cash flows are all critical elements for determining the relevant performance for the portfolio as a whole and for each individual investment manager's account.

A return metric implies that fund returns are used at the level of the individual management account to allow an analysis of the fund sponsor's decisions regarding manager selection. A dollar-metric approach uses account valuation and external cash flow data to calculate rates of return and also to compute the dollar impacts of the fund sponsor's investment policy decision making.

18 B is correct. Tarler was fired for underperformance but actually had outperformed the benchmark, and a Type II error is defined as firing (or not hiring) managers with positive value-added.

19 B is correct. The return for benchmark Option 2 is measurable.

20 A is correct. TWR is equal to the linked returns for each period between cash flows into/out of the fund, where each period return is equal to [(ending value – beginning value)/beginning value – 1]

$$\text{TWR} = (1 + \text{April 1-10 return}) \times (1 + \text{April 11-20 return}) \times (1 + \text{April 21-30 return})$$

$$\text{April 1-10 TWR} = \left[(25{,}800{,}000 - 1{,}000{,}000 - 25{,}000{,}000)/25{,}000{,}000\right] = -0.00800$$

$$\text{April 11-20 TWR} = \left[(25{,}600{,}000 + 500{,}000 - 25{,}800{,}000)/25{,}800{,}000\right] = 0.01163$$

$$\text{April 21-30 TWR} = \left[(26{,}000{,}000 - 25{,}600{,}000)/25{,}600{,}000\right] = 0.01563$$

$$\text{TWR} = (1 + -0.008)(1 + 0.01163)(1 + 0.01563) - 1 = 0.01922 \text{ or } 1.922\%$$

21 B is correct. The return due to the portfolio manager's style is Benchmark return – Market index return:

2.1% – 2.5% = –0.4%.

22 C is correct. The Sharpe Ratio = $(R_A - r_f)/\sigma_A$

Denker Sharpe Ratio = (2.0 – 0.2)/1.1 = 1.636

Benchmark Sharpe Ratio = (2.1 – 0.2)/1.3 = 1.462

Thus, the Denker portfolio has a higher Sharpe Ratio, which indicates *superior* risk-adjusted performance relative to the benchmark portfolio.

The Treynor Measure = $(R_A - r_f)/\beta_A$

Denker Treynor Measure = (2.0 – 0.2)/0.8 = 2.250

Benchmark Treynor Measure = (2.1 – 0.2)/0.8 = 2.375

Thus, the Denker portfolio has a lower Treynor Measure, which indicates *inferior* risk-adjusted performance by the benchmark portfolio.

Thus, the Sharpe ratio and the Treynor ratio offer conflicting conclusions about the performance of the Denker portfolio relative to the benchmark portfolio.

23 B is correct. The Pure Sector Allocation return equals the difference between the allocation (weight) of the Portfolio to a given sector and the Portfolio's benchmark weight for that sector, times the difference between the sector benchmark's return and the overall Portfolio's benchmark return.

$$r_{pj} = (w_{pj} - w_{Bj}) \times (r_{Bj} - r_B)$$

As a result, the return for the Consumer Cyclical sector

$$= (8.69\% - 5.97\%)(4.62\% - 1.82\%)$$
$$= (2.72\%)(2.80\%)$$
$$= 0.076\% \text{ which is } \textit{positive}$$

24 C is correct because Within-Sector Selection Return for sector j is given by

$$r_{pj} = w_{Bj} \times (r_{pj} - r_{Bj})$$

As a result, the return for the Financial Services sector

$$= (18.36\%)(-0.05\% - (-1.43\%))$$
$$= (18.36\%)(1.38\%)$$
$$= 0.253\% \text{ which is highest among the three}$$

25 B is correct.

$$\begin{aligned}\text{Total value added} &= \text{Beginning Portfolio Value} \times (\text{Portfolio Return} - \text{Benchmark Return}) \\ &= \$26{,}520{,}000 \times (1.96\% - 1.82\%) = \$37{,}128\end{aligned}$$

CUSTOMER SERVICE

68

PORTFOLIO MANAGEMENT
STUDY SESSION

18

Global Investment Performance Standards

The Global Investment Performance Standards (GIPS®) contain ethical and professional standards for presenting investment performance to prospective clients. These guidelines provide for standardized performance calculation and presentation among investment managers, enabling investors to objectively compare manager return histories and evaluate performance. This study session provides a grounding in the requirements and recommendations of GIPS.

READING ASSIGNMENTS

Reading 34 Overview of the Global Investment Performance Standards
by Philip Lawton, PhD, CFA, CIPM

© 2017 CFA Institute. All rights reserved.

CUSTOMER SERVICE

68

READING

34

Overview of the Global Investment Performance Standards

by Philip Lawton, PhD, CFA, CIPM

Philip Lawton, PhD, CFA, CIPM (USA).

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**a.** discuss the objectives, key characteristics, and scope of the GIPS standards and their benefits to prospective clients and investment managers;
☐	**b.** explain the fundamentals of compliance with the GIPS standards, including the definition of the firm and the firm's definition of discretion;
☐	**c.** explain the requirements and recommendations of the GIPS standards with respect to input data, including accounting policies related to valuation and performance measurement;
☐	**d.** discuss the requirements of the GIPS standards with respect to return calculation methodologies, including the treatment of external cash flows, cash and cash equivalents, and expenses and fees;
☐	**e.** explain the requirements and recommendations of the GIPS standards with respect to composite return calculations, including methods for asset-weighting portfolio returns;
☐	**f.** explain the meaning of "discretionary" in the context of composite construction and, given a description of the relevant facts, determine whether a portfolio is likely to be considered discretionary;
☐	**g.** explain the role of investment mandates, objectives, or strategies in the construction of composites;
☐	**h.** explain the requirements and recommendations of the GIPS standards with respect to composite construction, including switching portfolios among composites, the timing of the inclusion of new portfolios in composites, and the timing of the exclusion of terminated portfolios from composites;

(continued)

CFA Institute gratefully acknowledges the contributions of W. Bruce Remington, CFA, as co-author of the original (2005) version of this reading. This version was updated July 2012 by Kenneth Robinson, CFA, CIPM. © 2012 CFA Institute. All rights reserved.

LEARNING OUTCOMES

Mastery	*The candidate should be able to:*
☐	**i.** explain the requirements of the GIPS standards for asset class segments carved out of multi-class portfolios;
☐	**j.** explain the requirements and recommendations of the GIPS standards with respect to disclosure, including fees, the use of leverage and derivatives, conformity with laws and regulations that conflict with the GIPS standards, and noncompliant performance periods;
☐	**k.** explain the requirements and recommendations of the GIPS standards with respect to presentation and reporting, including the required timeframe of compliant performance periods, annual returns, composite assets, and benchmarks;
☐	**l.** explain the conditions under which the performance of a past firm or affiliation must be linked to or used to represent the historical performance of a new or acquiring firm;
☐	**m.** evaluate the relative merits of high/low, range, interquartile range, and equal-weighted or asset-weighted standard deviation as measures of the internal dispersion of portfolio returns within a composite for annual periods;
☐	**n.** identify the types of investments that are subject to the GIPS standards for real estate and private equity;
☐	**o.** explain the provisions of the GIPS standards for real estate and private equity;
☐	**p.** explain the provisions of the GIPS standards for Wrap fee/ Separately Managed Accounts;
☐	**q.** explain the requirements and recommended valuation hierarchy of the GIPS Valuation Principles;
☐	**r.** determine whether advertisements comply with the GIPS Advertising Guidelines;
☐	**s.** discuss the purpose, scope, and process of verification;
☐	**t.** discuss challenges related to the calculation of after-tax returns;
☐	**u.** identify and explain errors and omissions in given performance presentations and recommend changes that would bring them into compliance with GIPS standards.

1 INTRODUCTION

The Global Investment Performance Standards (the GIPS® standards) fulfill an essential role in investment management around the world. They meet the need for globally accepted standards for investment management firms in calculating and presenting their results to potential clients.

The GIPS standards are based on the ideals of fair representation and full disclosure of an investment management firm's performance history. Firms that claim compliance with the GIPS standards must adhere to rules governing not only rate-of-return calculations but also the way in which returns are displayed in a performance

presentation. They are further required to make certain disclosures and are encouraged to make others in a performance presentation, thereby assisting the user in interpreting and evaluating the reported returns. Potential and existing clients are assured that the information shown in a GIPS-compliant performance presentation reflects the results of the presenting firm's past investment decisions. They are also assured that the returns are calculated and presented on a consistent basis and that they are objectively comparable for a given strategy to those reported by other firms claiming compliance with the GIPS standards.

This reading comprehensively presents the requirements and recommendations of the 2010 version of the GIPS standards. In addition to presenting the GIPS standards, the reading explains the rationale and application of specific provisions, with particular attention to implementation issues. Section 2 of this reading provides background information on the need for the GIPS standards, their history, their governance, and the objectives and key characteristics of the GIPS standards. Section 3 covers the provisions of the GIPS standards. Section 4 explains the GIPS Valuation Principles, Section 5 reviews the GIPS Advertising Guidelines enabling firms to claim compliance with the GIPS standards in advertisements, and Section 6 describes verification. Section 7 considers other issues relevant to the GIPS standards, and Section 8 summarizes the reading's main points.

BACKGROUND OF THE GIPS STANDARDS

2

The GIPS standards, which offer significant advantages to investors and investment management firms, evolved from earlier efforts to improve the reliability of investment performance information and to standardize calculation methodologies. In this part of the reading, we will explain the benefits of the GIPS standards, recount their historical development, and introduce the governance body responsible for developing and interpreting the GIPS standards. We will also provide an overview of the GIPS standards.

2.1 The Need for Global Investment Performance Standards

In their current state, the GIPS standards are so broadly accepted and endorsed in the investment industry that it is worthwhile to recall the reasons they were developed in the first place. The total economic cost of defining, promulgating, interpreting, implementing, updating, monitoring, and validating claims of compliance with these voluntary ethical standards can be substantial. Why have investment industry participants seen fit to incur such costs? What are the benefits?

To appreciate the value of industry-wide performance presentation standards, consider some of the many ways in which unscrupulous employees might attempt to gather and retain assets by misrepresenting a firm's historical record in the GIPS standards' absence. In communicating with a prospective client, they could

- present returns only for the best-performing portfolios as though those returns were fully representative of the firm's expertise in a given strategy or style;
- base portfolio values on their own unsubstantiated estimates of asset prices;
- inflate returns by annualizing partial-period results;
- select the most favorable measurement period, calculating returns from a low point to a high point;
- present simulated returns as though they had actually been earned;

- choose as a benchmark the particular index the selected portfolios have outperformed by the greatest margin during the preferred measurement period;
- portray the growth of assets in the style or strategy of interest so as to mask the difference between investment returns and client contributions; or
- use the marketing department's expertise in graphic design to underplay unfavorable performance data and direct the prospect's attention to the most persuasive elements of the sales presentation.

Some of the foregoing examples are admittedly egregious abuses. They are not, however, farfetched. In the late 1980s, before performance presentation standards became widely accepted, a groundbreaking committee of the Financial Analysts Federation (a predecessor organization of CFA Institute) reported that investment advisors were "left to their own standards, which have been varied, uneven, and, in many instances, outright irresponsible and dishonest."[1] The investment management industry remains highly competitive, and people whose careers and livelihoods depend on winning new business want to communicate their firm's performance in the most favorable light (as they certainly should). The GIPS standards are ethical criteria designed simply to ensure that the firm's performance history is fairly represented and adequately disclosed. Indeed, employees who are pressured to misrepresent their firm's investment results can and should cite the GIPS standards.

Without established, well formulated standards for investment performance measurement and presentation, the prospective client's ability to make sound decisions in selecting investment managers would be impaired. Individual investors and their advisors, as well as pension plan sponsors, foundation trustees, and other institutional investors with fiduciary responsibility for asset pools, need reliable information. The GIPS standards give them greater confidence that the returns they are shown fairly represent an investment firm's historical record. The GIPS standards also enable them to make reasonable comparisons among different investment management firms before hiring one of them. Evaluating past returns is only one dimension of the manager selection process, but it is an important one, and the due diligence legally and ethically expected of fiduciaries cannot be satisfied without it.

Global standards for performance presentation, including the requirement that a firm show each composite's[2] investment returns alongside the returns of an appropriate benchmark, can lead to an informative discussion about the firm's investment decision-making process. The prospective client might ask, for instance, why the composite outperformed the benchmark in some periods and not in others, inviting the firm's spokespersons to explain past returns and to describe how the investment product is positioned for the future.

It must be stressed in this context that reviewing properly calculated, fully disclosed historical results does not exempt the prospective client from a thorough investigation of the candidate firm's background, resources, and capabilities for the mandate under consideration. Due diligence in selecting an investment manager includes, among many other important elements, examining a firm's regulatory history, the experience and professional credentials of its decision makers, the soundness of its investment philosophy, the nature of its investment and operational risk controls, and the independence of its service providers. At a minimum, however, the firm's representatives should be able to explain the sources of its past returns reasonably, credibly, and insightfully in light of the firm's investment philosophy and investment decision-making process as well as the then-prevailing capital market environment.

---

1 The Committee for Performance Presentation Standards (1987, p. 8).

2 A "composite" is formally defined as an "aggregation of one or more portfolios managed according to a similar investment mandate, objective, or strategy." The construction of composites is discussed in detail later.

The GIPS standards' benefits to prospective and existing clients are clear. What, if any, are the benefits to the investment management firms incurring the expenses required to achieve and maintain compliance with the GIPS standards?

There is, first, an incalculable benefit to the investment management industry as a whole. The development of well founded, thoughtfully defined performance presentation standards is a great credit not only to the vision of certain professionals and organizations but, above all, to the leadership of the investment management firms that were the early adopters. At present, widespread adherence to the GIPS standards may help restore the industry's credibility, which was severely damaged by the discovery of numerous fraudulent investment schemes in the aftermath of the financial crisis that followed the collapse of the subprime mortgage loan and credit default swap markets in 2008. The GIPS standards may reassure investors about compliant firms' veracity in the area of investment performance reporting, especially if they have been verified. Verification, discussed later in this reading, refers to an investment firm's voluntarily engaging an independent third party to test the firm's performance measurement and composite construction procedures in order to bring additional credibility to the firm's claim of compliance with the GIPS standards.

The practical benefits to individual firms facing the initial and ongoing expenses of GIPS compliance have increased over time. In some markets, the GIPS standards are so well accepted by plan sponsors and consultants that non-compliance is a serious competitive impediment to a firm's winning new institutional business. Requests for proposals (RFPs) in manager searches routinely ask if the responding firm is in compliance with the GIPS standards and if the firm has been independently verified.[3] In addition, the global recognition the GIPS standards have gained helps the compliant firm to compete in international markets because prospective clients should value the ability to equitably compare its investment performance to that of local GIPS-compliant firms. Compliance with the GIPS standards has appropriately been characterized as the investment management firm's passport to the international marketplace.

Because the GIPS standards reflect best practices in the calculation and presentation of investment performance, firms may also realize internal benefits. In the course of implementing the GIPS standards, they might identify opportunities to strengthen managerial controls. The discipline of reviewing portfolio guidelines and defining, documenting, and adhering to internal policies in support of compliance with the GIPS standards typically improves the firm's oversight of investment operations and provides management with additional comfort in the accuracy of the firm's composite performance and the quality of the composite presentations provided to prospective investors. Similarly, technological enhancements designed to provide valid calculation input data and presentation elements, such as dispersion statistics, may improve the quality of information available to the firm.

Only investment management **firms** may claim compliance with the GIPS standards.[4] Consultants, software houses, or third-party performance measurement providers such as custodians may not claim to be GIPS-compliant. Moreover, investment firms may claim to be compliant only on a firm-wide basis (I.0.A.4).[5] GIPS compliance cannot be claimed only for some of an investment firm's products, nor for specific composites or portfolios. A firm's claim of compliance signifies, among other things,

3 Competence in evaluating compliance with the GIPS standards is a curriculum element in the Certificate in Investment Performance Measurement (CIPM®) program.

4 The GIPS standards refer to the investment management firm claiming compliance as the FIRM. This reading uses boldface type for terms that are defined in the GIPS Glossary (Section V of the Global Investment Performance Standards).

5 Following a Preface and an Introduction, the GIPS standards have four chapters: I. Provisions of the Global Investment Performance Standards; II. Valuation Principles; III. Advertising Guidelines; and IV. Verification. (See Exhibit 1.) This reading cites the GIPS standards by giving the chapter followed by section and provision identifiers.

that the firm's performance measurement data inputs, processes, and return calculation methodology conform to the prescribed guidelines and that all of the firm's fee-paying discretionary **portfolios** have been assigned to at least one **composite**.

2.2 The Development of Performance Presentation Standards

Investors have been keeping track of their wealth for as long as capital markets have existed. The industry standards for performance measurement and presentation as we know them today, however, have resulted from developments that began in the late 1960s and gathered speed in the 1990s.

Peter O. Dietz published his seminal work, *Pension Funds: Measuring Investment Performance*, in 1966. The Bank Administration Institute (BAI), a US-based organization serving the financial services industry, subsequently formulated rate-of-return calculation guidelines based on Dietz's work.

In 1980, Wilshire Associates joined with a number of custodial banks to establish the Trust Universe Comparison Service (TUCS), a database of portfolio returns organized for use in peer group comparisons, and the members established standards for computing returns in order to ensure comparability.

The direct lineage of the current Global Investment Performance Standards starts with the voluntary guidelines for the North American marketplace defined by a committee of the Financial Analysts Federation. The Committee for Performance Presentation Standards (CPPS) published a report in the September/October 1987 issue of the *Financial Analysts Journal.* The committee's recommendations notably included using a time-weighted total return calculation; reporting performance before the effects of investment management fees; including cash in portfolio return calculations; reaching agreement with the client in advance on the starting date for performance measurement; selecting a risk- or style-appropriate benchmark for performance comparisons; and constructing and presenting accurate, asset-weighted composites of investment performance. The committee strongly recommended that the Financial Analysts Federation disseminate and attempt to impose performance presentation standards for investment management organizations.[6]

Another milestone was the development of the Association for Investment Management and Research (AIMR) Performance Presentation Standards (AIMR-PPS®). AIMR, founded in January 1990 when the Financial Analysts Federation merged with the Institute of Chartered Financial Analysts, subsequently became CFA Institute. In 1990, as one of its first actions, the AIMR Board of Governors endorsed the AIMR-PPS standards. The Board also established the AIMR Performance Presentation Standards Implementation Committee to review the proposed Standards and to seek industry input prior to formal implementation. The AIMR-PPS standards were implemented, and the first edition of the *AIMR Performance Presentation Standards Handbook* was published in 1993.

Acting independently, the Investment Management Consultants Association (IMCA) also issued performance measurement guidelines in 1993. IMCA endorses the GIPS standards, which apply to investment firms. The IMCA standards complement the GIPS standards with guidelines for investment consultants in analyzing data obtained from investment managers in the course of manager searches as well as in reporting, monitoring, and analyzing performance results for clients.[7]

6 CPPS (1987, pp. 8–11).

7 For further information, see the IMCA Performance Reporting Guidelines (2010) on the Investment Management Consultants Association website at www.imca.org.

In 1995, AIMR formed the Global Performance Presentation Standards Subcommittee, reporting to the Implementation Committee, to address international performance issues and to develop global standards for presenting investment performance. The following year, AIMR revised the AIMR-PPS standards, stipulating new requirements, such as the inclusion of accrued income in bond market values in both the numerator and the denominator of return calculations, and presenting new recommendations, such as the use of temporary accounts for significant cash flows. In 1997, AIMR released the second edition of the *AIMR Performance Presentation Standards Handbook* incorporating these and other changes.

In 1998, after circulating several preliminary drafts among industry participants, the Global PPS Subcommittee released the Global Investment Performance Standards for public comment. The AIMR Board of Governors formally endorsed the GIPS standards early in 1999 and established the Investment Performance Council (IPC) later that year to manage the further development and promulgation of the GIPS standards.

The IPC consisted of approximately 36 members from a variety of fields within the global investment industry representing 15 countries. From 1999 to 2006, the IPC focused on its principal goal: to have all countries adopt the GIPS standards as the standard for investment firms seeking to present historical investment performance.

The IPC strongly encouraged countries without an investment performance standard in place to accept the GIPS standards as the local norms, either in English or in a Translation of GIPS (TG).

Due to local regulation or to well-accepted practice, some countries have additional requirements over and above those set forth in the GIPS standards. In these cases, the IPC promoted an approach designated as a "Country Version of GIPS" (CVG). The country would adopt the GIPS standards as their core standards, supplemented by additional provisions as necessary to meet local requirements. If the CVG included any differences that could not be justified on the basis of regulatory stipulations or widely recognized practice, the local sponsor (typically a professional association) was required to provide a transition plan for eliminating the differences within a specified period. In 2001, the AIMR-PPS standards were adopted by the AIMR Board of Governors and the IPC as the US and Canadian version of GIPS. The first edition of *The Global Investment Performance Standards (GIPS) Handbook* was published in 2002 in a loose-leaf format to accommodate changes and additions to the GIPS standards with the passage of time.

In February 2005, the IPC revised the GIPS standards and created a single global standard for investment performance reporting. The revised GIPS standards granted all CVG-compliant firms reciprocity for periods prior to 1 January 2006, such that their CVG-compliant history will satisfy the GIPS requirement, discussed later in this reading, to show at least a five-year track record in performance presentations.

The IPC was superseded by the GIPS Executive Committee (EC) and the GIPS Council in 2005. (We discuss the governance of the GIPS standards below.)

The second edition of *The Global Investment Performance Standards (GIPS) Handbook* was published in 2006.

Working in close collaboration with its technical subcommittees, ad hoc working groups, and representatives of the GIPS country sponsors, the EC undertook a comprehensive review of the GIPS standards' requirements, recommendations, and guidance that led, with substantial industry input, to the 2010 edition of the GIPS standards.

The present reading is based on the 2010 edition of the GIPS standards, which notably includes new risk-related provisions intended to provide investors with a more comprehensive view of a firm's performance. The effective date for the 2010 GIPS standards is 1 January 2011.

Please note that in 2010 many of the GIPS Guidance Statements were updated to reflect the 2010 edition of the GIPS standards. These updates were also effective 1 January 2011.

2.3 Governance of the GIPS Standards

The GIPS Executive Committee (EC), a standing committee of the CFA Institute, is the decision-making body responsible for developing and implementing the provisions of the Global Investment Performance Standards. The EC has nine members, including its Executive Director and the chairs of four technical subcommittees, the GIPS Council, and three regional investment performance subcommittees.

The Interpretations Subcommittee, which seeks to clarify the GIPS standards through interpretations that effectively respond to new issues presented by the global investment industry, is responsible for ensuring the integrity, consistency and applicability of the GIPS standards. Firms claiming compliance with the GIPS standards must also comply with all applicable interpretations and guidance.

The Investment Manager Subcommittee, Investor/Consultant Subcommittee, and Verification/Practitioner Subcommittee are forums for understanding GIPS-related issues faced by investment management firms, investors and their representatives, and verifiers and third-party service providers, respectively. Their perspectives are shared with the Executive Committee, the Interpretations Subcommittee, and other EC Subcommittees in order to ensure a consistent understanding and to improve the quality of the GIPS standards. The EC established the GIPS Council to facilitate the involvement of all country sponsors in the ongoing development and promotion of the GIPS standards. (As of this writing, there are 35 endorsed GIPS country sponsors.) In addition, the EC established Regional Investment Performance Subcommittees (RIPS) under the GIPS Council to represent the interests of the countries within regions and encourage national and regional support in the development, promulgation, and maintenance of the GIPS standards. There are RIPS for the Americas; Europe, the Middle East, and Africa (EMEA); and Asia Pacific.

The EC also has a Nominations Committee that is responsible for developing a fair and objective selection process for the electable members of the EC and its standing subcommittees, and a Promotion and Awareness Subcommittee charged with formulating clear, consistent messages to educate key stakeholders about the benefits of the GIPS standards.

In addition, temporary working groups are also formed as deemed necessary by the EC to address specific subject matters.

The GIPS EC is supported by a dedicated team of CFA Institute staff members under the leadership of the Executive Director.

2.4 Overview of the GIPS Standards

To orient the reader, we present the Table of Contents of the Global Investment Performance Standards in Exhibit 1. The Preface recapitulates the historical development of the GIPS standards, which we presented somewhat more extensively earlier. The Introduction, to which we now turn, provides extensive information about the GIPS standards. Rather than paraphrasing and commenting on every point made in the Introduction, we will highlight certain concepts in the following paragraphs.

Exhibit 1 Table of Contents
GLOBAL INVESTMENT PERFORMANCE STANDARDS (GIPS®)
As Adopted by the GIPS Executive Committee

PREFACE

INTRODUCTION

PROVISIONS OF THE GLOBAL INVESTMENT PERFORMANCE STANDARDS

Exhibit 1 (Continued)

0 Fundamentals of Compliance
1 Input Data
2 Calculation Methodology
3 Composite Construction
4 Disclosure
5 Presentation and Reporting
6 Real Estate
7 Private Equity
8 Wrap Fee/Separately Managed Account (SMA) Portfolios
VALUATION PRINCIPLES
ADVERTISING GUIDELINES
VERIFICATION
GLOSSARY
Appendix A: Sample Compliant Presentations
Appendix B: Sample Advertisements
Appendix C: Sample List of Composite Descriptions

The Introduction to the GIPS standards articulates the Standards' objectives: "The establishment of a voluntary global investment performance standard leads to an accepted set of best practices for calculating and presenting investment performance that is readily comparable among investment firms, regardless of geographic location. These standards also facilitate a dialogue between investment firms and their existing and prospective clients regarding investment performance." Because the GIPS standards are global, **prospective clients** engaged in an evaluation of competing investment firms' historical performance know that rates of return have been calculated in accordance with a common set of valuation principles and methodological guidelines. In addition, because they presumably understand the firms' GIPS-compliant basis for valuing assets and calculating returns, prospective clients can proceed directly to a discussion of how the historical results were achieved. This dialogue can help them assess the quality of the asset managers' thinking and the consistency of their investment process in past market conditions.

The Introduction additionally sets forth the goals of the GIPS Executive Committee. They are to establish industry-wide best practices for calculating and presenting performance information; to obtain worldwide acceptance of a common performance measurement and presentation standard based on the principles of fair representation and full disclosure; to promote the use of accurate and consistent performance data; to encourage fair, global competition for all markets without creating barriers to entry for new investment management firms; and to foster the notion of industry self-regulation on a global basis. Performance presentation standards thoughtfully and carefully designed by well-informed industry participants who are committed to the ethical principles of fairness and full disclosure may serve to moderate the need for expanded regulatory intervention in this area.

The Introduction also has an Overview section that states certain key characteristics of the GIPS standards. Among them is the proposition that the Global Investment Performance Standards are *ethical* standards intended to ensure fair representation and full disclosure of an investment firm's performance. As ethical standards, they are voluntary. Meeting the objectives of fair representation and full disclosure is likely

to require more than simply adhering to the minimum requirements of the GIPS standards. For instance, when appropriate, firms have the responsibility to include information not addressed by the GIPS standards in the GIPS-compliant presentation.

The GIPS standards apply to investment management firms, not to individuals. (We will return to the definition of the firm for the purpose of compliance with the GIPS standards.) In order to promote fair representations of performance, the GIPS standards require firms to include *all* actual fee-paying, discretionary portfolio composites that are defined by investment mandate, objective, or strategy. Relying on the integrity of input data, the GIPS standards require firms to use certain calculation methods and to make certain disclosures along with the firm's performance. When the GIPS standards conflict with law and/or regulations regarding the calculation and presentation of performance, the GIPS standards obligate firms to comply with the local requirements and to disclose the conflict in the performance presentation.

The GIPS standards consist of **requirements**, which **must** be followed in order for a firm to claim compliance, and **recommendations**, which are optional but **should** be followed because they represent best practice in performance presentation. Firms must comply with all requirements of the GIPS standards, including not only the provisions of the GIPS standards but also any updates, Guidance Statements, interpretations, Questions & Answers, and clarifications published by CFA Institute and the GIPS Executive Committee which are available on the GIPS website (www.gipsstandards.org) and in the *GIPS Handbook*. The GIPS standards will continue to evolve as the industry tackles additional areas of performance measurement and recognizes the implications of new investment strategies, instruments, and technologies.

The Introduction comments as well on the extent of the historical performance record to be minimally included in compliant presentations. The GIPS standards require firms to show investment performance for a minimum of five years, or since the inception of the firm or composite if either has existed for less than five years. After presenting at least five years of GIPS-compliant history, the firm must add annual performance each subsequent year building to a minimum of 10 years. In general, firms may link non-GIPS-compliant performance to their GIPS-compliant performance so long as only GIPS-compliant returns are presented for periods after 1 January 2000 and the firm discloses the periods of non-compliance. In the case of private equity and real estate, firms must also comply with Sections 6 and 7, respectively, of Chapter I in the GIPS standards. We will consider them later in this reading.

We have remarked that firms must meet *all* the requirements set forth in the GIPS standards. There can be no exceptions. As stated in the part of the Introduction headed "Compliance," firms must accordingly take all steps necessary to ensure that they have satisfied all the requirements before claiming compliance with the GIPS standards. Moreover, firms are strongly encouraged to perform periodic internal compliance checks to confirm the validity of compliance claims. Implementing adequate internal controls during all stages of the investment performance process will instill confidence in the performance presented and in the claim of compliance. The GIPS Executive Committee strongly recommends that firms be verified.

As previously mentioned, the effective date for the 2010 GIPS standards is 1 January 2011. In other words, GIPS-compliant presentations that include performance for periods that begin on or after 1 January 2011 must be prepared in accordance with the 2010 edition of the GIPS standards.

The Introduction includes a section subtitled, "Implementing a Global Standard," which recognizes the vital part that local sponsoring organizations play in the effective implementation and ongoing administration of the GIPS standards within their countries. Country sponsors link the GIPS EC and the local markets in which investment managers conduct their business. In addition to supporting the adoption of the GIPS standards, country sponsors will ensure that their country's interests are taken into account as the governing body continues to develop the GIPS standards. The GIPS

standards also encourage regulators to recognize the benefit of investment management firms' voluntary compliance with standards representing global best practices, to consider taking enforcement action on firms that falsely claim compliance with the GIPS standards, and to encourage independent third-party verification.

Finally, the Introduction closes by restating the vitally important role of country sponsors and identifying the endorsed GIPS country sponsors as of 31 December 2010. As of 1 July 2012, there are 35 country sponsors including organizations from Luxembourg, Korea, Mexico, and Peru.

IMPLEMENTATION (1)

Management Commitment. Senior management's stated commitment to the spirit and objectives of the GIPS standards and steadfast willingness to invest the necessary time and resources are essential for a firm to achieve compliance with the GIPS standards. The implementation effort is most likely to succeed if senior management makes achieving compliance a high priority; clearly communicates the importance of the initiative throughout the firm; oversees the preparation of a comprehensive project plan; and establishes an adequate budget, with particular attention to consulting and information systems requirements.

Some firms may wrongly assume that implementation of the GIPS standards involves "re-crunching" a few numbers and reformatting performance presentation tables. In fact, achieving compliance can be a complex, challenging, and potentially expensive undertaking. Merely adopting the GIPS standards as a means of passing the initial screening in RFP competitions may lead to shortcuts that ultimately compromise the firm's application of the GIPS standards, deprive it of valuable internal benefits, and needlessly expose it to reputational and regulatory risk.

A firm must also have a high level of commitment from its compliance, investment management, operating, and marketing staff. Achieving and maintaining compliance with the GIPS standards typically involves an investment firm's portfolio accounting, market data services, information technology, portfolio management, marketing, and compliance groups, as well as the performance measurement team. It is a complex process for investment management organizations to define and document policies, gather and validate input data, calculate rates of return, construct and maintain meaningful composites, and present investment results in accordance with the GIPS standards. Careful planning with the active participation of diverse organizational units is a critical element of the implementation project.

PROVISIONS OF THE GIPS STANDARDS

3

We turn now to the specific provisions of the GIPS standards. Chapter I, Provisions of the Global Investment Performance Standards, presents firm-wide requirements and recommendations in subsections addressing the fundamentals of compliance, input data, calculation methodology, composite construction, disclosures, and presentation and reporting. In addition, the GIPS standards include particular provisions for real estate and private equity. Exhibit 2 contains an excerpt from the GIPS standards introducing each of these topics.

Exhibit 2 CONTENT OF THE GLOBAL INVESTMENT PERFORMANCE STANDARDS

0 **Fundamentals of Compliance:** Several core principles create the foundation for the GIPS standards, including properly defining the firm, providing compliant presentations to all prospective clients, adhering to applicable laws and regulations, and ensuring that information presented is not false or misleading. Two important issues that a firm must consider when becoming compliant with the GIPS standards are the definition of the firm and the firm's definition of discretion. The definition of the firm is the foundation for firm-wide compliance and creates defined boundaries whereby total firm assets can be determined. The firm's definition of discretion establishes criteria to judge which portfolios must be included in a composite and is based on the firm's ability to implement its investment strategy.

1 **Input Data:** Consistency of input data used to calculate performance is critical to effective compliance with the GIPS standards and establishes the foundation for full, fair, and comparable investment performance presentations. For periods beginning on or after 1 January 2011, all portfolios must be valued in accordance with the definition of fair value and the GIPS Valuation Principles in Chapter II.

2 **Calculation Methodology:** Achieving comparability among investment management firms' performance presentations requires uniformity in methods used to calculate returns. The GIPS standards mandate the use of certain calculation methodologies to facilitate comparability.

3 **Composite Construction:** A composite is an aggregation of one or more portfolios managed according to a similar investment mandate, objective, or strategy. The composite return is the asset-weighted average of the performance of all portfolios in the composite. Creating meaningful composites is essential to the fair presentation, consistency, and comparability of performance over time and among firms.

4 **Disclosure:** Disclosures allow firms to elaborate on the data provided in the presentation and give the reader the proper context in which to understand the performance. To comply with the GIPS standards, firms must disclose certain information in all compliant presentations regarding their performance and the policies adopted by the firm. Although some disclosures are required for all firms, others are specific to certain circumstances and may not be applicable in all situations. Firms are not required to make negative assurance disclosures (e.g., if the firm does not use leverage in a particular composite strategy, no disclosure of the use of leverage is required). One of the essential disclosures for every firm is the claim of compliance. Once a firm meets all the requirements of the GIPS standards, it must appropriately use the claim of compliance to indicate compliance with the GIPS standards. The 2010 edition of the GIPS standards includes a revised compliance statement that indicates if the firm has or has not been verified.

5 **Presentation and Reporting:** After constructing the composites, gathering the input data, calculating returns, and determining the necessary disclosures, the firm must incorporate this information in presentations based on the requirements in the GIPS standards for presenting investment performance. No finite set of requirements can cover all potential situations or anticipate future developments in investment industry

Exhibit 2 (Continued)

structure, technology, products, or practices. When appropriate, firms have the responsibility to include in GIPS-compliant presentations information not addressed by the GIPS standards.

6 **Real Estate:** Unless otherwise noted, this section supplements all of the required and recommended provisions in Sections 0–5 in Chapter I of the GIPS standards. Real estate provisions were first included in the 2005 edition of the GIPS standards and became effective 1 January 2006. The 2010 edition of the GIPS standards includes new provisions for closed-end real estate funds. Firms should note that certain provisions of Sections 0–5 in Chapter I of the GIPS standards do not apply to real estate investments or are superseded by provisions within Section 6 in Chapter I. The provisions that do not apply have been noted within Section 6 in Chapter I.

7 **Private Equity:** Unless otherwise noted, this section supplements all of the required and recommended provisions in Sections 0–5 in Chapter I of the GIPS standards. Private equity provisions were first included in the 2005 edition of the GIPS standards and became effective 1 January 2006. Firms should note that certain provisions in Sections 0–5 in Chapter I of the GIPS standards do not apply to private equity investments or are superseded by provisions within Section 7 in Chapter I. The provisions that do not apply have been noted within Section 7 in Chapter I.

8 **Wrap Fee/Separately Managed Account (SMA) Portfolios:** Unless otherwise noted, this section supplements all of the required and recommended provisions in Sections 0–5 in Chapter I of the GIPS standards. The provisions that do not apply have been noted within Section 8 in Chapter I. All wrap fee/SMA compliant presentations that include performance results for periods beginning on or after 1 January 2006 must meet all the requirements of the wrap fee/SMA provisions.

3.1 Fundamentals of Compliance

Section I.0, "Fundamentals of Compliance," indicates that firms must comply with all the requirements of the GIPS standards[8] as well as all applicable laws and regulations regarding the calculation and presentation of performance, and—tacitly recognizing that firms which are arguably in technical compliance might still find ways to misrepresent investment results—they must not present performance or performance-related information that is false or misleading. (I.0.A.1–3.) Furthermore, the GIPS standards must be applied on a firm-wide basis (I.0.A.4); firms cannot claim to be in compliance with the GIPS standards with regard only to certain of the asset classes, investment strategies, products, or composites that fall within the definition of the firm.

Provision I.0.A.5 stipulates that firms must document the policies and procedures used in establishing and maintaining compliance with the GIPS standards and that the stated policies and procedures must be applied consistently including ensuring the existence and ownership of client's assets. We will see that the policies and procedures to be documented notably include, but are not limited to, the firm's definition of discretion; the criteria for including portfolios in specific composites; the timing of the inclusion and exclusion of new and terminated portfolios, respectively; the

8 This includes any updates, Guidance Statements, interpretations, Questions & Answers (Q&As), and clarifications published by CFA Institute and the GIPS Executive Committee, which are available on the GIPS standards website (www.gipsstandards.org) as well as in the *GIPS Handbook*.

treatment of cash flows; and the firm's policies, procedures, and methodologies for valuing investments. The firm's error correction policies and procedures must also be documented.

Completing and updating the firm's documentation of performance-related policies and procedures may prove to be one of the biggest contributions the GIPS implementation project makes to effective operations management. Because preparing proper documentation is typically less urgent than other business matters, it is not uncommon for refinements in policies and, especially, changes in the way tasks are accomplished to be explained, if at all, only in e-mails and memoranda that are not integrated into manuals or handbooks. Over time, the existing documentation can become inadequate or inaccurate. Implementing the GIPS standards may help managers assemble resources and allocate time to upgrading their existing documentation. Oftentimes, too, the effort to document longstanding policies and procedures leads to actions taken which improve internal controls and/or achieve operational efficiencies.

As we have already indicated, no exceptions to the GIPS standards are permitted; the firm cannot represent that it is in compliance with the GIPS standards "except for" anything, or make any other statements that might indicate partial compliance. Moreover, statements characterizing the calculation methodology used in a composite presentation as being in accordance with, in compliance with, or consistent with the GIPS standards, or similar statements, are prohibited.[9] Statements referring to the performance of a single, existing client as being "calculated in accordance with the Global Investment Performance Standards" are also prohibited except when a GIPS-compliant firm reports the performance of an individual client's portfolio to that client. (I.0.A.6–8)

Provisions I.0.A.9–11 of the GIPS standards describe other fundamental responsibilities of GIPS-compliant firms. First, firms are expected to "make every reasonable effort" to provide all prospective clients with a compliant presentation. In other words, firms cannot choose to whom they want to present GIPS-compliant performance. (The GIPS standards clarify that a firm will have met this requirement if a prospect has received a compliant presentation within the previous 12 months.) In addition, firms must provide a list of composite descriptions to any prospective client asking for such information, and they must provide upon request a compliant presentation for any composite listed. Discontinued composites must remain on the list for at least five years after their termination date.

To comply with the GIPS standards, a firm must be an investment firm, subsidiary, or division *held out to clients or potential clients as a distinct business entity* (I.0.A.12; emphasis added). The GIPS Glossary entry defines a **distinct business entity** as a "unit, division, department, or office that is organizationally and functionally segregated from other units, divisions, departments, or offices and that retains discretion over the assets it manages and that should have autonomy over the investment decision-making process." Possible criteria for identifying a distinct business entity are the organization being a legal entity, having a distinct market or client type, or using a separate and distinct investment process.

The way in which the investment management organization is held out to the public is a key factor in defining the firm. For example, if a unit of a larger company specializes in providing investment management services to private clients, and is marketed as a specialist in meeting the investment needs of high-net-worth individuals and family offices, then that organizational unit might qualify as a "firm" for the purpose of compliance with the GIPS standards. Certainly, however, the unit's

9 It merits emphasis that only investment management firms can claim to be in compliance with the GIPS standards, and such claims are legitimate only if *all* the requirements have been met. Accordingly, software developers and third-party performance measurement providers may not claim compliance with the GIPS standards.

entitlement to be considered a firm under the GIPS standards could be justified if it additionally were incorporated as a subsidiary and had its own dedicated financial analysts, portfolio managers, and traders located in a separate building or area of the company and reporting through a separate chain of command to the parent organization's senior management.

IMPLEMENTATION (2)

Defining the Firm. For small investment management boutiques, defining the firm may be a relatively easy task, but it can prove challenging for large firms or subsidiary companies.

Consider the case of a super-regional bank whose trust department consists of two separate and distinct divisions, Personal Trust and Institutional Trust. The personal trust division, called Eastern National Bank Personal Trust Services, offers investment management to private individuals and families. The institutional trust division, called Eastern Institutional Asset Advisors, serves tax-exempt non-profit organizations including pension funds and charitable foundations; it does not solicit or handle non-institutional business. Each division has its own investment management team, traders, marketing department, administrative personnel, and accounting department. After a few years of operating in this manner, the institutional investment unit decides to achieve compliance with the GIPS standards, but the personal trust department makes a business decision not to implement the GIPS standards. The institutional investment division may nonetheless be in position to become GIPS-compliant because it holds itself out to customers as a distinct business unit, with its own autonomous investment management, research, trading, and administrative team.

Based on the information provided, the institutional trust division appears to satisfy the conditions for defining itself as a firm for the purpose of compliance with the GIPS standards. Sample language might be, "The firm is defined as Eastern Institutional Asset Advisors, the institutional asset management division of Eastern National Bank."

On the other hand, if both divisions were to use the same investment process, approved security list, style models, etc., and merely divided assets between personal and institutional portfolios, then neither division alone could compellingly claim compliance. If the senior investment personnel of the personal trust division had authority to dictate the institutional trust division's investment strategy or tactical asset allocations, or to mandate the investment of institutional clients' funds in specific securities, then the institutional trust division would likely not qualify as a distinct business unit having autonomy over the investment decision-making process and discretion over the assets it manages. If the two divisions were organizationally segregated but shared the same trading desk, the institutional trust division would have to determine whether its decision-making autonomy is compromised by the trading arrangement—if the traders merely fill the portfolio manager's orders, then the institutional trust division arguably remains autonomous, but if the traders actively participate in the identification of misvalued securities, a greater impediment to the autonomy argument would exist.

Defining the firm in such a situation calls for the scrupulous exercise of professional judgment, with due attention to the ethical objectives of the Global Investment Performance Standards.

In view of the complexity of modern organizational structures, it may require judgment to determine if a given unit properly meets the definition of a firm. The decision has immediate and lasting practical consequences, however. Because the GIPS standards apply firm-wide, the definition of the firm will determine the extent of the initial implementation and ongoing compliance activities. It also establishes the boundaries for determining total firm assets. (As we will see, the presentation and reporting requirements of the GIPS standards include displaying the percentage of total firm assets represented by a composite or the amount of total firm assets at the end of each annual period). The phrase **total firm assets** refers to the aggregate

fair value[10] of all assets (whether or not discretionary or fee-paying) for which a firm has investment management responsibility. Total firm assets include assets managed by subadvisors that the firm has authority to select, and the performance of assets assigned to a subadvisor must be reflected in a composite provided the firm has discretion over the selection of the subadvisor. (I.0.A.13–14)

The fundamentals of compliance include two further requirements. First, a firm that has been defined for the purposes of the GIPS standards may very well undergo subsequent changes in its corporate structure or organizational design. However, changes in a firm's organization are not permitted to lead to alteration of historical composite results. Indeed, we may put it down as a general rule that, apart from correcting errors, historical composite results are not to be altered. Second, when a GIPS-compliant firm engages in joint marketing activities with other firms, the compliant firm must be distinguished from the other firms, and the marketing communication must make clear which firm is claiming compliance. (I.0.A.15–16)

Recall that the GIPS standards consist of requirements, which must be followed without exception in order for a firm to claim compliance, and recommendations, which are optional but represent best practice in performance presentation. The requirements described earlier are accompanied by four recommendations (I.0.B.1–4), the first of which is simply that firms should comply with the recommendations of the GIPS standards.

The second recommendation is that firms should be verified.

Third, firms should adopt the broadest, most meaningful definition of the firm. The GIPS standards recommend that the scope of the definition should include all offices operating under the same brand regardless of their geographical location and the actual name of the individual investment management companies. We may observe that defining the firm as broadly as possible reduces the likelihood of confusion among investors and regulators over the intended applicability of a claim of compliance.

Fourth, firms should annually provide each *existing* client a GIPS-compliant presentation for any composite in which the client's portfolio is included. Firms that act upon this recommendation will have to be prepared to explain to some clients why their portfolio's return falls below the composite's return; while this may be a difficult conversation, their explanation may lead the client to a better understanding of the firm's investment process and, perhaps, the impact of the client's constraints. (See the discussion of investment discretion later in this reading.)

3.2 Input Data

Before turning to time-weighted total return calculations, we will discuss the necessary input data. We observed earlier in this reading that accurate input data are a key characteristic of the GIPS standards. In fact, the GIPS standards rely on the integrity of input data, because correct rates of return obviously cannot be computed from incorrect asset values and transaction records. Accurately calculated results assume accurate inputs.

The provisions for input data are laid out in Provisions I.1.A.1–7 (requirements) and I.1.B.1–4 (recommendations). The first requirement is basic: All data and information necessary to support all items included in a compliant presentation must be captured and maintained. The need for a firm to obtain the inputs required for rate-of-return calculations and performance presentations is self-evident, although not always easily accomplished. "Maintaining" or storing the data and information, as

10 For periods prior to 1 January 2011, total firm assets must be the aggregate of the market value of all discretionary and non-discretionary assets under management within the defined firm. We address the difference between "market value" and "fair value" in Section 4.

required by the GIPS standards, is sound business practice, similar to documenting the firm's performance-related policies and procedures. Only if the historical input data have been kept, and are retrievable, can return calculations be replicated for clients, regulators, verifiers, and other parties in the event that questions arise.

There are three central input data concepts having to do with asset valuations. First, for periods beginning on or after 1 January 2011, portfolios must be valued in accordance with the definition of **fair value** and the GIPS Valuation Principles (I.1.A.2), not cost or book values. Second, **trade date accounting** is required for periods beginning on or after 1 January 2005 (I.1.A.5). Third, **accrual accounting** must be used for fixed-income securities and all other assets that earn interest income (I.1.A.6). Let us now consider each of these provisions.

Fair value supersedes **market value**, a subtly narrower concept that was contained in earlier editions of the GIPS standards.[11] We will briefly discuss fair value in this section and return to this concept in greater detail when we review the GIPS Valuation Principles later in this reading. Fair value reflects the amount at which an investment could be exchanged in a current arm's length transaction between willing parties acting knowledgeably and prudently. Accordingly, fair value must include earned income. Under the GIPS standards, valuations must represent the objective, observable, unadjusted quoted market prices for identical investments in active markets on the measurement date, if available; in the absence of prices that satisfy those criteria, valuations must represent the firm's best estimate of the market value, determined in accordance with the GIPS Valuation Principles.

In this context, it merits mention that cost is pertinent to performance measurement only insofar as it reflects an investment's beginning value. Book value, an accounting convention, is also irrelevant. (Roughly speaking, a financial asset's book value is its cost adjusted for the accretion of income and the amortization of any discount or premium.) For performance measurement, as opposed to financial or tax accounting, it does not matter whether gains and losses are realized or unrealized.[12] Along with investment income, the significant factors are the magnitude and direction of change in the assets' aggregate fair value over the measurement period.

The GIPS standards require that firms use trade-date accounting for the purpose of performance measurement for periods beginning on or after 1 January 2005 (I.1.A.5). This requirement is related to the mandatory use of fair value. A portfolio manager makes purchase and sale decisions based on current market conditions. (Even holding a security may be considered an investment decision, continuously renewed, to "buy" the security, or equivalently not to sell it and reinvest the proceeds in another security, at the current value.)

For the purposes of the GIPS standards, under trade-date accounting the "transaction is reflected in the portfolio on the date of the purchase or sale, and not on the settlement date." Settlement—the actual exchange of a security for cash at the price agreed on when the trade was executed—may take place days later. **Settlement-date accounting** is defined as "recognizing the asset or liability on the date when the exchange of cash and investments is completed." If the trade and settlement dates straddle the end date of a performance measurement period, then return comparisons between portfolios that use settlement-date accounting, on one hand, and benchmarks or portfolios that use trade-date accounting, on the other, may be invalid. Thus, the principle behind requiring trade-date accounting is to ensure that no significant lag occurs between a trade's execution and its reflection in the portfolio's performance.

11 Portfolio valuations must be based on market values (not cost basis or book values) for periods prior to 1 January 2011. The GIPS Glossary defines market value as the price at which investors can buy or sell an investment at a given time multiplied by the quantity held, plus any accrued income.

12 Note, however, that cost or book values and realized gains and losses are pertinent for after-tax performance calculations, discussed later.

For compliance with the GIPS standards, the trade-date accounting requirement is considered to be satisfied if assets and liabilities are recognized within three days of entering into the transaction.

The GIPS standards also stipulate that accrual accounting must be used for fixed-income securities and all other assets that earn interest income (I.1.A.6). This provision is also related to the fair valuation of assets. When a conventional bond is sold, it will be exchanged for cash in an amount that reflects not only the agreed-upon price of the instrument but also the seller's entitlement to interest earned but not yet paid. Similarly, for GIPS-compliant performance, interest income on an asset that is held in a portfolio must be recognized as it is earned versus when it is received. Accordingly, interest income earned but not yet received must be included in the value of fixed-income securities and all other assets that accrue interest income. With respect to dividend-paying equities, the GIPS standards recommend that dividends be accrued as of the ex-dividend date (I.1.B.3).

In addition to the key valuation-related provisions explained earlier, the input data requirements of the GIPS standards specify the frequency and timing of portfolio valuations (II.1.A.3–4). Exhibit 3 presents the pertinent requirements. Note that the requirements changed as of 1 January 2010 (not 2011). These changes were included in the 2005 edition of the GIPS standards, but their effective date was deferred until 1 January 2010 so as to provide firms enough time to accommodate them.

Exhibit 3 Frequency and Timing of Portfolio Valuations

For Periods…	Portfolios Must Be Valued…
Prior to 1 January 2001	At least quarterly
Beginning on or after 1 January 2001	At least monthly
Beginning on or after 1 January 2010	■ On the date of all large cash flows as defined by the firm for each composite; and ■ As of each calendar month-end or the last business day of each month

An **external cash flow** is capital (cash or investments) that enters or exits a portfolio. The GIPS standards do not specify the level of **large cash flows**; firms are required to define portfolio- or composite-specific amounts or percentages that constitute large external cash flows. Later in this reading, we examine the potentially distorting effect of large cash flows on rate-of-return calculations.

Provision 1.A.3.c further specifies that portfolios must be valued no more frequently than required by the valuation policy. The objective of this provision is to prohibit firms from opportunistically valuing a portfolio by selecting the most advantageous sub-periods over which to calculate their performance. Firms must adhere to their composite-specific valuation policy consistently and not "cherry pick" when to value portfolios.

The GIPS standards additionally require that, for periods beginning on or after 1 January 2006, the firm's composites, and necessarily the portfolios within the composites, must have consistent beginning and ending *annual* valuation dates. Unless the composite is reported on a non-calendar fiscal year, the beginning and ending valuation dates must be at calendar year-end or on the last business day of the year (I.1.A.7).

The GIPS standards governing input data also include three recommendations that we have not previously mentioned. First, the GIPS standards recommend that firms adopt a policy to value portfolios, not merely when large cash flows occur, but on the date of all external cash flows (I.1.B.1).

Second, valuations should be obtained from a qualified independent third party (I.1.B.2). Certainly, a firm's judicious selection of asset-pricing sources is a key element in achieving the fair representation of investment performance. Obtaining valuations from an independent third-party in most instances is considered to be best practice and the firm must insure that the valuations obtained satisfy the requirements of the GIPS standards. In addition, switching from one source to another so as to improve stated performance at the end of a reporting period is ethically indefensible.

Third, the GIPS standards related to input data also recommend that, when presenting net-of-fees returns, firms should accrue investment management fees (I.1.B.4). We discuss net-of-fees return calculations below. As a practical matter, the GIPS standards' input data requirements and recommendations have important implications for the design of a firm's performance measurement system, including its interface with the firm's portfolio accounting system. Management must ensure that portfolio valuations are performed properly and that all the data needed to substantiate the information contained in GIPS-compliant performance presentations are captured and maintained.

IMPLEMENTATION (3)

Input Data. Typically, the firm's portfolio accounting system is the primary source of data inputs to the performance measurement system. (The accounting system may itself have automated feeds from other sources, including the trading system for security transactions and external data services for market prices.) What we may call "performance accounting"—the compilation of data inputs for rate-of-return calculations—may differ from financial accounting, however, and any differences must be recognized when designing an interface between the portfolio accounting system and the performance measurement system. For instance, book values and the distinction between realized and unrealized capital gains and losses are necessary for financial accounting but might be inappropriate or irrelevant for before-tax performance measurement. Investment management fees may also require special treatment. A net-of-fees return is defined as the gross-of-fees return reduced by **investment management fees**, including performance-based fees and carried interest (the general partners' portion of the profits earned on the investments made by an investment vehicle). The portfolio accounting system may treat the performance-based fees and carried interest differently than the way they need to be treated for investment performance purposes. In order to meet the requirements—and, optimally, the recommendations—of the GIPS standards for input data, calculation methodology, composite construction, and performance presentation and reporting, the firm must comprehensively address these and many other accounting- and system-related issues.

3.3 Calculation Methodology: Time-Weighted Total Return

The GIPS standards mandate the use of a total rate of return, called total return for short (I.2.A.1). Total return is the most comprehensive and accurate expression of investment results because it reflects the change in portfolio value during the measurement period, taking into account not only income but also realized and unrealized gains and losses. (Recall from our discussion of input data that, for performance measurement, it does not matter whether gains and losses are transactionally realized. What matters is the change in fair value.) In other words, total return captures both the return from investment income and the return from capital gains and losses.

In the simplest case, when no external cash flows (i.e., client-initiated additions to or withdrawals from invested assets) occur during the period, calculating total return is straightforward:

$$r_t = \frac{V_1 - V_0}{V_0} \tag{1}$$

where r_t is the total return for period t, V_1 is the ending value of the portfolio, including cash and accrued income, at the end of the period; and V_0 is the portfolio's beginning value, including cash and accrued income, at the beginning of the specified period. (Recall that the requirement to include accrued interest income in the values of fixed-income securities appears in Provision I.1.A.6, and the recommendation that accrual accounting should be used for dividends as of the ex-dividend date appears in Provision I.1.B.3. We discuss the requirement to include cash, and cash equivalents, later.) Equation 1 assumes that income received remains in the portfolio, and expresses return as the ratio of the change in value during the period to the value at the start of the period. Despite its simplicity, the total return equation shown above produces an accurate representation of investment results in a single period with no external cash flows. As we will see, this equation is also used to calculate subperiod results under the intraperiod valuation method when external cash flows occur.

Most portfolios, of course, do have external cash flows. A separate account for an institutional investor, for example, may routinely have contributions and withdrawals based on the needs of the institution. In evaluating an investment firm, the effect of such contributions and withdrawals should be removed from the return calculation because the timing and amount of external cash flows are typically controlled not by the investment management firm but by the client (in this case, an institutional investor). Because performance measurement attempts to quantify the value added by investment decisions, the GIPS standards require the use of **time-weighted rates of return**, or approximations to time-weighted rates of return, to eliminate the impact of external cash flows on the return calculation.

Provision I.2.A.2 specifies the use of time-weighted rates of return that adjust for external cash flows. For periods beginning on or after 1 January 2005, firms must approximate rates of return that adjust for daily weighted external cash flows, and we have seen that for periods beginning on or after 1 January 2010, firms must value portfolios on the date of all large external cash flows. (We will return to the definition of "large" external cash flows below.) Provision I.2.A.2 also holds that, for periods beginning on or after 1 January 2001, firms must calculate portfolio returns at least monthly; for earlier periods, firms may calculate portfolio returns quarterly.

The most accurate way to calculate a total return while eliminating the impact of external cash flows is to value the portfolio whenever an external cash flow occurs, compute a subperiod return, and geometrically chain-link subperiod returns expressed in relative form according to the following equation:

$$r_{twr} = (1 + r_{t,1}) \times (1 + r_{t,2}) \times \ldots \times (1 + r_{t,n}) - 1 \tag{2}$$

where r_{twr} is the time-weighted total return for the entire period and $r_{t,1}$ through $r_{t,n}$ are the subperiod returns. We explicitly point out that Provision I.2.A.2 requires periodic returns to be geometrically **linked**—that is, converted to relative form (1 + r) and multiplied—according to the firm's composite-specific policy.

For example, consider a portfolio with a beginning value of $100,000 as of 31 May, a value of $109,000 on 5 June (including a cash contribution of $10,000 received that day), and an ending value of $110,550 on 30 June. Consider that the first subperiod ends and the second begins on the cash flow date, such that the ending value for subperiod 1 is $99,000 ($109,000 less the contribution of $10,000) and the beginning

value for Subperiod 2, including the $10,000 contribution, is $109,000. The portfolio's true time-weighted return using the intraperiod valuation method is 0.41 percent, computed as follows:

$$r_{t,1} = \frac{V_1 - V_0}{V_0} = \frac{(109{,}000 - 10{,}000) - 100{,}000}{100{,}000} = \frac{99{,}000 - 100{,}000}{100{,}000} = -0.01$$

$$r_{t,2} = \frac{V_1 - V_0}{V_0} = \frac{110{,}550 - 109{,}000}{109{,}000} = 0.0142$$

$$\begin{aligned} r_{twr} &= (1 + r_{t,1}) \times (1 + r_{t,2}) - 1 = [1 + (-0.01)] \times (1 + 0.0142) - 1 \\ &= 1.0041 - 1 = 0.0041 = 0.41\% \end{aligned}$$

Geometric linking, as shown here, is correct (and required by the GIPS standards) because returns are compounded and so are not additive but multiplicative.

Assuming the input data are valid, the intraperiod valuation method illustrated above gives truly accurate total returns. Accordingly, for periods beginning on or after 1 January 2010, the GIPS standards *require* firms to calculate returns by geometrically linking periodic returns before and after *large* cash flows and, as we saw when reviewing the provisions related to input data, the GIPS standards *recommend* that portfolios be valued on the date of *all* external cash flows. For earlier periods, however, estimation methods can be used.

For periods prior to 1 January 2005, cash flows can be assumed to occur at the midpoint of the measurement period. The Original Dietz method reflects this midpoint assumption:

$$r_{Dietz} = \frac{V_1 - V_0 - CF}{V_0 + (CF \times 0.5)} \tag{3}$$

where CF is the net external cash flow for the period.

Using the same example, the Original Dietz formula gives a return of 0.52 percent:

$$r_{Dietz} = \frac{V_1 - V_0 - CF}{V_0 + (CF \times 0.5)} = \frac{110{,}550 - 100{,}000 - 10{,}000}{100{,}000 + (10{,}000 \times 0.5)} = 0.0052 = 0.52\%$$

A time-weighted total return calculation that adjusts for *daily* weighted cash flows is required for periods beginning on or after 1 January 2005. Examples of acceptable approaches are the Modified Dietz method and the Modified Internal Rate of Return (Modified IRR) method, both of which weight each cash flow by the proportion of the measurement period it is held in the portfolio.

The formula for estimating the time-weighted rate of return using the Modified Dietz method is

$$r_{ModDietz} = \frac{V_1 - V_0 - CF}{V_0 + \sum_{i=1}^{n}(CF_i \times w_i)} \tag{4}$$

where $\sum_{i=1}^{n}(CF_i \times w_i)$ is the sum of each cash flow multiplied by its weight and $CF = \sum CF_i$.

The weight (w_i) is simply the proportion of the measurement period, in days, that each cash flow has been in the portfolio:

$$w_i = \frac{CD - D_i}{CD} \tag{5}$$

where CD is the total number of calendar days in the period and D_i is the number of calendar days from the beginning of the period to the time cash flow CF_i occurs. (Note that this formula assumes that cash flows occur at the end of the day.)[13] In our example, there is a $10,000 contribution on 5 June so $D_i = 5$, and there are 30 days in June, so $CD = 30$. The proportion of the measurement period that the $10,000 is in the portfolio is thus

$$w_i = \frac{CD - D_i}{CD} = \frac{30 - 5}{30} = \frac{25}{30} = 0.83$$

Applying the Modified Dietz formula to the same example gives a return of 0.51 percent:

$$r_{ModDietz} = \frac{V_1 - V_0 - CF}{V_0 + \sum_{i=1}^{n}(CF_i \times w_i)} = \frac{110{,}550 - 100{,}000 - 10{,}000}{100{,}000 + [10{,}000 \times (25/30)]} = 0.0051 = 0.51\%$$

The Modified IRR method is another estimation approach. This method determines the internal rate of return (IRR) for the period, adjusted to take into effect the timing of cash flows. The Modified IRR is the value of r that satisfies the following equation:

$$\text{Ending Value} = V_1 = \sum_{i=1}^{n}\left[CF_i \times (1 + r)^{w_i}\right] + V_0(1 + r) \qquad (6)$$

where the exponent, w_i, is as previously defined the ratio of the amount of time CF_i is in the portfolio to the total time in the measurement period. The equation is solved iteratively by a trial-and-error procedure, settling on the value of r that makes the series of cash flows equal to the ending fair value.[14] The Modified IRR method is computationally intensive, but programs are available for solving the equation efficiently. (Some Modified IRR programs use the Modified Dietz return as an initial estimate or seed value.) Applying the Modified IRR method to the simple example used earlier in this section gives a result of 0.51 percent, the same as the rate of return found with the Modified Dietz method.

3.4 Return Calculations: External Cash Flows

In the previous section, different methodologies for calculating a rate of return from a single set of input data gave different answers. To recapitulate:

Inputs:

Fair value on 31 May: $100,000

Cash flow on 5 June: + $10,000

Fair value on 5 June: $109,000 (after the cash flow)

Fair value on 30 June: $110,550

Solutions:

True time-weighted return: 0.41 percent

Original Dietz method: 0.52 percent

---

13 Cash flows can also be assumed to occur at the beginning of the day. In that case, the weight factor is adjusted to add another day to the period of time the cash flow is in the portfolio: $w_i = (CD - D_i + 1)/CD$. It is incumbent upon the firm to establish a policy to weight external cash flows consistently.

14 The Modified IRR method differs from the original internal rate of return method in that the exponent is the proportion of the measurement period that each cash flow is in the portfolio. Therefore, while the original IRR is a money-weighted return, the Modified IRR approximates a time-weighted return.

Modified Dietz method: 0.51 percent

Modified IRR method: 0.51 percent

In this particular example, the estimated rates of return given by the Modified Dietz and Modified IRR methods are nearly the same as the estimated return calculated by the Original Dietz method, which assumes that the external cash flow occurred at mid-month. However, the external cash flow causes the day-weighted estimates (0.51 percent) to vary by 10 basis points from the true time-weighted return (0.41 percent).

To appreciate the potentially distorting impact of external cash flows on estimated time-weighted rates of return, consider Exhibits 4 through 6. The exhibits depict a "market index" with a value of 100 as of 31 May, and the data below each exhibit represent portfolios with a value of $100,000 on 31 May and contributions of $10,000 received on 5 June (on the left-hand side) and 15 June (on the right-hand side). In flat and steadily rising or falling markets (illustrated in Exhibit 4 and Exhibit 5), the timing of the cash flows has a relatively modest impact on the accuracy of the estimates. We can observe this phenomenon by comparing the true time-weighted returns with those calculated using the Modified Dietz method. (Note that the Modified Dietz method is mathematically equivalent to the Original Dietz method when the cash flow occurs at the midpoint of the measurement period.) When markets are volatile, however, as illustrated in Exhibit 6, large external cash flows may have a material impact on the accuracy of the estimated return. The reader should work through these examples using the formulas for the true time-weighted return and the Modified Dietz method. The calculations for the first example, on the left-hand side of Exhibit 4, were shown above.

Exhibit 4 Impact of Cash Flows in a Flat Market

Returns			Returns		
	31-May Fair Value	$ 100,000		31-May Fair Value	$ 100,000
–1.00%	5-Jun Fair Value	$ 99,000	–0.93%	15-Jun Fair Value	$ 99,075
	Contribution	$ 10,000		Contribution	$ 10,000
	Total Fair Value	$ 109,000		Total Fair Value	$ 109,075
1.42%	30-Jun Fair Value	$ 110,550	1.35%	30-Jun Fair Value	$ 110,550
0.41%	Modified Dietz	0.51%	0.41%	Modified Dietz	0.52%

Source: Paula Gehr

Exhibit 5 Impact of Cash Flows in a Steadily Rising Market

Returns			Returns		
	31-May Fair Value	$ 100,000		31-May Fair Value	$ 100,000
2.00%	5-Jun Fair Value	$ 102,000	4.00%	15-Jun Fair Value	$ 104,000
	Contribution	$ 10,000		Contribution	$ 10,000
	Total Fair Value	$ 112,000		Total Fair Value	$ 114,000
5.88%	30-Jun Fair Value	$ 118,588	3.85%	30-Jun Fair Value	$ 118,385
8.00%	Modified Dietz	7.93%	8.00%	Modified Dietz	7.99%

Source: Paula Gehr

Exhibit 6 Impact of Cash Flows in a Volatile Market

Returns			Returns		
	31-May Fair Value	$ 100,000		31-May Fair Value	$ 100,000
–5.00%	5-Jun Fair Value	$ 95,000	–10.00%	15-Jun Fair Value	$ 90,000
	Contribution	$ 10,000		Contribution	$ 10,000
	Total Fair Value	$ 105,000		Total Fair Value	$ 100,000
13.68%	30-Jun Fair Value	$ 119,364	20.00%	30-Jun Fair Value	$ 120,000
8.00%	Modified Dietz	8.64%	8.00%	Modified Dietz	9.52%

Source: Paula Gehr

The GIPS standards require firms to formulate and document composite-specific policies for the treatment of external cash flows and to adhere to those policies consistently. (Provision I.2.A.2 reads in pertinent part, "External cash flows must be treated according to the firm's composite-specific policy.") Each policy should describe the firm's methodology for computing time-weighted returns and the firm's assumptions about the timing of capital inflows and outflows. If it is the firm's rule to value portfolios on the date of all external cash flows, as the GIPS standards recommend, then the firm should also state that policy.

As we have previously remarked, the GIPS standards do not specify a quantitative definition of large external cash flows. Taking into account the liquidity of the market segments or asset classes and the nature of the investment strategy, firms must make their own determinations for each composite. For example, a relatively high percentage of portfolio value might be easily deployed in a developed equity market, while a lower percentage of portfolio value might be deemed the appropriate criterion for a large external cash flow in a comparatively illiquid emerging debt market.

A composite-specific policy may define a "large" external cash flow in terms of the value of cash/asset flow or in terms of a percentage of the portfolio assets or the composite assets. Whatever definition a firm adopts, it must document the policy and follow it without exception. If a portfolio receives a large external cash flow, as defined for the composite in which the portfolio is included, the firm is not at liberty to omit the valuation on the grounds that the market was not especially volatile during the measurement period. Inconsistent applications of firm policies constitute a breach of the GIPS standards.

IMPLEMENTATION (4)

Return Calculation Policies. The GIPS standards state, "Firms must calculate time-weighted rates of return that adjust for external cash flows. Both periodic and sub-period returns must be geometrically linked. External cash flows must be treated according to the firm's composite –specific policy." (Excerpted from Provision I.2.A.2). The GIPS standards also state that, for periods beginning on or after 1 January 2010, portfolios must be valued on the date of all large cash flows, and that firms must define large cash flow for each composite to determine when the portfolios in that composite must be valued. (Excerpted from Provision I.1.A.3). Here are examples of internal policy statements addressing these elements:

Portfolio return calculation methodology: "Eastern Institutional Asset Advisors calculates each portfolio's time-weighted rate of return on a monthly basis. For periods beginning on or after 1 January 2010, portfolios are valued when large cash flows occur; in earlier periods, monthly returns are calculated using the Modified Dietz method. Returns for longer measurement periods are computed by geometrically linking the monthly returns."

Large external cash flows: "Eastern Institutional Asset Advisors revalues portfolios that belong to the Large-Cap Domestic Equity composite when capital equal to 10 percent or more of fair value as of the end of the most recent measurement period is contributed or withdrawn."

3.5 Additional Portfolio Return Calculation Provisions

The GIPS standards for calculation methodology include further provisions directly affecting portfolio returns. (We will discuss the calculation-related guidelines for composites in a later section.)

One requirement is that returns from cash and cash equivalents held in portfolios must be included in all total return calculations (I.2.A.3). A primary purpose of performance measurement is to enable prospective clients and, by extension, their consultants to evaluate an investment management firm's results. Within the constraints established by a client's investment policy statement (IPS), active managers often have discretion to decide what portion of a portfolio's assets to hold in cash or cash equivalents. In other words, the cash allocation decision may be at least partially under the manager's control, and thus return calculations must reflect the contribution of the cash and cash equivalents to investment results.

Consider the case of an institutional investor such as a defined-benefit pension plan sponsor. The structure of the sponsor's investment program is, generally, based on an asset allocation study or, preferably, an asset/liability study identifying the optimal mix of asset classes to meet the fund's financial objectives at an acceptable level of risk. The sponsor retains investment management firms to invest the fund's assets in specific markets in accordance with the study results. For example, within the domestic equity allocation, the sponsor might hire one firm to invest a certain portion of the fund's assets in small-cap growth stocks and another firm to invest a portion in large-cap value stocks. The sponsor expects the managers to remain fully invested in their mandated market sectors at all times. The sponsor's IPS may, however, allow the managers to hold some amount (e.g., up to 5 percent of portfolio assets) in cash and cash equivalents, if only to accommodate the cash thrown off in the process of buying and selling securities. (The client will usually define "cash equivalents," for example, as money market instruments and fixed income securities with less than one year to maturity.) In this case, it is up to the manager to decide how much cash to hold, up to 5 percent of assets.

The total portfolio return will be higher or lower depending on how much cash the manager holds and how the domestic equity and money markets perform relative to one another during the measurement period. A few simple scenarios based on actual historical US market returns will illustrate these points. First, in a rising equity market, cash positions reduce overall portfolio returns; the higher the cash position, the lower the portfolio return. This relationship is illustrated in Exhibit 7, in which increasing the cash position (represented here by US Treasury bills) from 1 percent to 5 percent of portfolio assets reduces the portfolio return for a three-month period by 26 basis points (0.26 percent).

Exhibit 7 Illustration of the Effect of Cash Holdings in Rising Markets

	1% Held in Cash		5% Held in Cash	
	Weight	Return	Weight	Return
Broad US equity market index	99%	6.57%	95%	6.57%
US Treasury bills	1%	0.26%	5%	0.26%
Total portfolio	100%	6.51%	100%	6.25%

In contrast, a higher cash position improves the portfolio return in a falling market. Exhibit 8 illustrates this result, whereby increasing the percentage of the portfolio held in cash from 1 percent to 5 percent boosts the three-month portfolio return by 11 basis points (0.11 percent).

Exhibit 8 Illustration of the Effect of Cash Holdings in Declining Markets

	1% Held in Cash		5% Held in Cash	
	Weight	Return	Weight	Return
Broad US equity market index	99%	–2.39%	95%	–2.39%
US Treasury bills	1%	0.45%	5%	0.45%
Total portfolio	100%	–2.36%	100%	–2.25%

Note that cash and cash equivalents must be included in the total return calculation even if the cash is not actually invested by the same person or group. The amount of cash available for short-term investment is more important to overall portfolio results than the money market manager's success in outperforming the short-term market. For the rising and falling equity markets described above, Exhibit 9 illustrates the relative impact of the portfolio manager's increasing the cash allocation from 1 percent to 5 percent and the money market trader's simultaneously achieving excess returns 50 basis points (0.5 percent) higher than Treasury bill returns. The portfolio manager's cash allocation decision has a substantially greater effect on overall portfolio returns than does the money market trader's proficiency in selecting attractive short-term investments.

Exhibit 9 Impact of Cash on Portfolio Returns

The GIPS standards further require that returns be calculated after the deduction of actual—not estimated—trading expenses (I.2.A.4). Trading expenses are costs incurred in the purchase or sale of investments, and the performance calculation must include them because these expenses must be paid in order to execute the investment strategy. The GIPS Glossary defines **trading expenses** as the actual costs of buying or selling investments and notes that these costs typically take the form of brokerage commissions, exchange fees and/or taxes, or spreads from either internal or external brokers. Commissions are explicit costs, generally a negotiated amount per share of common stock bought or sold, intended to compensate the broker, as the investor's agent, for arranging and settling trades. Bid–ask spreads are the difference between the price at which a dealer, acting for his firm's account, is willing to buy a security from a seller and the price at which he is willing to sell the security to a buyer. From the investor's perspective, the spread is the cost of immediacy or liquidity, and it compensates the dealer for both the cost of operations and the risk of adverse selection

(the possibility that a well-informed trader has better information than the dealer has about the fundamental value of a security in the dealer's inventory).[15] Actual trading expenses are necessary input data for GIPS-compliant rate-of-return calculations.

It merits mention in this context that, as the GIPS Glossary makes clear, **custody fees** should not be considered direct trading expenses, even when they are charged on a per-transaction basis. From a performance measurement perspective, although trading costs are unavoidably part of executing an investment strategy, they will typically be higher in a portfolio with relatively greater turnover. External cash flows, whether inflows or outflows, will typically result in a higher-than-normal volume of security transactions, but on an ongoing basis, a manager generally has control over portfolio turnover. A firm's trading capabilities will also affect its level of execution costs. Although it is not a matter of compliance with the GIPS standards, the investment manager has an ethical and fiduciary responsibility to achieve best execution on behalf of clients. If a client's directed brokerage program requires the firm to channel trades through approved brokers, regular communication with the client is in order.[16]

With respect to the GIPS standards, there are additional requirements when trading expenses cannot be broken out of **bundled fees**, that is, combined fees, which may include any combination of management, trading, custody, and/or administrative fees. The GIPS Glossary cites all-in fees as an example of bundled fees. All-in fee arrangements are common when a single company offers diverse services such as asset management, brokerage, and custody. When actual trading expenses cannot be identified and segregated from a bundle fee, the gross-of-fees return must be reduced by the entire amount of the bundled fee or by that portion of the bundled fee that includes the trading expenses. In other words, when calculating returns gross of investment management fees, the entire bundled fee or the portion of the bundled fee that includes trading expenses must be deducted. When calculating returns net of investment management fees, the entire bundled fee or the portion(s) of the bundled fee that include the investment management fee and the trading expenses must be deducted. These requirements are presented in Provisions I.2.A.5.a–b, where it is reiterated that the use of estimated trading expenses is not permitted.

Provision I.2.B.1 recommends that returns be calculated net of non-reclaimable withholding taxes on dividends, interest, and capital gains. Some countries allow certain types of foreign investors to recoup a portion of withholding taxes that are paid when transactions or payments occur by filing claims. It is recommended that withholding taxes subject to reclamation be accrued. Withholding taxes that cannot be recovered should be deducted when calculating returns.

3.6 Composite Return Calculation Provisions

The notion of a composite is central to the GIPS standards. Because composite returns convey the firm's investment results for a given investment mandate, objective, or strategy, proper composite construction is essential to achieving the ethical aims of the GIPS standards, the fair representation and full disclosure of the firm's performance.

A composite may be thought of as a combined portfolio composed of similar portfolios in proportion to their weights as a percent of the composite's total assets. Accordingly, the composite return is the asset-weighted average of the returns of all the individual constituent portfolios. The GIPS standards prescribe an asset-weighting method for composite return calculations as described further below.

15 For a comprehensive treatment of these topics, the interested reader is referred to Larry Harris (2003).
16 CFA Institute addresses this and many related issues in its "Trade Management Guidelines" and "Soft Dollar Standards," available on the CFA Institute website.

Standard I.2.A.6 reads, "Composite returns must be calculated by asset-weighting the individual portfolio returns using beginning-of-period values or a method that reflects both beginning-of-period values and external cash flows." Let us explore these methods in an example. Exhibit 10 displays the beginning asset values of four portfolios that, taken together, constitute a composite. The exhibit also shows the external cash flows experienced by each portfolio during the month of June. (We have seen Portfolio A before.) For completeness, the exhibit also shows each portfolio's ending fair value.

Exhibit 10 A Composite Including Four Portfolios: Weighted External Cash Flows

	Cash Flow Weighting Factor	Portfolio ($ Thousands)				
		A	B	C	D	Total
Beginning assets (31 May)		100.00	97.40	112.94	124.47	434.81
External cash flows:						
5 June	0.83	10.00	15.00			25.00
8 June	0.73				–15.00	–15.00
17 June	0.43		–5.00			–5.00
24 June	0.20				–6.50	–6.50
29 June	0.03		–2.50		–4.00	–6.50
Ending assets (30 June)		110.55	105.20	113.30	100.50	429.55
Beginning assets + Weighted cash flows		108.30	107.63	112.94	112.10	440.97
Percent of total beginning assets		23.00%	22.40%	25.97%	28.63%	100.00%
Percent of total beginning assets + Weighted cash flows		24.56%	24.41%	25.61%	25.42%	100.00%

Note: Weighted cash flows reflect two-decimal-place precision in the weighting factors.

Determining the percentage of total composite assets held in each portfolio at the beginning of the measurement period is straightforward. Portfolio A had a beginning fair value of $100,000, and all four portfolios combined had a beginning fair value of approximately $435,000, so the percentage held by Portfolio A is 100/434.81 = 0.23 = 23%. As we will show in a moment, under a method reflecting only beginning-of-period values, we can calculate the composite return by multiplying the individual portfolio returns by the percentage of beginning composite assets held in each portfolio and summing the products.

Determining the return impact of portfolios based on beginning assets and weighted external cash flows is a little more complex. The weighting factor, however, is already familiar from our discussion of the Modified Dietz rate-of-return calculation. Each external cash flow is weighted in proportion to percentage of the time it is held in the portfolio during the measurement period. Recall Equation 5:

$$w_i = \frac{CD - D_i}{CD}$$

where CD is the total number of calendar days in the period and D_i is the number of calendar days since the beginning of the period to the time cash flow CF_i occurs. Exhibit 10 showed the weighting factor computed to two decimal places with this formula for each of the days in the measurement period (the month of June) on which external cash flows occur that affect any of the portfolios in the composite. The exhibit

also showed the weighted external cash flows under the two methods discussed. For the method incorporating weighted external cash flows, the sum of beginning assets and weighted external cash flows, V_p, is calculated as:

$$V_p = V_0 + \sum_{i=1}^{n}(CF_i \times w_i) \tag{7}$$

where V_0 is the portfolio's beginning value and $\sum_{i=1}^{n}(CF_i \times w_i)$ is the sum of each portfolio's weighted external cash inflows and outflows. Note that the right-hand side in Equation 7 is the denominator of the Modified Dietz formula (see Equation 4).

The composite return is the weighted-average return of the individual portfolios that belong to that composite. Under the "beginning assets" weighting method, the composite return calculation is

$$r_C = \sum\left[r_{pi} \times \frac{V_{0,pi}}{\sum_{pi=1}^{n} V_{0,pi}}\right] \tag{8}$$

where r_C is the composite return, r_{pi} is the return of an individual portfolio i, $V_{0,pi}$ is the beginning value of portfolio i, and $\sum_{pi=1}^{n} V_{0,pi}$ is the total beginning fair value of all the individual portfolios in the composite. In other words, the composite return is the sum of the individual portfolio returns weighted in proportion to their respective percentages of aggregate beginning assets.

Under the alternate "beginning assets plus weighted cash flows" method, the return calculation uses the individual portfolios' V_P, computed above, in place of $V_{0,p}$:

$$r_C = \sum\left(r_{pi} \times \frac{V_{pi}}{\sum V_{pi}}\right) \tag{9}$$

Exhibit 11 supplies each individual portfolio's return for the month of June and presents the composite returns resulting from these two weighting methods.

Exhibit 11 Composite Returns

	Percent of Beginning Assets	Percent of Beginning Assets + Weighted Cash Flows	Return for Month of June
Portfolio A	23.00%	24.56%	0.51%
Portfolio B	22.40%	24.41%	0.28%
Portfolio C	25.97%	25.61%	0.32%
Portfolio D	28.63%	25.42%	1.36%
	100.00%	100.00%	
Composite Return:			
Based on beginning assets			0.65%
Based on beginning assets plus weighted cash flows			0.62%

Under the "beginning assets" weighting method, the composite return shown in Exhibit 11 is:

$$r_C = (0.0051 \times 0.23) + (0.0028 \times 0.224) + (0.0032 \times 0.2597) + (0.0136 \times 0.2863)$$
$$= 0.0065 = 0.65\%$$

Similarly, the composite return under the "beginning assets plus weighted cash flows" method is:

$$r_C = (0.0051 \times 0.2456) + (0.0028 \times 0.2441) + (0.0032 \times 0.2561) +$$
$$(0.0136 \times 0.2542) = 0.0062 = 0.62\%$$

Mathematically astute performance analysts may already have discerned another valid way to compute composite returns under a method that correctly reflects both beginning-of-period values and external cash flows. Beginning assets and intraperiod external cash flows can be summed and, treating the entire composite as though it were a single portfolio, the return can be computed directly with the Modified Dietz formula. Paying attention to the direction of the cash flows, this approach can be illustrated with data from Exhibit 10, using Equation 4:

$$r_{ModDietz} = \frac{V_1 - V_0 - CF}{V_0 + \sum_{i=1}^{n}(CF_i \times w_i)}$$

$$r_C = \frac{429.55 - 434.81 - 25 - (-15) - (-5) - (-6.5) - (-6.5)}{440.97}$$
$$= \frac{2.74}{440.97} = 0.0062 = 0.62\%$$

In the interest of ensuring that firms present composite returns with reasonable accuracy, the GIPS standards specify the required frequency of asset weighting. Provision I.2.A.7 states that for periods beginning on or after 1 January 2010 composite returns must be calculated by asset weighting the individual portfolio returns at least monthly, and Provision I.2.B.2 recommends that the same be done for earlier periods. The less frequently the asset-weighting exercise is conducted, the greater the likelihood that composite returns will inaccurately reflect the constituent portfolios' aggregate performance. We will encounter this issue again, and illustrate the potential for returns to drift away from mathematically precise computations, when we discuss custom benchmark rebalancing.

3.7 Constructing Composites I—Qualifying Portfolios

In order to prevent firms from presenting only their best-performing portfolios to prospective clients, the GIPS standards require firms to include all portfolios that meet certain criteria in at least one composite. The first requirement for composite construction reads, "All actual, fee-paying, discretionary portfolios must be included in at least one composite." It goes on to clarify that non-fee-paying portfolios may be included in a composite (with appropriate disclosure)[17] provided that they are discretionary, but non-discretionary portfolios must not be included in a firm's composites. (I.3.A.1).

17 See Provision I.5.A.6.

IMPLEMENTATION (5)

Composite Construction: Portfolio Documentation. The GIPS standards require that all data and information necessary to support all items included in a compliant presentation must be captured and maintained (I.1.A.1). At the outset of the implementation project, it is useful to develop a complete list of the firm's portfolios. The list can then be used to check that all documentation such as investment management contracts, custody agreements, investment policy statements (IPS), and compliance documents are available and up to date. This exercise creates a good opportunity for managers and administrative staff to confirm that portfolios are discretionary and to verify target asset mixes, acceptable asset ranges, portfolio size, tax status, investment restrictions, and other characteristics pertinent to the portfolios' assignment to composites. It is also advisable to conduct a formal review and update of the master portfolio list annually. Doing so will help ensure that documentation is kept current and that portfolios are assigned to the correct composites, particularly if clients have modified portfolio mandates and constraints during the year. The review will also point out the need for the creation of new composites if a significant number of portfolios no longer fit into existing composites or if a new investment strategy is launched.

A key term in this requirement is "discretionary." If an actual, fee-paying portfolio is discretionary, it must be included in at least one composite; if it is not discretionary, it must not be included in any composite. A portfolio is discretionary if the manager is able to implement the intended investment strategy. For example, the manager of a fully discretionary domestic mid-cap value portfolio is free to purchase any stock issued in the investor's home country that meets the pertinent market capitalization and style criteria. The firm might define mid-cap stocks as those whose market capitalization falls within a certain range. Similarly, the firm might define value stocks in terms of their price-to-earnings multiple, price-to-book ratio, dividend yield, or other characteristics intended to distinguish them from growth stocks. In line with best practice, the firm and the client will agree in advance that the portfolio's investment objective is to outperform a specified benchmark that is an appropriate measure of success in the domestic mid-cap market. For instance, the firm might construct a custom benchmark that is acceptable to the client, or the firm and the client might agree to use a commercially available index that mirrors the domestic mid-cap market.

If the client imposes restrictions on the manager's freedom to make investment decisions to buy, hold, and sell securities so as to carry out the investment strategy and achieve the portfolio's financial objectives, then the manager must consider whether the portfolio is in fact discretionary. In general, restrictions that impede the investment process to such an extent that the strategy cannot be implemented as intended may be presumed to render the portfolio non-discretionary.

Investors commonly set forth investment restrictions in investment policy statements (IPS). In addition to articulating the investor's overall financial objectives, an IPS normally expresses a number of constraints intended to limit the investment risks to which the assets are exposed. For example, the IPS may limit an individual equity portfolio's economic sector exposure to a certain percentage of portfolio assets or a certain relationship to the comparable benchmark weight: "No portfolio shall hold more than 15 percent of assets or 125 percent of the corresponding benchmark weight, whichever is greater, in any given sector, such as consumer discretionary stocks or information technology stocks." A fixed-income portfolio may be constrained to hold no securities rated below investment grade and to maintain the portfolio's weighted-average duration within a specified range, such as 75 percent to 125 percent of the benchmark duration. These restrictions are intended to preserve the portfolios from losses in value due to inadequate sector diversification, excessive credit quality risk, or unacceptable levels of interest rate risk.

Clearly, in addition to ensuring that the benchmark is appropriate, investors must be careful to formulate constraints that achieve their intended risk-control objectives without unduly impairing the portfolio managers' ability to act on their professional judgment regarding the relative attractiveness of sectors and securities. In other words, a well-written IPS meets the client's need for risk mitigation while respecting the portfolio manager's discretion. The manager is well advised to discuss with the client any restrictions that are incompatible with the intended investment strategy. Upon accepting the investment management assignment, however, the portfolio manager is ethically bound by the client's stated policies. Moreover, investment management agreements often incorporate the IPS, so the portfolio manager may also be legally required to comply with properly communicated client-specified constraints.

In some cases, the client's investment constraints may impinge on the portfolio manager's flexibility. A personal investor might prohibit investment in securities issued by companies operating in industries he or she considers socially unacceptable, such as alcohol, tobacco, or gaming. A corporate client might prohibit the sale of company stock, or a foundation might similarly ban the sale of "sentimental holdings," securities issued by the company in which its founder made a fortune. Additionally, legal restrictions may apply. For instance, a public fund might be statutorily precluded from investing in non-domestic securities. None of these constraints automatically renders a portfolio non-discretionary. Rather, in these and other cases, the portfolio managers must determine whether or not they have scope to execute the investment strategy. It may be appropriate to classify a portfolio as discretionary despite the presence of restrictions (such as the prohibition of alcohol, tobacco, or gaming stocks cited above) and to include it in a composite with other, similarly constrained portfolios.

IMPLEMENTATION (6)

Defining Discretion. The GIPS standards require that all actual fee-paying discretionary portfolios be included in at least one composite. The key words here are actual, fee-paying, and discretionary. Stated in simple terms, every portfolio that meets these criteria has to be included in at least one composite. Because discretion is one of the key variables that determine inclusion in or exclusion from a composite, a firm implementing the GIPS standards must have a clear, written definition of discretion. The GIPS Guidance Statement on Composite Definition defines discretion as "the ability of the firm to implement its intended strategy," and counsels, "If documented client-imposed restrictions significantly hinder the firm from fully implementing its intended strategy the firm may determine that the portfolio is non-discretionary." The Guidance Statement, available on the GIPS standards website, offers a starting point for the firm's definition of discretion. The firm's documented policy on discretion should help practitioners judge whether a specific portfolio is discretionary and decide how to handle portfolios deemed wholly or partially non-discretionary. The firm must consistently apply its definition of discretion.

A client could insist that the manager retain specific holdings that might or might not otherwise be held in a portfolio. For example, the client could direct that legacy holdings with a low cost basis must not be sold due to the adverse tax consequences of realizing large gains. In such cases, retaining the asset in the portfolio may skew performance, and—whether the impact is favorable or unfavorable in any given measurement period—the outcome would not reflect the results of the manager's actual discretionary investment management. If holding the assets hinders the ability to implement the intended strategy, either the entire portfolio should be considered non-discretionary and removed from the firm's composites or the individual assets should be removed and the remaining assets for which the manager has full discretion should be retained in (or added to) the composite. Alternately, the firm might include a materiality threshold in its policy, enabling it to consider a portfolio discretionary if the non-discretionary assets consist of less than a certain percentage of portfolio assets.

Recognizing that degrees of discretion exist, the firm must consider the interactions among client-directed constraints, the portfolio's strategy or style, and the investment process, notably including the financial instruments employed. For example, a client's investment policy might proscribe the use of derivative securities such as futures, swaps, and options. In this case, the firm must consider whether the restriction is pertinent. To take up the example of the domestic mid-cap stock portfolio again, the fact that the client prohibits the use of derivatives may be irrelevant if the manager simply buys, holds, and sells common stocks. If the use of derivative securities is central to the firm's implementation of the investment mandate, however, then the client's policy may render the portfolio non-discretionary.

In some cases, the pattern of external cash flows might make a portfolio non-discretionary. For example, if a client frequently makes large withdrawals, perhaps on a regular schedule, the portfolio managers might have to maintain such a high level of liquidity that they cannot truly implement the investment strategy as they do for other portfolios with a similar stated investment mandate, objective, or strategy.

All actual portfolios that are fee-paying and discretionary must be included in at least one composite; no portfolios that are not actual may be included in any composite. The GIPS standards state that composites must include only actual assets managed by the firm (I.3.A.2). Firms must not link the performance of simulated or model portfolios with actual performance (I.3.A.3). In the process of developing, testing, and refining new investment strategies, firms frequently construct model portfolios and use historical security prices to simulate hypothetical performance in past measurement periods. Composites cannot include simulated, backtested, or model portfolios (The GIPS Guidance Statement on the Use of Supplemental Information states that model, hypothetical, backtested, or simulated returns can be shown as **supplemental information** but cannot be linked to actual composite returns.)

On the other hand, if the firm actually created and managed portfolios with its own assets—sometimes called seed money—it could include them from inception in appropriate composites (or, more likely, construct new composites reflecting the new strategies), subject to a presentation and reporting requirement related to the inclusion of non-fee-paying portfolios in composites (see provision I.5.A.6, discussed later). The GIPS standards recommend that firms disclose if a composite contains proprietary assets (I.4.B.8).

To summarize the criteria for including portfolios in composites: All actual, fee-paying, discretionary portfolios must be included in at least one composite. Actual, discretionary portfolios that are non-fee-paying may be included in at least one composite, but neither non-discretionary nor non-actual portfolios may be included in any composite.

3.8 Constructing Composites II—Defining Investment Strategies

Defining and constructing meaningful composites is a vital step toward achieving the ideal of fair representation and the goal of providing prospective clients with useful comparative information. Under the GIPS standards, composites must be defined according to investment mandate, objective, or strategy; composites must include all portfolios that meet the composite definition as documented in the firm's policies and procedures; and the **composite definition**, including detailed criteria that determine the assignment of portfolios to the composite, must be made available upon request (I.3.A.4). Well-defined composites will be objectively representative of the firm's products and consistent with the firm's marketing strategy. To promote comparability, it is beneficial for firms to take into account how other firms characterize similar products.

The GIPS Guidance Statement on Composite Definition suggests a hierarchy that may be helpful for the firm considering how to define composites. Firms are not required to define their composites according to each level of the suggested hierarchy.

Investment Mandate
  Asset Classes
    Style or Strategy
      Benchmarks
        Risk/Return Characteristics

A composite based on the investment mandate bears a summary product or strategy description, such as "Global Equities." This may be an entirely acceptable composite definition as long as no significant strategic differences exist among the portfolios included in the composite. It is a guiding principle of composite definition that firms are not permitted to include portfolios with different investment mandates, objectives, or strategies in the same composite.

A composite based on the constituent portfolios' asset class, such as "equity" or "fixed income," may also be acceptable; however, asset classes are broadly inclusive, and, because generic descriptions are not very informative, asset class composites should be offered only if they are legitimately and meaningfully representative of the firm's products.

In order to afford investors a better understanding of the nature of a composite, the firm may use an asset-class modifier indicating the composite's investment style or strategy. For example, equity portfolios may be restricted to a specific economic sector such as telecommunication services. Stocks issued by corporations competing in the same economic sector are presumably affected more or less the same way by exogenous factors such as changes in raw material prices, consumer demand, or the general level of interest rates.

Equity portfolios might also be actively managed to a defined style. A nine-box style matrix widely used by investment consultants in asset allocation studies and performance evaluations classifies portfolios by capitalization (large cap, midcap, and small cap) and by style (value; core, also called neutral, market oriented, or blend; and growth). In addition, some capital market index providers offer capitalization- and style-based indexes. Although the construction methodologies for such indexes must be carefully considered, they may serve adequately as market-based performance benchmarks for portfolios managed in conformity with these categories. Stocks assigned to one category may move more or less together, and one category may have favorable performance relative to the equity market as a whole while another category underperforms the broad market. For instance, the investment performance of portfolios managed to a small-cap growth strategy may vary considerably from the results achieved by large-cap value portfolios, depending on whether large-cap or small-cap stocks and growth or value stocks are in favor during a given measurement period.

A portfolio may be assigned to one of the style matrix categories based on the money-weighted averages of pertinent characteristics of the portfolio's holdings. For example, a portfolio holding stocks with an average market capitalization of USD 2 billion along with a relatively high price-to-earnings multiple, a relatively high price-to-book ratio, and a relatively low dividend yield, would likely be identified as a midcap growth portfolio.[18] Alternately, the portfolio's historical monthly or quarterly returns might be regressed against the returns of pertinent capital market indexes to determine which style-specific benchmarks best explain the portfolio's performance. Evaluating the comparative merits of these approaches falls outside the scope of this

18 For a more complete discussion, see Stephen C. Gaudette and Philip Lawton (2007).

reading. Suffice it to say that, given the widespread acceptance of these categories, a firm may meaningfully and usefully define composites with reference to the capitalization range and the style in which the constituent portfolios are managed.

IMPLEMENTATION (7)

Defining Composites. One of the greatest challenges in implementing the GIPS standards is devising the set of composites that will most meaningfully represent the firm's products. The GIPS standards require each actual, fee-paying, discretionary portfolio to be included in at least one composite, and composites to be defined according to similar investment criteria (i.e., mandates, objectives and/or strategies). What appears to be a straightforward exercise—defining composites and assigning portfolios to them—may prove rather difficult in practice.

A useful guideline is to build a set of composites that will accurately represent the firm's distinct investment strategies. With too few composites, a firm risks overlooking significant differences and grouping diverse portfolios together into a single, overly broad composite subject to a wide dispersion of portfolio returns. With too many composites, in addition to incurring unnecessary costs, the firm runs the risk of creating narrowly defined groupings that are too much alike in investment strategy, contain too few portfolios or assets to be useful, or compromise client confidentiality.

Assuming that the implementation team has already defined the "firm" and "discretion" and compiled a master list of portfolios, here is a common-sense strategy for reaching agreement on composite definitions.

1. Review the firm's organizational structure and investment process to see if distinctive strategies can be readily identified. For instance, an equity advisor might have units specializing in one or more active management strategies as well as index fund construction and quantitatively driven enhanced indexing.
2. Review the firm's existing marketing materials including, if possible, marketing materials from competitors and recently received requests for proposals (RFPs). The objective is to determine how the industry defines products similar to those the firm offers.
3. Referring to the hierarchy presented in the GIPS Guidance Statement on Composite Definition, construct a provisional framework using descriptive captions to identify possible composites.
4. Taking into consideration the clients' investment policies, test how well the firm's actual, fee-paying, discretionary portfolios would fit the provisional framework. The inevitable identification of exceptions—that is, the discovery that portfolios that must be included in some composite do not really fit any—will lead to the redefinition of proposed composites or the creation of new composites. Several iterations may be needed.
5. Review the proposed set of composites for compliance with the GIPS standards.
6. Document the composite definitions in detail, and circulate the definitions for final review by all affected parties within the firm.

Of course, the most effective process for defining composites may differ from one firm to another in view of variables such as organizational structure, culture, and investment strategies, among other factors. Nonetheless, composite definitions have lasting consequences, and it is highly desirable to have a plan for reaching consensus.

Firms may also define composites based on the portfolios' benchmarks, as long as the benchmarks reflect the investment strategy and the firm has no other composites with the same characteristics. This approach is particularly appropriate if the portfolios are limited to holding stocks that are held in the index.

Finally, portfolios sharing distinctive risk/return profiles may reasonably be grouped together. For example, enhanced index funds with benchmark-specific targeted excess returns and tracking error tolerances might fall into natural groups.

Fixed-income composites can likewise be meaningfully and usefully defined in many dimensions. For example, composites might conform to asset classes or market segments such as government debt, mortgage-backed securities, convertible bonds, or high-yield bonds; investment strategies such as fundamental credit analysis, sector rotation, or interest rate anticipation; or investment styles such as indexing or core-plus. However a firm chooses to define the composites representing its investment products, they must be composed of portfolios managed in accordance with similar investment strategies or objectives.

3.9 Constructing Composites III—Including and Excluding Portfolios

The GIPS standards governing composite construction hold that composites must include new portfolios on a timely and consistent basis after the portfolio comes under management (I.3.A.5). Firms are required to establish, document, and consistently apply a policy of including new portfolios in the appropriate composites on a timely basis. Preferably, new portfolios should be included as of the beginning of the next full performance measurement period after the firm receives the funds. For example, if a portfolio is funded on 20 May and the firm calculates composite returns monthly (as indeed it must for periods beginning on or after 1 January 2001)[19], optimally the composite should include the new portfolio as of the beginning of June. It may take time to invest the assets of a new portfolio in accordance with the desired investment strategy, however, particularly when the portfolio is funded in kind (that is, with securities other than cash and cash equivalents) and the assets have to be redeployed, or when the securities to be purchased are relatively illiquid (e.g., in emerging markets). Accordingly, the GIPS standards give firms some discretion to determine when to add the new portfolio to a composite. In such cases, the firm must establish a policy on a composite-by-composite basis and apply it consistently to all new portfolios.

In addition to winning new business, firms routinely lose relationships. Under the GIPS standards, a firm must include a terminated portfolio in the historical performance of the appropriate composite up to the last full measurement period that the portfolio was under management (I.3.A.6). In many cases, the firm loses its discretion over the portfolio upon being notified of a pending termination. The client may instruct the firm to stop buying securities immediately and to commence the liquidation of holdings in preparation for an outbound cash transfer on a specified date. Alternately, the client may halt trading and transfer control of the portfolio to a transition management organization to facilitate moving assets to a new firm. When the firm being terminated thus loses its discretion over the portfolio, it should include the portfolio in the composite through the last full measurement period prior to notification of termination. To use the same example, if a firm that calculates performance monthly is informed on 20 May that its management contract is being terminated effective 31 May, and is instructed to stop trading forthwith, then the firm should include the portfolio in its composite through 30 April. In any event, it is incumbent upon the GIPS-compliant firm to have defined and documented its policies governing the removal of terminated portfolios from composites and, of course, to apply those policies consistently.

19 Provision I.2.A.2.a.

IMPLEMENTATION (8)

Adding, Removing, and Switching Portfolios. GIPS-compliant firms must have written policies setting forth when portfolios may be added to or removed from composites. These policies should be composite-specific. For a firm that reports composite performance monthly, a policy statement could read as follows:

> "All new portfolios funded with cash or securities on or before the 15th day of the month shall be added to the appropriate composite at the beginning of the following month. All new portfolios funded with cash or securities after the 15th day of the month shall be added to the appropriate composite at the beginning of the second month after funding. All portfolios shall be deemed 'non-discretionary' on the date notice of termination is received and removed from the composite at the end of the month prior to notification. The historical performance of terminated portfolios shall remain in the appropriate composite."

Policies like the sample above allow firms a reasonable amount of time to implement the strategy without delaying inclusion of the portfolio in the appropriate composite. Each firm should develop a policy that conforms to its own investment process while meeting the GIPS standards' requirement to include portfolios in composites on a timely basis. The firm's policy for adding or removing portfolios should also include language strictly limiting the switching of portfolios from one composite to another, in accordance with Provision I.3.A.7. Here is a sample statement for a policy:

> "Portfolios shall not be moved from one composite to another unless the composite is redefined or documented changes in the client's guidelines require restructuring the portfolio in such a way that another composite becomes more appropriate. The portfolio shall be removed from the original composite at the end of the last calendar month before the event causing the removal occurred and shall be added to the appropriate new composite at the beginning of the calendar month following the date on which the portfolio is substantially invested. The historical performance of the portfolio shall remain in the appropriate composite."

The GIPS standards also stipulate that portfolios cannot be switched from one composite to another unless documented changes in the portfolio's investment mandate, objective, or strategy or the redefinition of the composite make it appropriate. The historical performance of the portfolio must remain with the original composite (I.3.A.7). This is an important provision; if the GIPS standards permitted firms to transfer portfolios from one composite to another at will, an unethical firm might identify and exploit opportunities to improve the reported performance of selected composites by re-populating them with the portfolios whose investment results were most advantageous during the measurement period.

The GIPS standards describe two conditions under which portfolios can be reassigned. First, a portfolio can be switched from one composite to another if the client revises the mandate, objective, or strategy governing the investment of portfolio assets and the guideline changes are documented. For instance, a client might decide to modify the portfolio mandate from mid-cap value to large-cap value, or from domestic equity to global equity, with a corresponding change in the benchmark, while retaining the same investment advisor to restructure and manage the "same" portfolio in accordance with the new strategy. Or perhaps a client might decide to

allow the use of derivative securities, previously prohibited, triggering a change in the investment strategy and making it suitable to assign the portfolio to a composite made up of portfolios that use derivatives.

Second, a portfolio can be reassigned to another composite if the original composite is redefined in such a way that the portfolio no longer fits it. Generally, if a strategy changes over time, it is most appropriate to create a new composite; accordingly, the redefinition of an existing composite should be a highly unusual event. (See the related requirement stated in Provision I.3.A.4, where it is also asserted that the GIPS standards do not permit changes to composites to be applied retroactively.) To repeat, if a portfolio is switched from one composite to another as permitted in these two situations—a pertinent, documented change in the portfolio's investment mandate, objective, or strategy, or a redefinition of the composite—then the historical record of the portfolio must remain in the composite to which it was originally assigned.

In the event of significant[20] external cash flows, the GIPS standards recommend that firms use **temporary new accounts** rather than temporarily removing entire portfolios from composites (see Provision I.3.B.2). Firms adopting this direct approach place client initiated incoming cash and securities into a temporary account that is not included in any composite until the external cash flows have been invested in accordance with the portfolio's investment mandate, objective, or strategy, at which time it would be transferred into the main portfolio and treated as an external cash flow. Relatedly, when the client initiates a large capital withdrawal, the firm transfers cash and securities in the desired amount to a temporary account until it liquidates the securities and the funds are distributed. The transfer is treated as an external cash outflow in calculating the portfolio's time-weighted total return.

This theoretically appropriate means of handling significant external cash flows is recommended but not required, in part because current technology does not readily allow for the establishment of temporary new accounts. Firms may be compelled to temporarily remove entire portfolios from composites when significant external cash flows occur. Provision I.3.A.10 addresses this situation. It states that firms wishing to remove portfolios from composites in cases of significant cash flows must define what they mean by "significant" on an *ex ante*, composite-specific basis and must consistently follow the composite-specific significant cash flow policy. We also refer the reader to the GIPS Guidance Statement on the Treatment of Significant Cash Flows for further information and direction on this practically important topic.

The GIPS provisions for composite construction additionally address the issue of minimum asset levels. A firm might decide that a particular composite will not include any portfolios whose value is below a specified level, on the grounds, for instance, that the investment strategy can be fully implemented only for portfolios above a certain size. The GIPS standards indicate that if a firm sets a minimum asset level for portfolios to be included in a composite, the firm must not include portfolios below that asset level in that composite. In other words, the policy, once established, must be followed consistently (I.3.A.9). The same provision further states that any changes to a composite-specific minimum asset level must not be applied retroactively.

The GIPS Guidance Statement on Composite Definition notes that portfolios may drop below a composite-specific minimum asset level because of client withdrawals or depreciation in value. If a firm establishes a minimum asset level for a composite, it must document its policies regarding how portfolios will be treated if they fall below the minimum and must apply these policies consistently. The Guidance Statement requires firms to specify in their policies the basis for evaluating portfolios against a

20 The GIPS standards distinguish between *large* and *significant* cash flows. "Large" denotes the level at which the firm determines that an external cash flow may distort performance if the portfolio is not valued. "Significant" describes the level at which the firm determines that a client-directed external cash flow may temporarily prevent the firm from implementing the composite strategy.

composite's minimum asset level (for instance, a firm might use beginning value, ending value, or beginning value plus cash flows, etc.). In order to curtail the movement of portfolios into and out of composites, the Guidance Statement recommends that firms consider establishing a threshold and a minimum time period for applying the policy. For example, the firm might establish a range of ±5 percent of the minimum asset level and a condition that portfolios must remain above or below the minimum asset level for at least two periods before they are added to or removed from the composite. If a portfolio is removed from a composite, its prior performance must remain in the composite. The firm must determine if the portfolio that has been removed meets any other composite definition and include it in the appropriate composite in a timely and consistent manner.

As previously noted, Provision I.3.A.9 also stipulates that any adjustments to a composite-specific minimum asset level cannot be applied retroactively. This requirement can create a problem when capital market movements cause portfolios' values to fall below the stated minimum. For example, the total market value of the Dow Jones Wilshire 5000 Index was approximately USD 12.1 trillion at the end of February 2008. Over the ensuing twelve months, the index had a return of –43.3 percent, representing a loss of shareholder value in excess of USD 5 trillion. If a firm's composite had a minimum portfolio asset level of $50 million, a portfolio initially valued at $85 million that experienced a comparable decline would no longer qualify for inclusion in the composite and would have to be removed from the composite when its value fell below the minimum asset level. Although the magnitude of the drop in the broad US equity market during this period was extreme, firms are well advised to consider the risk of having to exclude all portfolios from composites with minimum asset levels. The minimum asset level can be changed prospectively, subject to disclosure (see Provision I.4.A.19), but not retroactively.

The GIPS standards also recommend that firms should not present a composite presentation to a prospective client who is known not to meet the composite's minimum asset level (I.3.B.1). It is to be presumed that the firm has sound reasons for establishing a minimum asset level for a given strategy. Accordingly, it would not be in the prospective client's best interest to be shown a compliant presentation of a composite that does not represent a strategy available to that prospective client.

3.10 Constructing Composites IV—Carve-Out Segments

The GIPS standards describe the proper treatment of asset class segments "carved out" of multiple-strategy portfolios.

In discussing the requirements surrounding the calculation methodology, we recognized that returns from cash and cash equivalents held in portfolios must be included in total return calculations (I.2.A.3), and we examined the impact of short-term investments on equity portfolio results in "up" and "down" markets. The requirement that cash and cash equivalents be taken into account in portfolio and composite return calculations is based on the fundamental principle of fair representation: A composite that did not include portfolio cash positions would not fairly represent investment performance to a prospective or existing client. This principle carries over to the inclusion of portfolio segments in composites. Provision I.3.A.8 states that, for periods beginning on or after 1 January 2010, a **carve-out** must not be included in a composite unless the carve-out is managed separately with its own

cash balance.[21] For example, the stock portion alone of a portfolio consisting of stocks, bonds, and cash cannot be included in an equity composite as though it were a stand-alone discretionary portfolio.

Carve-out segments are also addressed in the provisions for disclosure and for presentation and reporting. For periods prior to 1 January 2010, if carve-outs are included in a composite, firms must disclose the policy used to allocate cash to the carve-outs (see Provision I.4.A.23). In addition, for periods beginning on or after 1 January 2006 and ending before 1 January 2011, if a composite includes carve-outs, the compliant presentation must include the percentage of the composite assets represented by carve-outs as of each annual period-end (see Provision I.5.A.5).

IMPLEMENTATION (9)

Carve-Out Segments. Equilibrium Capital Advisors, a firm specializing in balanced portfolios, maintains a number of multi-strategy composites constructed according to strategic asset mix ranges. For example, among other multi-class composites, Equilibrium Capital Advisors has a Standard Balanced Account Composite composed of portfolios with a strategic asset allocation target of 50 percent equity and 50 percent fixed income; a Conservative Balanced Account Composite composed of portfolios with a 35/65 equity/fixed income strategic mix; and an Aggressive Balanced Account Composite composed of portfolios with an 80/20 equity/fixed income strategic mix. In order to control transaction expenses by reducing the frequency of portfolio rebalancing, the target mixes are accompanied by 5 percent tolerance ranges. For instance, the Aggressive Balanced Account Composite is permitted to vary from 75/25 to 85/15 equity/fixed income mixes.

The equity segments of all the balanced composites are managed in accordance with a single strategy by the Equity Markets Group under the leadership of John Boyle, and the fixed income segments of the balanced composites as well as all cash and cash equivalent positions are managed by the Fixed Income Markets Group. Boyle wants to create a new equity composite composed of the equity segments of the multi-strategy portfolios. Can such a composite be constructed in compliance with the GIPS standards?

Provision I.3.A.8 states that, for periods beginning on or after 1 January 2010, a carve-out must not be included in a composite unless the carve-out is managed separately with its own cash balance. In the case of Equilibrium Capital Advisors, it appears that the cash generated in the course of equity and fixed-income investment management is pooled, and short-term investing is conducted for the balanced portfolio as a whole. The equity segments of the firm's balanced portfolios are not managed separately with their own cash balances. Accordingly, Equilibrium must not create the composite that Boyle would like to have.

3.11 Disclosure

The GIPS standards advance the ideals of fair representation and full disclosure. We will consider the presentation and reporting provisions shortly. Before doing so, however, we will cite the numerous required and recommended disclosure provisions. The reader will already be familiar with many of these topics from previous sections, so we will discuss most items here only briefly. We have grouped the disclosure provisions by subject area.

A firm may claim compliance once it has satisfied all the requirements of the GIPS standards, including those we will present later in this reading. The precise wording of the claim of compliance is laid down as a disclosure requirement in Provision I.4.A.1.

21 For periods prior to 1 January 2010, if carve-outs were included in a composite, cash must have been allocated to the carve-out in a timely and consistent manner. The GIPS Guidance Statement on the Treatment of Carve-Outs describes some acceptable cash allocation methodologies.

The wording differs depending upon whether or not a firm has been verified. A firm that is verified must use the exact wording of the following two-paragraph compliance statement in all compliant presentations (and only in compliant presentations):

> "[Insert name of firm] claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. [Insert name of firm] has been independently verified for the periods [insert dates]. The verification report(s) is/are available upon request.
>
> "Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis, and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards. Verification does not ensure the accuracy of any specific composite presentation."[22]

A firm that has not been verified must use the following statement, again, always and only in compliant presentations:

> "[Insert name of firm] claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. [Insert name of firm] has not been independently verified."

A firm that is verified may additionally choose to have the verifier conduct a specifically focused performance examination of a particular composite performance presentation. Provision I.4.A.1 also provides the exact wording of the two-paragraph compliance statement that must be used in compliant performance presentations of composites that have been examined:

> "[Insert name of firm] claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. [Insert name of firm] has been independently verified for the periods [insert dates].
>
> "Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis, and (2) the firm's processes and procedures are designed to calculate and present performance in compliance with the GIPS standards. The [insert name of composite] composite has been examined for the periods [insert dates]. The verification and examination reports are available upon request."

Several provisions concern disclosures related to the GIPS-compliant firm. The definition of the "firm" used to determine the firm's total assets and firm-wide compliance is a required disclosure (I.4.A.2). A clear explanation of the way in which the firm is defined enables the prospective client to understand precisely which investment organization (or unit of a larger entity) is presenting results, is claiming compliance, and will be responsible for managing the client's assets if hired. If a firm is redefined, it must disclose the date, describe the redefinition, and explain the reason (I.4.A.16). If a parent company contains multiple firms, the GIPS standards recommend that each firm within the parent company disclose a list of the other firms contained within the parent company (I.4.B.5).

Firms are further required to disclose all significant events that would help a prospective client interpret the compliant presentation (I.4.A.14). For example, a firm must advise the prospective client if past results in a given strategy were achieved by

22 The claims of compliance given in this section may be used only in compliant performance presentations. Different wording for compliance claims in advertisements is stipulated in the GIPS Advertising Guidelines, discussed later in this reading.

a portfolio manager who has left the firm, or if all key members of the research team supporting the strategy have resigned. Firms must also disclose if the performance from a past firm or affiliation is linked to the performance of the firm (I.4.A.35). For periods beginning on or after 1 January 2006, firms must disclose the use of a subadvisor and the periods a subadvisor was used (I.4.A.25), and for earlier periods they should disclose the use of a sub-advisor and the periods a sub-advisor was used (I.4.B.7).

Other provisions have to do with disclosures related to composites. In a compliant performance presentation, firms must disclose the composite description,[23] which must contain sufficient information to allow a prospective client to understand the key characteristics of the composite's investment mandate, objective, or strategy (I.4.A.3). It is not enough merely to have a broadly indicative name such as "Growth and Income Composite," which might mean one thing to one user and something else to another; the provision requires that prospective clients be given a reasonably informative explanation, however concise, setting forth the composite's salient features. For example, a "Growth and Income Composite" composed of balanced portfolios or "accounts" managed on behalf of individuals might be described in these terms: "The Growth and Income Composite includes taxable balanced accounts with assets greater than $100,000. The accounts are managed to a strategic asset allocation target of 50 percent equity and 50 percent fixed income within a tactical range of 10 percent. The equity segments are invested in large-capitalization common stocks. The fixed income segments of the individual accounts are invested in investment-grade instruments including US government and agency securities, corporate bonds, and mortgage-backed securities. The benchmark for this strategy is a blended index made up of 50 percent Standard & Poor's 500 Stock Index and 50 percent Bloomberg Barclays Capital US Aggregate Bond Index." Appendix C of the GIPS standards includes other examples of **composite descriptions**.

The availability upon request of the firm's list of composite descriptions is a required disclosure (I.4.A.11). This information enables prospective clients to determine if the composite they have been shown is the most appropriate for their needs and to request compliant performance presentations of any other composites of interest. Recall that the list must include not only all of the firm's current composites but also any that have been discontinued within the last five years (see Provision I.0.A.10).

Firms must also disclose the **composite creation date** (I.4.A.10), the date on which the firm first grouped one or more portfolios to form the composite. This is not necessarily the earliest date for which composite performance is reported. If a firm has redefined a composite, the firm must disclose the date of, description of, and reason for the redefinition (I.4.A.17).[24] Similarly, firms must disclose any changes to a composite's name (I.4.A.18).

The preceding requirements apply to all composites. Further requirements apply in certain cases. First, firms must disclose the minimum asset level, if any, below which portfolios are not included in a composite, as well as any changes to the minimum asset level (I.4.A.19). Second, as previously noted, if in periods prior to 1 January 2010 carve-outs are included in a composite, firms must disclose the policy used to allocate cash to the carve-outs (I.4.A.23). Third, if the firm has adopted a significant cash flow policy for a specific composite, then the firm must disclose how it defines significant

23 The GIPS standards distinguish between *definitions* and *descriptions* of composites. A composite definition sets forth detailed criteria that determine the assignment of portfolios to composites, whereas a composite description provides general information regarding the investment mandate, objective, or strategy of the composite. The GIPS Glossary entry for composite description states, "The composite description may be more abbreviated than the composite definition but must include all key features of the composite and must include enough information to allow a prospective client to understand the key characteristics of the composite's investment mandate, objective, or strategy."

24 As previously noted, the GIPS standards do not permit changes to composite definitions to be applied retroactively (I.3.A.4).

cash flows for that composite and the periods to which the definition applies (I.4.A.32). The GIPS standards recommend that firms disclose if a composite contains proprietary assets (I.4.B.8).

The GIPS standards include both required and recommended disclosures regarding valuations. For periods prior to 1 January 2010, firms must disclose if any portfolios were not valued as of calendar month-end or as of the last business day of the month (I.4.A.26). For periods beginning on or after 1 January 2011, firms must disclose if portfolio investments are valued using subjective unobservable inputs, as described in the GIPS Valuation Principles if the portfolio investments valued using subjective, unobservable inputs are material to the composite (I.4.A.27). For periods beginning on or after 1 January 2011, firms must disclose if the composite's valuation hierarchy materially differs from the hierarchy that is recommended in the GIPS Valuation Principles (I.4.A.28). (We will discuss the GIPS Valuation Principles later in this reading.) Firms should disclose the key assumptions used to value portfolio investments (I.4.B.4), and they should disclose material changes to valuation policies and/or methodologies (I.4.B.1). For periods prior to 1 January 2011, firms should disclose the use of subjective unobservable inputs for valuing portfolio investments if the investments so valued are material to the composite (I.4.B.6).

Firms must also disclose that policies for valuing portfolios, calculating returns, and preparing compliant presentations are available upon request (I.4.A.12). To cite obvious examples, GIPS-compliant firms should be prepared to respond to prospective clients' questions about their valuation methods and sources, return calculation methodology, or treatment of large external cash flows. The GIPS standards recommend, but do not require, that firms disclose material changes to calculation policies and/or methodologies (I.4.B.2).

Firms must disclose the currency used to express performance (I.4.A.7). For periods beginning on or after 1 January 2011, firms must also disclose and describe any known material differences in the exchange rates or valuation sources used among the portfolios within a composite, and between the composite and the benchmark (I.4.A.21); for earlier periods, only differences in exchange rates (not in valuation sources) need be disclosed. When defining materiality, firms would do well to consider the ethical principles of fair representation and full disclosure. If there is internal disagreement over the significance of an item, it seems advisable to disclose the pertinent facts so as to allow prospective clients and their consultants to take them into consideration.

Firms must disclose relevant details of the treatment of withholding tax on dividends, interest income, and capital gains, if material, and, if the information is available, they must also disclose if benchmark returns are net of withholding taxes (I.4.A.20).

In view of their importance for evaluating performance, it is not surprising that benchmarks are subject to disclosure requirements. Firms must disclose the **benchmark description** (I.4.A.4) and, if a custom benchmark or a combination of multiple benchmarks is used, the firm must disclose the benchmark components, weights, and rebalancing process (I.4.A.31). For example, a firm might construct a custom security-based benchmark composed of securities that conform to the firm's investment process and the composite's strategy. Or, as another example, a firm's balanced composite might have a blended benchmark reflecting the strategic asset mix with reference to which the portfolios are managed. The benchmark in this case might be constructed by weighting well-chosen capital market indexes with desirable characteristics such as asset class representativeness and investability.

IMPLEMENTATION (10)

Benchmark Presentation. Eastern Institutional Asset Advisors presents the performance of a Global Balanced Composite. The strategic asset mix of the portfolios in the composite is 50 percent US equity, 10 percent international equity, 35 percent US fixed-income

securities, and 5 percent cash. The composite has a blended benchmark composed of capital market indexes weighted in accordance with the strategic asset allocation. Eastern Institutional Asset Advisors places the following disclosure on the Global Balanced Composite's performance presentation:

> "The benchmark for the Global Balanced Composite is composed of 50 percent S&P 500, 10 percent MSCI EAFE Index, 35 percent Bloomberg Barclays Capital US Aggregate Bond Index, and 5 percent US Treasury bills. The benchmark is rebalanced monthly."

The frequency of benchmark rebalancing can affect the reported returns for an annual period. Exhibit 12 displays one calendar year's data for the Global Balanced Composite described in Implementation (10). The blended benchmark return for the year is calculated first on a monthly and then on a quarterly basis for the purpose of comparison.

Exhibit 12 Illustration of Rebalancing Policies

	Domestic Equity Index	International Equity Index	Domestic Fixed Income Index	Cash Equivalents Index		Blended Benchmark
Blended benchmark weights	50%	10%	35%	5%		
			Monthly Rebalancing			
January	–1.46%	–3.96%	0.79%	0.15%		-0.84%
February	–1.93%	0.61%	0.96%	0.13%		–0.56%
March	3.76%	5.56%	–1.65%	0.15%		1.87%
April	–6.06%	0.76%	1.90%	0.16%		–2.28%
May	–0.74%	1.65%	0.85%	0.16%		0.10%
June	–7.12%	–4.41%	0.74%	0.14%		–3.74%
July	–7.79%	–9.21%	1.19%	0.15%		–4.39%
August	0.66%	0.00%	1.75%	0.14%		0.95%
September	–10.87%	–10.43%	1.59%	0.16%		–5.91%
October	8.80%	4.87%	–0.45%	0.15%		4.74%
November	5.89%	4.56%	–0.02%	0.16%		3.40%
December	–5.87%	–2.86%	2.08%	0.12%		–2.49%
Linked monthly returns	–22.09%	–13.50%	10.11%	1.78%	→	**–9.30%**
			Quarterly Rebalancing			
First quarter	0.27%	2.00%	0.08%	0.43%		0.38%
Second quarter	–13.39%	–2.09%	3.53%	0.46%		–5.65%
Third quarter	–17.27%	–18.68%	4.60%	0.45%		–8.87%
Fourth quarter	8.45%	6.52%	1.60%	0.43%		5.46%
Linked quarterly returns	–22.08%	–13.49%	10.11%	1.78%	→	**–8.98%**

In this example, the monthly calculation produces a blended benchmark return of –9.30 percent for the year, while the quarterly calculation (using the same input data) produces a return of –8.98 percent for the year. There is a difference of 32 basis points (0.32 percent) between the full-year benchmark returns under the two rebalancing methods. Once established, the firm must apply its benchmark rebalancing policy consistently, without regard to the *ex post* impact on the composite's relative performance in any annual period.

If the firm determines that no appropriate benchmark for the composite exists, the firm must disclose why no benchmark is presented (I.4.A.29). If the firm changes the benchmark, the firm must describe the change, disclose the date it became effective, and explain the reason for the change (I.4.A.30). The GIPS standards recommend that firms disclose material differences between the composite investment mandate, objective, or strategy and that strategy represented by the benchmark (I.4.B.3).

Numerous provisions address the topic of fees. The GIPS Glossary defines the **gross-of-fees return** as the return on investments reduced by any trading expenses incurred during the period and the **net-of-fees return** as the gross-of-fees return reduced by the investment management fees (including performance-based fees and carried interest).[25] When presenting gross-of-fees returns, firms must disclose if they deduct any other fees in addition to the actual trading expenses (I.4.A.5). Similarly, when presenting net-of-fees returns, firms must disclose if any other fees are deducted in addition to the actual trading expenses and the investment management fee; in addition, firm must disclose if model or actual investment management fees are used and if returns are net of performance-based fees (I.4.A.6). The firm must also disclose the **fee schedule** appropriate to the compliant presentation (I.4.A.9). As explained in the GIPS Glossary, the term "fee schedule" refers to the firm's current schedule of investment management fees or bundled fees relevant to the particular compliant presentation. If a composite contains portfolios with bundled fees, firms must also disclose the various types of fees that the bundled fee includes (I.4.A.24).

As we will see when examining the provisions of the GIPS standards related to presentation and reporting, firms must report a measure of the **internal dispersion** of the returns of the individual portfolios within a composite. Because there are different ways to convey dispersion, the GIPS standards require firms to disclose which measure of internal dispersion they present (I.4.A.8).

It is an important, albeit challenging, provision that firms must disclose the presence, use, and extent of leverage, derivatives, and short positions, if material. The disclosure must include a description of the frequency of use and characteristics of the instruments sufficient to identify risks (I.4.A.13). As a practical matter, it is admittedly difficult to explain in writing the use of leverage or derivative securities and the risks of their use, especially for the benefit of prospective clients who may not have been exposed previously to complex investment strategies. A clear explanation, however, will help prospective clients interpret the historical performance and evaluate the additional risk resulting from the use of leverage or derivatives.

For example, a fixed income manager might use interest rate futures contracts as an efficient and economical means of adjusting the sensitivity of corporate bond portfolios to anticipated changes in interest rates. The firm might provide the following description of its use of derivatives: "Crystal Capital routinely uses US Treasury bond futures contracts to change the portfolios' modified duration. Because of their

25 Performance-based investment management fees are typically contingent upon the portfolio's exceeding a prescribed level of return, either absolutely or in comparison with a benchmark. Carried interest, commonly used in private equity and real estate investing, refers to the profits allocated to general partners from the profits made by the investment vehicle.

call features and credit risk, the corporate bonds held in the portfolio may experience price changes that do not closely match movements in the US Treasury bond futures contracts, resulting in portfolio valuations that differ from the targeted outcome."

Two disclosure provisions pertain to performance presentations. Firms must disclose if the presentation conforms with laws and/or regulations that conflict with the requirements of the GIPS standards. The manner in which any laws or regulations conflict with the GIPS standards must also be disclosed (I.4.A.22). For any performance presented for periods prior to 1 January 2000 that does not comply with the GIPS standards, firms must disclose the periods of non-compliance (I.4.A.15.)

We will see when reviewing the presentation and reporting provisions that the 2010 edition of the GIPS standards requires firms to present, for each annual period, the annualized three-year *ex post* standard deviation of monthly composite and benchmark returns and, if appropriate, another measure of risk. (See the discussion of Provision I.5.A.2 later in this reading.) There are two required disclosures having to do with this presentation requirement. First, firms must disclose if the three-year annualized ex post standard deviation for the composite and/or the benchmark is not presented because 36 monthly returns are unavailable (I.4.A.33). Second, if the firm determines that the standard deviation is not a relevant or appropriate measure, and accordingly presents an additional risk measure, then the firm must disclose this decision. Specifically, the firm must describe why *ex post* standard deviation is not relevant or appropriate, describe the additional risk measure presented, and explain why the additional measure was selected (I.4.A.34).

Meeting the objectives of fair representation and full disclosure may call for providing more information than the GIPS standards minimally require. Practitioners are well advised to prepare compliance checklists to ensure that the disclosure requirements and, where feasible, the recommendations of the GIPS standards are met for the firm as a whole and for each composite presented. We turn now to the provisions for presentation and reporting.

3.12 Presentation and Reporting Requirements

The ethical ideals of fair representation and full disclosure culminate in GIPS-compliant performance presentations. In this section, we will focus on the required elements of performance presentations prepared in accordance with the GIPS standards.

For each GIPS-compliant composite presented, the GIPS standards require that firms show at least five years of annual[26] performance (less if the firm or composite has been in existence for a shorter period), and that the GIPS-compliant performance record must then be extended each year until 10 years' results have been presented. The core elements of a GIPS-compliant performance presentation additionally include composite and benchmark annual returns for all years; the number of portfolios (if six or more); the amount of assets in the composite; either the percentage of the firm's total assets represented by the composite or the amount of total firm assets at the end of each period; and a measure of **internal dispersion** of individual portfolio returns for each annual period if the composite contains six or more portfolios for the full year. For composites with an inception date on or after 1 January 2011, when the initial period is less than a full year, firms must present returns from the composite inception date through the initial annual period-end. For example, if a composite has an inception date of 1 April 2011, the performance presentation as of 31 December 2011 will cover the nine-month period 1 April–31 December 2011. Similarly, for composites with a

26 Annual returns are normally presented for calendar years, but they may be presented for other annual periods if the composite is reported on a non-calendar fiscal year. See Provision I.1.A.7 described earlier.

composite termination date of 1 January 2011 or later, firms must present returns from the last annual period-end through the composite termination date. The requirements listed in this paragraph are set forth in Provisions I.5.A.1.a–i.

We have previously remarked on the importance of selecting appropriate benchmarks in order to interpret historical results and to conduct meaningful performance evaluations. We have also made note of certain benchmark-related disclosure requirements. An important presentation and reporting requirement is set forth in Provision I.5.A.1.e: The total return for the benchmark must be presented for each annual period. This provision also states that the benchmark must reflect the composite's investment mandate, objective, or strategy.

The GIPS standards require that for each annual period a measure of internal dispersion of the returns earned by individual portfolios in the composite be presented (I.5.A.1.i.). This important requirement is intended to allow users to see how consistently the firm implemented its strategy across individual portfolios. A wide range of results should prompt the recipient of the performance presentation to inquire about possible causes of the variability of returns to portfolios that are purportedly managed in accordance with the same strategy. It may suggest, among many other possibilities, that the composite is defined too broadly to provide meaningful information.

The dispersion of the annual returns of individual portfolios within a composite can be measured in various ways. The GIPS Glossary entry for internal dispersion mentions several acceptable methods. Let us refer to the data in Exhibit 13, showing the beginning values (in euros) and the annual rates of return earned by the 14 portfolios that were in a German equity composite for the full year 20XX. (Note that only those portfolios in the composite for the entire year are included in the calculation of this dispersion measure.) The portfolios presented in Exhibit 13 are arrayed in descending order of returns.

Exhibit 13 Data for Calculation of Dispersion

Portfolio	Beginning Value	20XX Return
A	€118,493	2.66%
B	€79,854	2.64%
C	€121,562	2.53%
D	€86,973	2.49%
E	€105,491	2.47%
F	€112,075	2.42%
G	€98,667	2.38%
H	€92,518	2.33%
I	€107,768	2.28%
J	€96,572	2.21%
K	€75,400	2.17%
L	€77,384	2.07%
M	€31,264	1.96%
N	€84,535	1.93%

The GIPS Glossary defines internal dispersion as "a measure of the spread of the annual returns of individual portfolios within a composite" and indicates that acceptable measures include, but are not limited to, high/low, range, and the equal-weighted or asset-weighted standard deviation of portfolio returns. Using the data in Exhibit 13, we will consider each of these measures.

The simplest method of expressing internal dispersion for an annual period is to disclose the highest and lowest returns earned by portfolios that were in the composite for the full year. In the case of the German equity composite, the highest return was 2.66 percent and the lowest was 1.93 percent. As an alternative, the high/low range—the arithmetic difference between the highest and the lowest return—might also be presented. In this case it was 0.73 percent, or 73 basis points. In either form, the high/low disclosure is easy to understand. It has, however, a potential disadvantage. In any annual period, an outlier—that is, one portfolio with an abnormally high or low return—may be present, resulting in a measure of dispersion that is not entirely representative of the distribution of returns. Although they are more difficult to calculate and to interpret, other dispersion measures may convey better information.

The standard deviation of returns for portfolios included in the composite is another acceptable measure of internal dispersion. As applied to composites, standard deviation measures the cross-sectional dispersion of returns for portfolios included in the composite. The standard deviation for a composite in which the constituent portfolios are equally weighted is[27]

$$S_c = \sqrt{\frac{\sum_{i=1}^{n}\left(r_i - \bar{r}_c\right)^2}{n-1}} \tag{10}$$

where r_i is the return of each individual portfolio, $\bar{r}_c$ is the equal-weighted mean or arithmetic mean return to the portfolios in the composite, and n is, as before, the number of portfolios in the composite. Applying Equation 10 to the portfolio data given in Exhibit 13, assuming equal weighting, the standard deviation proves to be 23 basis points (0.23 percent). If the individual portfolio returns are normally distributed around the mean return of 2.32 percent, then approximately two-thirds of the portfolios will have returns falling between the mean plus the standard deviation (2.32% + 0.23% = 2.55%) and the mean minus the standard deviation (2.32% – 0.23% = 2.09%).

The standard deviation of portfolio returns is a valid measure of internal dispersion. Most spreadsheet programs include statistical functions to facilitate the calculation of equal-weighted standard deviations, and many prospective clients will have at least a passing acquaintance with the concept.

Some firms prefer to present the asset-weighted standard deviation rather than the equal-weighted standard deviation. The equation for the asset-weighted standard deviation of individual portfolio returns within a composite is:

$$S_{C_{aw}} = \sqrt{\sum_{i=1}^{n}\left[\left(r_i - \bar{r}_{proxy}\right)^2 \times w_i\right]} \tag{11}$$

27 The use of both n and $n - 1$ in the denominator can be supported. If n were used in calculating the standard deviation of returns for the example presented in the text, the result would be 22 basis points (0.22%).

where $\bar{r}_{proxy}$ is the asset-weighted mean return of portfolios 1 through n (see Equation 12); w_i is the weight of portfolio i, calculated as the ratio of the beginning value of portfolio i to the total beginning value of the assets of portfolios 1 through n, that is, $w_i = \frac{V_{0,i}}{V_{0,Total}}$; and the sum of the weights w_1 through w_n is 1.

$$\bar{r}_{proxy} = \sum_{i=1}^{n}(w_i \times r_i) \tag{12}$$

Applying Equations 11 and 12 to the data given in Exhibit 13, we find that the asset-weighted standard deviation is 21 basis points (0.21 percent).

Although the GIPS Glossary does not explicitly mentioned it, the interquartile range—the difference between the returns in the first and third quartiles of the distribution—is also an acceptable measure of internal dispersion. Quartiles divide the distribution of returns into quarters, such that 25 percent of the observations fall at or above the first quartile and 25 percent fall at or below the third quartile. If the distribution were divided into percentiles, the first quartile would contain observations at or above the 25th percentile, and the third quartile would contain observations at or above the 75th percentile. The quartiles for the German equity composite are shown in Exhibit 14.

Exhibit 14 Quartile Distribution of German Equity Portfolio Returns

	First Quartile (3 Portfolios)	25th Percentile Return = 2.50%
Interquartile Range	Second Quartile (4 Portfolios)	Median Return = 2.355%
	Third Quartile (4 Portfolios)	75th Percentile Return = 2.145%
	Fourth Quartile (3 Portfolios)	

The quartile breakpoints indicated in Exhibit 14 are located by determining the returns at the 25th, 50th, and 75th percentiles (the 50th percentile is the median). The yth percentile is defined as the point above which y percent of observations lie. The location of percentiles (and thus quartile breakpoints) is approximate in small data sets. An approximation for the position of a percentile y in an array with n entries sorted in descending order is:

$$L_y = (n+1)\frac{y}{100} \tag{13}$$

For example, the German equity composite presented in Exhibit 13 contains 14 portfolios (n = 14) listed in descending order of return. Using Equation 13, the approximate location of the 25th percentile (y = 25) is between the third and the fourth portfolio:

$$L_{25} = (14+1)\frac{25}{100} = 3.75$$

The value of the return at the 25th percentile is found by linear interpolation. The third portfolio, identified only as Portfolio C in Exhibit 13, had a return of 2.53 percent, and the fourth, Portfolio D, had a return of 2.49 percent. Reflecting the "0.75"

in "3.75," the return at the interpolated 25th percentile is below that of Portfolio C by three-quarters of the distance between the returns earned by Portfolio C and Portfolio D, respectively. Let us call r_{25} the value of the return at the 25th percentile. Then:

$$\begin{aligned} r_{25} &= 0.0253 - [0.75 \times (0.0253 - 0.0249)] \\ &= 0.0253 - 0.0003 \\ &= 0.025 = 2.50\% \end{aligned}$$

Through the same process of linear interpolation, we find that the return at the 75th percentile is 2.145 percent. With these values in hand, calculating the interquartile range is straightforward. It is the spread, or the arithmetic difference, between the returns at the 25th and the 75th percentiles. In the case of the German equity composite, the interquartile range is 2.5 percent minus 2.145 percent, or approximately 36 basis points (0.36 percent).

The interquartile range, then, represents the length of the interval containing the middle 50 percent of the data. Because it does not contain the extreme values, the interquartile range is not exposed to the risk of being skewed by outliers. However, prospective clients may be unfamiliar with the interquartile range as a measure of dispersion. When disclosing that interquartile range is the measure of internal dispersion used, as required by Provision I.4.A.8, firms might wish to include a definition of interquartile range. For instance, the disclosure might read, "The measure of internal dispersion of the returns for portfolios that were included in the composite for the full year is the interquartile range, the spread between portfolio returns at the 25th and 75th percentiles."

Note that the GIPS standards do not limit firms to using one of the measures of internal dispersion described earlier. A firm may prefer another way of expressing composite dispersion. The method chosen should, however, fairly represent the range of returns for each annual period.

The 2010 edition of the GIPS standards newly requires that firms present information about the historical variability of composite and benchmark returns. Specifically, Provision I.5.A.2.a states that, for periods ending on or after 1 January 2011, firms must present, as of each annual period end, the three-year annualized *ex post* standard deviation (using monthly returns) for the composite and the benchmark. The rationale is to give prospective clients an indication of the risk of an investment strategy as executed by the firms under consideration. Because all GIPS-compliant performance presentations include the same risk measure, and that measure is based upon historical experience rather than subjective inputs, the GIPS standards allow for some degree of comparability among firms that claim compliance.

However, standard deviation assumes that returns are normally distributed, and so it may not be the most suitable risk measure for every investment strategy. Accordingly, Provision I.5.A.2.b states that, if the firm determines that the three-year annualized *ex post* standard deviation is not relevant or appropriate, the firm must present an additional three-year *ex post* measure of risk for the composite and the benchmark. The periodicity of the composite and the benchmark must be identical; for instance, if the chosen measure of historical composite risk is calculated using monthly returns, then the equivalent measure of benchmark risk must also be based upon monthly returns.

For any performance presented for periods prior to 1 January 2000 that does not comply with the GIPS standards, the firm must disclose the periods of non-compliance (II.4.A.15). Firms may link non-compliant performance so long as only compliant returns are presented for periods beginning on or after 1 January 2000 (I.5.A.3).

The GIPS provisions for presentation and reporting state that returns for periods of less than one year must not be annualized (I.5.A.4). Extrapolating partial-year returns by annualizing them would amount to a prediction about investment results for the rest of the year.

In our discussion of composite construction (I.3.A.8) and required disclosures (I.4.A.23), we mentioned the practice of "carving out" or extracting performance data on a single segment included in a multiple-strategy portfolio for inclusion in a composite. A related presentation and reporting requirement exists. Under Provision I.5.A.5, for periods beginning on or after 1 January 2006 and ending prior to 1 January 2011, if a composite includes carve-outs, the presentation must include the percentage of composite assets that is composed of carve-outs as of the end of each annual period. The GIPS standards do not require firms to disclose what percentage of composite assets was composed of carve-outs for periods falling outside the 2006–2010 timeframe.

Another requirement of the GIPS standards for presentation and reporting addresses the inclusion of non-fee-paying portfolios in composites. We saw when discussing the requirements for composite construction that all actual, fee-paying, discretionary portfolios must be included in at least one composite. Provision I.3.A.1 goes on to state that non-fee-paying discretionary portfolios may be included in a composite (with appropriate disclosures).[28] For example, in the interest of public service or community relations, a firm might waive the investment management fee on a charitable organization's portfolio, or a firm might use its own or its principals' capital to implement a new investment strategy. Provision I.5.A.6 stipulates that if a composite contains any non-fee-paying portfolios, the firm must present, as of the end of each annual period, the percentage of the composite assets represented by the non-fee-paying portfolios. In addition, if a composite contains portfolios with bundled fees, firms must present as of the end of each annual period, the percentage of composite assets that are bundled-fee portfolios (I.5.A.7).

The "portability" of past performance is a complex and sometimes contentious subject, but Provision I.5.A.8 summarizes the conditions under which performance of a past firm or affiliation *must* be linked to or used to represent the historical performance of a new or acquiring firm. The conditions, which apply on a composite-specific basis, are that (1) substantially all the investment decision makers are employed by the new or acquiring firm, (2) the decision-making process remains substantially intact and independent within the new or acquiring firm, *and* (3) the new or acquiring firm has records that document and support the reported performance. If a GIPS-compliant firm acquires another firm or affiliation, the firm is given one year to bring any non-compliant assets into compliance.

Appendix A of the GIPS standards contains several sample GIPS-compliant performance presentations. We have included Sample 1 in Exhibit 15.

Exhibit 15 Sample Investment Firm Balanced Growth Composite 1 January 2002 through 31 December 2011

Year	Composite Gross Return (%)	Composite Net Return (%)	Custom Benchmark Return (%)	Composite 3-Yr Std Dev (%)	Benchmark 3-Yr Std Dev (%)	Number of Portfolios	Internal Dispersion (%)	Composite Assets ($M)	Firm Assets ($M)
2002	–10.5	–11.4	–11.8			31	4.5	165	236
2003	16.3	15.1	13.2			34	2.0	235	346
2004	7.5	6.4	8.9			38	5.7	344	529
2005	1.8	0.8	0.3			45	2.8	445	695
2006	11.2	10.1	12.2			48	3.1	520	839

28 Non-discretionary portfolios, on the other hand, cannot be included in a firm's composites under the GIPS standards.

Exhibit 15 (Continued)

Year	Composite Gross Return (%)	Composite Net Return (%)	Custom Benchmark Return (%)	Composite 3-Yr Std Dev (%)	Benchmark 3-Yr Std Dev (%)	Number of Portfolios	Internal Dispersion (%)	Composite Assets ($M)	Firm Assets ($M)
2007	6.1	5.0	7.1			49	2.8	505	1,014
2008	–21.3	–22.1	–24.9			44	2.9	475	964
2009	16.5	15.3	14.7			47	3.1	493	983
2010	10.6	9.5	13.0			51	3.5	549	1,114
2011	2.7	1.7	0.4	7.1	7.4	54	2.5	575	1,236

Sample 1 Investment Firm claims compliance with the Global Investment Performance Standards (GIPS®) and has prepared and presented this report in compliance with the GIPS standards. Sample 1 Investment Firm has been independently verified for the periods 1 January 2000 through 31 December 2010. The verification report is available upon request. Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards. Verification does not ensure the accuracy of any specific composite presentation.

Notes:

1. Sample 1 Investment Firm is a balanced portfolio investment manager that invests solely in US-based securities. Sample 1 Investment Firm is defined as an independent investment management firm that is not affiliated with any parent organization. Policies for valuing portfolios, calculating performance, and preparing compliant presentations are available upon request.
2. The Balanced Growth Composite includes all institutional balanced portfolios that invest in large-cap US equities and investment-grade bonds with the goal of providing long-term capital growth and steady income from a well-diversified strategy. Although the strategy allows for equity exposure ranging between 50–70%, the typical allocation is between 55–65%. The account minimum for the composite is $5 million.
3. The custom benchmark is 60 percent YYY US Equity Index and 40 percent ZZZ US Aggregate Bond Index. The benchmark is rebalanced monthly.
4. Valuations are computed and performance is reported in US dollars.
5. Gross-of-fees returns are presented before management and custodial fees but after all trading expenses. Composite and benchmark returns are presented net of non-reclaimable withholding taxes. Net-of-fees returns are calculated by deducting the highest fee of 0.83 percent from the monthly gross composite return. The management fee schedule is as follows: 1.00 percent on the first $25 million; 0.60 percent thereafter.
6. This composite was created in February 2000. A complete list of composite descriptions is available upon request.
7. Internal dispersion is calculated using the equal-weighted standard deviation of annual gross-of-fees returns of those portfolios that were included in the composite for the entire year.
8. The three-year annualized standard deviation measures the variability of the composite and the benchmark returns over the preceding 36-month period. The standard deviation is not presented for 2002 through 2010 because monthly composite and benchmark returns were not available, and is not required for periods prior to 2011.

3.13 Presentation and Reporting Recommendations

In addition to the requirements explained earlier, the GIPS standards include recommended practices in the presentation and reporting of investment results.

Provision I.5.B.1.a recommends that firms present gross-of-fees returns; that is, the return on investments reduced by **trading expenses** incurred during the period. It is fitting to reduce returns by trading expenses so as to take into account the firm's ability to execute a strategy efficiently. More or less directly comparable to benchmark returns, gross-of-fees returns are useful for prospective clients who wish to evaluate a firm's investment skill without regard to **investment management fees**, which may be negotiable, or **administrative fees**, which may not be under the manager's control.

(Administrative fees, defined as all fees other than trading expenses and the investment management fee, could include custody, accounting, auditing, consulting, performance measurement, and legal fees, among others. The GIPS standards recommend that gross-of-fees and net-of-fees returns not be reduced for administrative fees because these are typically outside the control of the firm.) Although investors only receive net-of-fees returns, gross-of-fees returns enable them to appraise a firm's investment results in comparison with an appropriate benchmark and to reach tentative conclusions about a firm's skill relative to other managers with similar strategies.

Provision I.5.B.2.a recommends that, in addition to the required annual returns, firms should present cumulative composite and benchmark returns for all periods. Cumulative returns are calculated by geometrically linking historical returns in accordance with Equation 2 (reprinted here for convenience).

$$r_{twr} = (1 + r_{t,1}) \times (1 + r_{t,2}) \times \ldots \times (1 + r_{t,n}) - 1$$

For instance, using Equation 2 and the data given in Exhibit 15, we find that the composite's cumulative gross-of-fees return was 40 percent and the cumulative benchmark return was 28.1 percent for the 2002–2011 period.

Recall that the GIPS standards require composite returns to be calculated on an asset-weighted basis (I.2.A.6). Provision I.5.B.2.b recommends that firms present equal-weighted mean and median returns for each composite. These composite returns may provide useful information to prospective clients, particularly if the required dispersion measure has been calculated on an equal-weighted basis.

The GIPS standards also recommend that performance presentations include returns for quarterly and/or monthly time periods (I.5.B.2.c). Relatedly, the GIPS standards recommend that GIPS-compliant presentations be updated quarterly (I.5.B.9).

The GIPS standards also recommend that annualized composite and benchmark returns be presented for periods longer than 12 months (I.5.B.2.d). (We have observed, of course, that returns for periods shorter than one year must *not* be annualized.) As expressed in Equation 14, annualized returns are calculated by taking the *n*th root of chain-linked returns, where *n* is the number of years in the period.

$$r_{ann} = \sqrt[n]{\left(1 + r_{t,1}\right) \times \left(1 + r_{t,2}\right) \times \ldots \times \left(1 + r_{t,N}\right)} - 1 \qquad \textbf{(14)}$$

For instance, the sample GIPS-compliant presentation shown earlier in this reading covers the 10-year period 2002 through 2011. Applying Equation 14 to the cumulative returns calculated above, we find that the annualized gross-of-fees return for the composite during that 10-year period was approximately 3.42 percent, and the annualized return for the benchmark during the same period was approximately 2.5 percent.

We saw earlier that, for periods ending on or after 1 January 2011, the GIPS standards require firms to present the annualized three-year *ex post* standard deviation of composite and benchmark returns. There are four related recommendations. Provision I.5.B.3 recommends that the same measures be presented for earlier annual periods. Provisions I.5.B.4–5 state that the corresponding annualized composite and benchmark total returns should be shown for each period the standard deviation is presented, and vice-versa. Provision I.5.B.6 recommends that firms present additional relevant composite-level *ex post* risk measures. In sum, the GIPS standards strongly advocate offering prospective clients relevant quantitative information they can use to evaluate the riskiness of the investment strategy represented by a composite.

We saw when reviewing the provisions related to disclosure that, for any non-compliant performance presented for periods prior to 1 January 2000, firms are required to disclose the periods of non-compliance (I.4.A.15). The GIPS standards recommend that firms comply for all historical periods (I.5.B.8). This recommendation does not relieve firms of the requirement to add annual performance on an ongoing

basis to build a ten-year compliant track record. Indeed, Provision I.5.B.7 states that firms should present more than ten years of annual performance in the compliant presentation.

3.14 Introduction to the Real Estate and Private Equity Provisions

The GIPS standards include provisions for real estate and private equity, two major asset classes with distinctive characteristics. In general, the main sections of the GIPS standards apply to real estate and private equity as well; however, the GIPS standards include certain exceptions to the main provisions and set forth separate, additional requirements and recommendations for these two asset classes as defined.

Real estate and private equity investments can be structured in many different ways. The GIPS standards specify the types of investments that are *not* considered real estate. Publicly traded real estate securities (such as real estate investment trusts, or REITs) and mortgage-backed securities are subject to the general provisions rather than to the real estate provisions of the GIPS standards. Also excluded from the real estate provisions are private debt investments, including commercial and residential loans, where the expected return is solely related to contractual interest rates without any participation in the economic performance of the underlying real estate. The GIPS Glossary complements this definition by listing the types of investments that *are* considered real estate, namely, investments in wholly or partially owned properties; commingled funds, property unit trusts, and insurance company separate accounts; unlisted, private placement securities issued by private real estate investment trusts (REITs) and real estate operating companies (REOCs); and equity-oriented debt (e.g., participating mortgage loans) or any private interest in a property where some portion of return to the investor at the time of investment is related to the performance of the underlying real estate.

Similarly, the **private equity** provisions pertain to private equity investments made by fixed life, fixed commitment vehicles, including **primary fund vehicles** (which make direct investments rather than investing in other fund vehicles), **funds of funds** (which predominately invest in **closed-end funds** and may opportunistically make direct investments), and **secondary fund vehicles** (which buy interests in existing fund investment vehicles). A closed-end fund, as defined in the GIPS Glossary for purposes of the real estate and private equity provisions, is a type of investment vehicle where the number of investors, total **committed capital**, and life are fixed; it is not open for subscriptions and/or redemptions.[29] Private equity **open-end** or **evergreen** funds, which allow for ongoing investment and redemptions, remain subject to the main provisions in Sections 0–5 in Chapter I of the GIPS standards.

The real estate and private equity provisions were first included in the GIPS standards in 2005 and became effective 1 January 2006.[30] Unless otherwise stated, the following requirements and recommendations are effective 1 January 2011. Real estate investing and private equity investing are highly specialized areas of expertise, and the GIPS standards governing them are necessarily complicated. In the following sections of this reading, we will consider the principal concepts of the real estate and private equity provisions. However, this discussion is not an exhaustive treatment of these complex topics.

29 There are special provisions for real estate closed-end funds.

30 Firms must not link non-GIPS-compliant real estate performance for periods beginning on or after 1 January 2006 to their GIPS-compliant performance (I.6.A.15). Firms must not present non-GIPS-compliant private equity performance for periods ending on or after 1 January 2006 (I.7.A.28). Any performance presented for periods ending prior to 1 January 2006 that does not comply with the GIPS standards must be disclosed in accordance with Provisions I.6.A.11 and I.7.A.20.

3.15 Real Estate Provisions

Fair values are central to calculating returns on real estate assets, and accordingly the GIPS standards for input data[31] and disclosures[32] include provisions related to valuation procedures. For periods beginning on or after 1 January 2011, firms must value real estate investments in accordance with the definition of fair value and the GIPS Valuation Principles (I.6.A.1); for earlier periods, firms must value real estate investments at market value as defined in the 2005 edition of the GIPS standards. Firms are not required to determine the value of real estate assets as frequently as they must value portfolios composed of more-liquid (non real estate) securities in accordance with the main sections of the GIPS standards. For periods prior to 1 January 2008, real estate investments must be valued at least once every 12 months. For periods beginning on or after 1 January 2008, real estate investments must be valued at least quarterly, and for periods beginning on or after 1 January 2010 they must be valued as of each quarter end or the last business day of each quarter (I.6.A.2–3).

In the absence of transactions, however, managers' internal estimates of values may be based on subjective assumptions. Accordingly, the GIPS standards require firms to have valuations conducted periodically by independent, credentialed experts. Specifically, provision I.6.A.4 states that for periods prior to 1 January 2012, real estate investments must have an external valuation at least once every 36 months. For periods beginning on or after 1 January 2012, real estate investments must have an external valuation at least once every 12 months unless client agreements stipulate otherwise; in that case, they must have an external valuation at least every 36 months (or more frequently if required by the client agreement).

Provision I.6.A.5 goes on to state that external valuations must be performed by an independent external **professionally designated, certified, or licensed commercial property valuer/appraiser**. In markets where specialists with appropriate credentials are unavailable, the firm must take steps to ensure that it uses only well-qualified, independent property valuers or appraisers. Common-sense steps might include considering the appraiser's pertinent experience in the local market with the kind of properties to be independently valued. In accordance with the real estate provisions on presentation and reporting, firms must present as of each annual period end, the percentage of composite assets valued using an external valuation during the annual period (I.6.A.16.b).

The GIPS standards also include rate-of-return calculation requirements[33] for real estate. For periods beginning on or after 1 January 2006, portfolio returns after the deduction of actual **transaction expenses** incurred during the period must be calculated at least quarterly (I.6.A.6–7). For real estate (and private equity) return calculations, the gross-of-fees return is the return on investments reduced by any transaction expenses incurred during the period. Transaction expenses include all actual legal, financial, advisory, and investment banking fees related to buying, selling, restructuring, and/or recapitalizing portfolio investments as well as any trading expenses. As with the main provisions of the GIPS standards discussed earlier in this reading, the net-of-fees return is the gross-of-fees return reduced by investment management fees. For periods beginning on or after 1 January 2011, **income returns** and **capital returns** (known as component returns) must be calculated separately using geometrically linked time-weighted rates of return (I.6.A.8). Composite and

31 The following input data provisions do not apply to real estate: I.1.A.3.a, I.1.A.3.b, I.1.A.4, and I.1.B.1.
32 The following disclosure provisions do not apply to real estate: I.4.A.5, I.4.A.6, I.4.A.15, I.4.A.26, I.4.A.33, and I.4.A.34.
33 The following calculation methodology provisions do not apply to real estate: I.2.A.2.a, I.2.A.4, and I.2.A.7.

component returns must be calculated by asset-weighting the individual portfolio returns at least quarterly (I.6.A.9). Let us now discuss the concept of component returns in greater detail.

The GIPS standards require that compliant presentations for real estate composites include time-weighted component returns in addition to total returns, and component returns must be clearly identified as gross-of-fees or net-of-fees (I.6.A.14). The two components of real estate total returns are income returns and capital returns. Component returns provide information about the source of the total return. Generally, "core" real estate strategies derive most of their total return through income returns, "opportunistic" strategies derive most of their total return through capital returns, and "value-added" strategies derive their total return through both income and capital returns.

A firm may choose to present in compliant presentations total returns that are gross-of-fees, net-of-fees, or both. Likewise, a firm may choose to present in compliant presentations component returns that are gross-of-fees, net-of-fees, or both. If a firm chooses to present only gross-of-fees total returns in the compliant presentation, then the firm should also present gross-of-fees component returns. If a firm chooses to present only net-of-fees total returns in the compliant presentation, then the firm should also present net-of-fees component returns. If a firm chooses to present both gross-of-fees and net-of-fees total returns in the compliant presentation, the firm at a minimum should present gross-of-fees component returns.

Component returns are typically calculated utilizing information from the accounting records that tracks income/expense and capital gain/loss (realized and unrealized appreciation/depreciation) amounts separately. The sum of the income and capital amounts is reflected in the numerator of the total return calculation as described below.

Real estate portfolio accounting, including valuation, is usually performed internally on a quarterly basis, and, therefore, both portfolio and composite returns are typically calculated quarterly. For any given quarter, the sum of the income and capital component returns will equal the total return, with any differences solely due to rounding. The GIPS standards require that firms must calculate real estate portfolio returns at least quarterly (I.6.A.6). However, some firms calculate portfolio returns monthly for some or all of their real estate composites. In these instances, the sum of the monthly income and capital component returns will equal the monthly total return, but this relationship will not hold for the quarterly returns calculated using three geometrically linked monthly returns. See further discussion later. The typical return formulas utilized by real estate firms to calculate component and total returns are depicted later in this section for informational purposes. The GIPS standards allow flexibility in choosing the calculation methodology, which means that firms may use alternative formulas, provided the calculation method chosen represents returns fairly, is not misleading, and is applied consistently. The calculation of component returns should be the same for all real estate portfolios within a composite.

In an earlier section of this reading, we discussed the definition of "discretion" under the main sections of the GIPS standards. The GIPS provisions for disclosure associated with real estate performance presentations require firms to provide a description of discretion (I.6.A.10.a). Real estate portfolios are considered discretionary if the firm has sole responsibility or sufficient decision-making authority for major investment decisions.

Among other disclosure requirements, performance presentations for real estate investments must include disclosures about the methods and frequency of valuations. These requirements are set forth in Provisions I.6.A.10.b–e. In each real estate compliant presentation, firms must disclose the internal valuation methodologies used to value real estate investments for the most recent period. For example, among other conventional approaches, the firm might capitalize the income generated by a property, using an income capitalization rate imputed or "extracted" from the market

based on the net operating income and sale prices of similar properties; or the firm might base the valuation of the subject property directly on the reported sale prices of comparable nearby properties, with adjustments to reflect differences in the properties' location, features, or condition.[34] For periods beginning on or after 1 January 2011, firms must disclose material changes to valuation policies and/or methodologies and any material difference between an external valuation and the valuation used in performance reporting, along with the reason for the difference. Firms must also disclose the frequency of independent, external valuations by appropriately credentialed valuers or appraisers. The GIPS Valuation Principles, which are discussed later in this reading, include additional requirements and recommendations specifically related to real estate investments.

For periods beginning on or after 1 January 2006, the effective date of the real estate provisions, firms must not link non-GIPS-compliant performance to their GIPS-compliant performance (I.6.A.15).[35] For any performance presented for periods prior to 1 January 2006 that does not comply with the GIPS standards, firms must disclose the periods of non-compliance (I.6.A.11).

It is important to note that GIPS Provision I.5.A.1.a–h, as discussed earlier in Section 3.12 of this reading, applies to real estate composite compliant performance presentations.

The real estate presentation and reporting provisions also stipulate that each compliant performance presentation of a composite that includes more than five portfolios must contain a specific measure of internal dispersion, namely, the high and low annual time-weighted rate of return for the individual portfolios in the composite (I.6.A.16.a).

In addition to the foregoing requirements, the GIPS standards include recommendations pertaining to real estate input data, disclosures, and presentation and reporting. For periods prior to 1 January 2012, real estate investments should be externally valued by an independent, professionally credentialed property valuer or appraiser at least once every 12 months, and external valuations should be as of the end of the annual period (I.6.B.1–2). Firms should also disclose the basis of accounting for the portfolios in the composite, for instance, US Generally Accepted Accounting Principles (GAAP) or International Financial Reporting Standards (IFRS), and they should disclose and explain material differences, as of the end of each annual period, between the valuations used in performance reporting, on one hand, and financial reporting, on the other (I.6.B.3–4). The GIPS standards further recommend that for periods prior to 1 January 2011 firms should disclose material changes to valuation policies and/or methodologies (I.6.B.5). The GIPS standards recommend that firms present both gross-of-fees and net-of-fees returns, the percentage of the total value of composite assets that are not real estate, as defined, at the end of each annual period, and component returns of the benchmark, if available (I.6.B.6–8).

The 2010 edition of the GIPS standards contain further requirements and recommendations for real estate closed-end fund composites, including provisions related to calculation methodology. In addition to time-weighted rates of return, firms must calculate annualized **since inception internal rates of return (SI-IRR)** using quarterly cash flows at a minimum (I.6.A.17–18). We will encounter SI-IRR again in connection with the private equity provisions, where it is also a required element.

An internal rate of return is the discount rate that sets an investment's net present value equal to zero; expressed another way, it is the discount rate that equates the present value of an investment's cost with the present value of its benefits. The cost is the capital the client invests; the benefits are the distributions the client receives

34 These and other appraisal techniques are explained in Shilling (2002).

35 The following presentation and reporting provisions do not apply to real estate: I.5.A.1.i, I.5.A.2, I.5.A.3, I.5.B.3, I.5.B.4, and I.5.B.5.

plus the investment's value at the end of the measurement period. Mathematically, we calculate the annualized internal rate of return from the value of r that solves the following equation:

$$V_0 = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{V_N}{(1+r)^N} \tag{15}$$

where V_0 represents the initial investment (the beginning value), the terms CF_1, CF_2, and so on represent interim cash flows, and V_N represents the ending value. For simplicity, Equation 15 assumes equally spaced end-of-period cash flows. In this formula, r is a subperiod return; when annualized, it is the internal rate of return.

Of course, the investor may make more than one capital contribution. With attention to the direction (the sign) of the cash flows, we can restate the equation for the internal rate of return as follows:

$$\sum_{i=0}^{N} \frac{CF_i}{(1+r)^i} = 0 \tag{16}$$

where CF_i is the cash flow for the period i and N is the total number of periods. In Equation 16, a negative CF_i represents a net cost or outflow to the investor and a positive CF_i represents a net distribution or inflow to the investor; CF_0 and CF_N incorporate V_0 and V_N, respectively, in Equation 15. This formulation accommodates multiple contributions or capital calls (cash inflows to the portfolio) and distributions (cash outflows from the portfolio) over the entire inception-to-date timeframe. By setting the sum of the present values of cash inflows and outflows equal to zero, the equation effectively defines r as the discount rate that makes the present value of the cost equal the present value of the benefits.

An example may make the calculation more clear. Let us consider the investment from the perspective of a client who funds the real estate portfolio and receives benefits in the form of cash distributions during the measurement period and ownership of fairly valued assets as of the end of the period. For this example, Exhibit 16 shows the timing and amount of the quarterly cash flows. The portfolio's real estate assets are valued as of the end of the second year, so the since-inception performance measurement period is eight quarters.

Exhibit 16 Data for an IRR Calculation

	Date	Quarter	Amount
Initial investment	31 December Year 0	0	–$150,000
Additional investment	30 June Year 1	2	–$100,000
Distribution received	31 March Year 2	5	$12,665
Distribution received	30 September Year 2	7	$11,130
Ending value	31 December Year 2	8	$274,300

The client's experience can be expressed graphically, as in Exhibit 17, with the ending value reflected as a cash flow. Note that in some periods, no cash flows occur.

Exhibit 17

Using the data in Exhibit 16 as inputs to Equation 16, we find through an iterative trial-and-error process that the quarterly discount rate r is approximately 2.53 percent. Exhibit 18 validates this result. The present value factor applied to each cash flow is $1/(1 + r)^i$, where r is the discount rate and i is the sequential number of the subperiod. For instance, the present value factor applied to the cash distribution of $12,665 paid out on 31 March of Year 2, the fifth quarter, is

$$\frac{1}{(1 + 0.0253)^5} = 0.88256$$

Exhibit 18 shows that 2.53 percent is the quarterly discount rate that sets the sum of the present values of the cash flows from inception through the end of the measurement period equal to zero. The GIPS real estate provisions require us to annualize the since-inception internal rate of return. To annualize a return that was computed on a quarterly basis, we calculate $(1 + r)^4 - 1$, so the SI-IRR earned in this example is 10.51 percent.

Exhibit 18 Demonstration that the Computed IRR is Correct

Date	Cash Flow	Period	Present Value Factor (r = 2.53%)	Present Value
31 December Year 0	–150,000	0	1	–150,000
30 June Year 1	–100,000	2	0.95126	–95,126
31 March Year 2	12,665	5	0.88256	11,178
30 September Year 2	11,130	7	0.83954	9,344
31 December Year 2	274,300	8	0.81883	224,605
Total (does not equal zero due to rounding)				1

As noted, firms must use quarterly cash flows at a minimum in calculating the SI-IRR for closed-end real estate fund composites. In other words, CF_i must reflect the net cash flow for a period no longer than a quarter. (It is recommended in Provision I.6.B.9 that daily cash flows be used in calculating SI-IRR). Firms must disclose the frequency of cash flows used in the SI-IRR calculation (I.6.A.21).

The GIPS provisions for composite construction require closed-end real estate fund composites to be defined by **vintage year** as well as investment mandate, objective, or strategy, and to keep the composite definition consistent throughout the life of the composite (I.6.A.19). The vintage year is useful information for prospective clients who wish to establish the comparability of different composites. There is a related disclosure requirement: Firms must disclose the vintage year of the composite and how the vintage year is defined (I.6.A.22). The GIPS Glossary mentions two methods of determining the vintage year: 1) the year of the investment vehicle's first drawdown or capital call from its investors; and 2) the year when the first committed capital from outside investors is closed and legally binding.

The provisions related to presentation and reporting for real estate closed-end funds require firms to present the composite's net-of-fees SI-IRR through the end of each annual period.[36] For periods beginning on or after 1 January 2011, when the initial period is less than a full year, firms must present the net-of-fees SI-IRR through the end of the initial annual period; in this case, the SI-IRR must not be annualized. For periods ending on or after 1 January 2011, firms must present the net-of-fees SI-IRR through the composite's **final liquidation date**. (I.6.A.23.) Firms must also disclose the final liquidation date for liquidated composites (I.6.A.20).

Firms must also present the SI-IRR of the benchmark as of each annual period end. In addition to reflecting the composite's investment mandate, objective, or strategy, the benchmark must have the same vintage year and be presented for the same time period as the composite (I.6.A.26). Given that the benchmark SI-IRR must be presented, firms may also find it advantageous to present the composite's gross-of-fees SI-IRR. However, if shown, the gross-of-fees SI-IRR of the composite must be presented for the same period of time the net-of-fees SI-IRR is presented (I.6.A.24).[37]

Firms are required to present information about the financial history and status of real estate closed-end funds as of the end of each period. Specifically, they must present the composite's cumulative **committed capital** (the capital pledged to the investment vehicle), since-inception **paid-in capital** (the amount of committed capital that has been drawn down), and since-inception **distributions**. Firms must also report certain multiples or ratios for each annual period presented. One of them is the ratio of **total value** to since-inception paid-in capital (**TVPI**, also called the **investment multiple**). TVPI provides information about the value of the composite relative to its cost basis. For the purpose of the TVPI calculation, total value can be determined by adding since-inception distributions to date to the end-of-period **residual value**. Firms must also report the ratio of since-inception distributions to since-inception paid-in capital (**DPI**, also called the **realization multiple**); the ratio of since-inception paid-in capital to committed capital (the **PIC multiple**); and the ratio of residual value to since-inception paid-in capital (**RVPI**, also called the **unrealized multiple**). These requirements are set forth in Provision I.6.A.25.

Please see Appendix A of the GIPS standards for a sample real estate closed-end fund composite compliant performance presentation.

---

36 Firms must initially present at least five years of performance (or performance from the firm's inception or the composite's inception date if they have been in existence less than five years), and must present an additional year of performance each subsequent year. Please note that this requirement for real estate closed-end fund composites is in addition to the requirement to calculate time-weighted rates of return that adjust for external cash flows, and presenting such returns in a composite compliant performance presentation as required by Provision I.5.A.1.a

37 Please note that Provisions I.4.A.29-31 are not scoped out for real estate or private equity and so these disclosures are required, if applicable.

3.16 Private Equity Provisions

The GIPS provisions for private equity use technical terms that may be unfamiliar to the performance measurement generalist. Although considerably simplified for brevity, an overview of the private equity investment process may facilitate understanding of the GIPS standards' requirements and recommendations.

Let us take for an example a venture capital fund organized as a **limited partnership**, one of many investment structures used in the private equity market. A venture capital firm identifies an emerging industry, develops the fund concept, and secures commitments from investors who pledge to pay in a certain amount of capital over a certain period of time, often three to five years. In this structure, a venture capital firm will serve as **general partner**, and the investors will be **limited partners**. The general partner screens early stage companies' business plans, identifies the most promising enterprises, and conducts in-depth analysis and due diligence on the quality of their management, the legal status of their intellectual property rights, and the prospective demand for their products, among many other factors. The general partner then negotiates deals with the companies that pass scrutiny and places capital calls drawing down the limited partners' committed capital for investment in the portfolio companies. There may be multiple capital calls to meet each company's cash requirements in accordance with the terms of the deal. As the fund matures, the general partner harvests the portfolio companies (for instance, by taking them public) and distributes the proceeds to the limited partners. With this background in mind, let us turn to the GIPS provisions for private equity.

There are two provisions related to input data.[38] For periods ending on or after 1 January 2011, private equity investments must be valued in accordance with the definition of fair value and the GIPS Valuation Principles,[39] and they must be valued at least annually (I.7.A.1–2). We will discuss the GIPS Valuation Principles in a later section of this reading.

The GIPS private equity provisions related to calculation methodology[40] state that firms must calculate annualized since-inception internal rates of return (SI-IRR)[41] and that, for periods ending on or after 1 January 2011, the SI-IRR must be calculated using daily cash flows; for earlier periods, either daily or monthly cash flows may be used. Distributions of stock must be included as cash flows and valued at the time of distribution (I.7.A.3–4).

All private equity returns must be calculated after the deduction of actual **transaction expenses** incurred during the period, and net-of-fees returns must be net of actual investment management fees including **carried interest**, representing the profits on the investments of the investment vehicle that general partners are allocated (I.7.A.5–6). All private equity fund of fund returns must be net of all underlying partnership and/or fund fees and expenses, including carried interest (I.7.A.7).

The private equity provisions for composite construction[42] state that composite definitions must remain consistent throughout the life of the composite (I.7.A.8). Primary fund vehicles must be included in at least one composite defined by vintage year and investment mandate, objective, or strategy (I.7.A.9). Funds of funds must be included in at least one composite defined by vintage year of the fund of funds and/or investment mandate, objective, or strategy. (I.7.A.10).

---

38 The following input data provisions do not apply to private equity: I.1.A.3.a, I.1.A.3.b, I.1.A.4, and I.1.B.1.

39 For earlier periods, private equity investments must be valued according to either the GIPS Private Equity Valuation Principles in the 2005 edition of the GIPS standards or the GIPS Valuation Principles in the 2010 edition of the GIPS standards.

40 The following calculation methodology provisions do not apply to private equity: I.2.A.2, I.2.A.4, I.2.A.6, I.2.A.7, and I.2.B.2.

41 We explained the SI-IRR calculation in connection with the real estate provisions.

42 The following composite construction provisions do not apply to private equity: I.3.A.10 and I.3.B.2.

Specific disclosure requirements[43] also apply for private equity. Firms must disclose the vintage year of each composite, how the vintage year is determined, and, where applicable, the **final liquidation date** (I.7.A.11–12). As one might expect, there are disclosure requirements pertaining to the valuation of private equity investments. Firms must disclose their private equity valuation methodologies for the most recent period and, for periods ending on or after 1 January 2011, they must disclose any material changes to valuation policies and/or methodologies (I.7.A.13-14); disclosing such changes is recommended for earlier periods (I.7.B.4). If the firm adheres to any industry valuation guidelines in addition to the GIPS Valuation Principles, it must disclose which guidelines have been applied. (I.7.A.15). The GIPS Valuation Principles, which are explained later in this reading, set forth additional requirements and recommendations specifically related to valuing private equity investments.

There are also disclosure requirements related to calculations of private equity composite returns. If daily cash flows are not used in the SI-IRR calculation for periods prior to 1 January 2011, then firms must disclose the frequency of the cash flows that are used (I.7.A.17); recall that the SI-IRR must be calculated using either daily or monthly cash flows for periods prior to 1 January 2011. Firms must also disclose the periods of non-compliance when presenting non-GIPS-compliant SI-IRR for periods ending prior to 1 January 2006 (I.7.A.20). Similarly to disclosure requirements of the main provisions of the GIPS standards, for gross-of-fees returns firms must disclose if any other fees are deducted in addition to transaction expenses, and for net-of-fees returns they must disclose if any fees other than transaction expenses and investment management fees are deducted (I.7.A.18–19).

Firms must disclose the calculation methodology used for the benchmark. Firms that choose to present a composite's **public market equivalent** (PME) as a benchmark must disclose the index used in calculating it. (I.7.A.16.) In this approach to benchmarking, firms apply the composite's external cash flows to a hypothetical investment that earns the returns of a capital market index. By replicating the timing and amount of composite cash flows in a PME, firms can calculate the internal rate of return of a benchmark to which the composite's SI-IRR is comparable.

Having reviewed the requirements for input data, calculation methodology, composite construction, and disclosure, we are in position to address the GIPS provisions for private equity presentation and reporting.[44] Firms must present, and clearly identify, both the gross-of-fees and the net-of-fees SI-IRR of the composite through the end of each annual period. Firms must initially present at least five years of performance (or, if fewer than five years, performance from the firm's inception or the composite inception date), and each subsequent year they must present an additional year of performance. For periods beginning on or after 1 January 2011, when the initial period is shorter than a full year, firms must present the non-annualized gross-of-fees and net-of-fees SI-IRR through the initial annual period end. For periods ending on or after 1 January 2011, firms must present the gross-of-fees and net-of-fees SI-IRR through the composite's final liquidation date. (I.7.A.21.) Firms must also present the SI-IRR of the benchmark through the end of each annual period; in addition to representing the composite's investment mandate, objective, or strategy, the benchmark must be the same vintage year and presented for the same time period as the composite (I.7.A.24). Firms must not present non-GIPS-compliant SI-IRR for periods ending on or after 1 January 2006 (I.7.A.28).

43 The following disclosure provisions do not apply to private equity: I.4.A.5, I.4.A.6.a, I.4.A.6.b, I.4.A.8, I.4.A.15, I.4.A.26, I.4.A.32, I.4.A.33, and I.4.A.34.

44 The following presentation and reporting provisions do not apply to private equity: I.5.A.1.a, I.5.A.1.b, I.5.A.1.c, I.5.A.1.d, I.5.A.1.e, I.5.A.1.i, I.5.A.2, I.5.A.3, I.5.B.2, I.5.B.3, I.5.B.4, and I.5.B.5.

Several requirements apply specifically to private equity fund of fund composites. First, for periods ending on or after 1 January 2011, if a fund of funds composite is defined only by its investment mandate, objective, or strategy,[45] then firms must also present, as of the most recent annual period, the SI-IRR of the underlying investments aggregated by vintage year as well as other measures that are required by provision I.7.A.23 (see below). These measures must be presented gross of the fund of funds investment management fees and must be presented as of the most recent annual period end (I.7.A.22). Second, if fund of funds composite is defined only by its investment mandate, objective, or strategy, and a benchmark is presented for the underlying investments, the benchmark must reflect the same mandate, objective, or strategy and have the same vintage year as the underlying investments (I.7.A.25). Third, for periods ending on or after 1 January 2011, firms must present the percentage, if any, of fund of funds composite assets that is invested in direct investments (rather than fund vehicles) as of each annual period end (I.7.A.26). It is recommended but not required that this percentage be presented for earlier periods (I.7.B.6).

For periods ending on or after 1 January 2011, firms must present the percentage of primary fund vehicle composite assets that is invested in fund investment vehicles (rather than in direct investments) as of the end of each annual period (I.7.A.27). It is recommended but not required that the same percentage be presented for earlier periods (I.7.B.7).

For all private equity composites, firms must present, as of each annual period end, the cumulative committed capital, since-inception paid-in capital, and since-inception distributions. In addition, firms must present the following ratios: total value to since-inception paid-in capital (known as the investment multiple or TVPI); since-inception distributions to since-inception paid-in capital (called the realization multiple or DPI); since-inception paid-in capital to cumulative committed capital (the PIC multiple); and residual value to since-inception paid-in capital (the unrealized multiple or RVPI) (I.7.A.23.). These ratios were mentioned earlier in connection with real estate closed-end fund composites.

Finally, there are some recommendations that we have not previously mentioned. Private equity investments should be valued at least quarterly; for periods ending prior to 1 January 2011, the SI-IRR should be calculated using daily cash flows; and firms should disclose and explain material differences between the valuations used in performance reporting and the valuations used in financial reporting as of each annual period end (I.7.B.1–3).

Just as with real estate investing, the intricacies of performance presentation in compliance with the GIPS provisions for private equity reflect this field's complexity. Of necessity, the introductory treatment given the subject here does not address many nuances or special circumstances that the practitioner may encounter. Further information about these specialized asset classes may be found in the GIPS Guidance Statements on Real Estate and Private Equity, both of which are available on the GIPS website (www.gipsstandards.org).

3.17 Wrap Fee/Separately Managed Account (SMA) Provisions

Wrap fee portfolios, also known as separately managed accounts (SMAs), are typically managed by investment management firms serving as sub-advisors to a sponsor who acts as the client's investment advisor. The sponsor charges the client a single **bundled**

45 On the other hand, if the fund of funds composite is defined only by vintage year of the fund of funds, it is recommended but not required that firms present, for periods ending on or after 1 January 2011, the SI-IRR of the underlying investments aggregated by investment mandate, objective, or strategy, along with the other measures listed in provision I.7.A.23. These measures should be gross of the fund of funds investment management fees (I.7.B.5.).

fee which combines fees for various services such as investment management, trading, custody, and administrative functions. Such arrangements create complexities that are specifically addressed by the provisions of the GIPS standards governing the presentation of wrap fee/SMA performance.

The GIPS standards for wrap fee portfolios or separately managed accounts apply to wrap fee/SMA performance presentations to existing and prospective wrap fee/SMA sponsors and prospective wrap fee/SMA clients if they present results for periods beginning on or after 1 January 2006. Furthermore, these provisions apply to portfolios where there are bundled fees and a sponsor serves as an intermediary between an investment firm that claims to comply with the GIPS standards and the end user of the investment services. They do not apply to other types of bundled fee arrangements, nor are they applicable to model or overlay portfolios unless the firm has discretion to manage the actual individual portfolios.

The wrap fee/SMA provisions *supplement* the required and recommended provisions of the GIPS standards, that is to say, they are in addition to the fundamentals of compliance; the provisions for input data, calculation methodology, composite construction, disclosure, and presentation and reporting; and, if applicable, the provisions for real estate and private equity. Of special importance in this context is the requirement to capture and maintain all data and information necessary to support all items included in a compliant presentation (I.1.A.1); recognizing that wrap fee/SMA portfolios are subject to the same level of verification as all other portfolios, firms may have to choose between relying upon the sponsor's performance calculations and engaging in shadow accounting[46] to track the wrap fee/SMA portfolios in their own performance measurement system. Also pertinent is the requirement to calculate returns after the deduction of the actual trading expenses incurred during the measurement period (I.2.A.4). We saw earlier that, if the actual trading expenses cannot be identified and segregated from a bundled fee, returns must be reduced by the entire bundled fee or the portion of the bundled fee that includes the trading expenses (I.2.A.5.a–b). We also made note of disclosure and presentation requirements pertaining to composites that contain portfolios with bundled fees: Firms must disclose the types of fees that are included in the bundled fee (I.4.A.24) and present the percentage of composite assets represented by portfolios with bundled fees as of the end of each annual period (I.5.A.7).

The first provision set forth in the wrap fee/SMA section of the GIPS standards has to do with composite construction. Provision I.8.A.1 requires firms to include the performance record of actual wrap fee/SMA portfolios in appropriate composites in accordance with the firm's established portfolio inclusion policies (discussed in Section 3.9 earlier in this reading). Once established, the portfolios containing wrap fee/SMA portfolios must be used in the firm's compliant presentations to prospective wrap fee/SMA clients.

IMPLEMENTATION (11)

Defining Composites. Firms may have both wrap fee/SMA portfolios and non-wrap fee/SMA portfolios that are managed in accordance with the same investment strategy. In this case, they must decide at the outset whether to include all of them in the same composite for performance presentations to non-wrap fee/SMA prospects or to define a separate composite that only contains the non-wrap fee/SMA portfolios. If they choose to include both types of portfolios in the same composite, their performance presentation will show larger composite assets. However, if they are unable to break out actual trading

46 In the present context, a sub-advisory firm that engages in "shadow accounting" independently maintains a parallel set of portfolio accounting records to serve as the basis for calculating and presenting investment performance.

expenses from the sponsor's bundled fee, then they must reduce the wrap fee/SMA portfolio returns by the entire amount of the bundled fee or the portion of the bundled fee that includes trading expenses. This may have a competitively disadvantageous result: A composite that contains both kinds of portfolio is likely to have lower gross-of-fees and net-of-fees returns than the composite would have if it only contained non-wrap fee/SMA portfolios. Firms must consider the trade-off between higher assets and lower returns when defining composites for non-wrap fee/SMA portfolios.

There are several disclosure-related provisions that apply to wrap fee/SMA composite presentations. For all compliant presentations that include periods before an actual wrap fee/SMA portfolio was included in the composite, the firm must disclose for each period that the composite does not contain actual wrap fee/SMA portfolios (I.8.A.2). In addition, for any performance presented for periods prior to 1 January 2006 that does not comply with the GIPS standards, firms must disclose the periods of non-compliance (I.8.A.3). Additional disclosure requirements pertaining to sponsor-specific performance presentations are explained below.

When firms present performance to prospective wrap fee/SMA clients, the composite must include all wrap fee/SMA portfolios, regardless of the sponsor, that are managed according to the composite's investment mandate, objective, or strategy. In other words, firms must present "style-defined" composites to prospective wrap fee/SMA clients (I.8.A.5.). Moreover—and this is a key requirement—when firms present performance to prospective wrap fee/SMA clients, they must present the performance net of the *entire* wrap fee (I.8.A.6). This provision applies regardless of the nature of the services covered by the wrap fee.

The GIPS standards distinguish between style-defined composites that contain wrap fee/SMA portfolios, described in the preceding paragraph, and sponsor-specific wrap fee/SMA composites. Whether to report its investment results or to win additional business, a firm that serves as sub-advisor to a wrap fee/SMA sponsor may wish to prepare a GIPS-compliant performance presentation that includes only the sponsor's wrap fee/SMA portfolios—in other words, a performance presentation of a sponsor-specific composite. When doing so, firms must disclose the name of the sponsor (I.8.A.4.a) and, if the purpose of the presentation is to generate wrap fee/SMA business and does *not* include performance net of the entire wrap fee, the firm must disclose that the sponsor-specific presentation is only for the use of the named sponsor (I.8.A.4.b). The intent of the last-mentioned provision is to discourage sponsors from redistributing purportedly GIPS-compliant performance presentations to prospective wrap fee/SMA clients without reducing returns by the entire wrap fee.

Finally, firms must not link non-GIPS-compliant performance for periods beginning on or after 1 January 2006 to their GIPS-compliant wrap fee/SMA performance (I.8.A.7).

4 GIPS VALUATION PRINCIPLES

The GIPS standards are based on the ethical principles of fair representation and full disclosure. Recalling how rates of return are calculated, it is almost trivially apparent that meaningful performance measurement presupposes the validity of beginning and ending asset values. During the global financial crisis of 2008–2009, however, when market prices were unavailable for many hard-to-value securities, the investment industry and the accounting profession gave renewed attention to the issue of valuation. The International Accounting Standards Board (IASB), the Financial Accounting Standards Board (FASB), and others re-examined the notions

of fair value and market value, and studied the problem of valuing assets in inactive markets. The GIPS Valuation Principles were developed in consideration of the work done by these organizations. Effective 1 January 2011, the GIPS standards require firms to apply a fair value methodology following the definition and requirements we are about to summarize.

The GIPS standards define fair value as the amount at which an investment could be exchanged in a current arm's length transaction between willing parties in which the parties each act knowledgeably and prudently. (In this context, the phrase "arm's length" describes a transaction in which the parties are unrelated and acting in their own interests.) The valuation must be determined using the objective, observable, unadjusted quoted market price for an identical investment in an active market on the measurement date if this price is available;[47] otherwise, the valuation must reflect the firm's best estimate of the market value. Fair value must include accrued income. (II.A, Fair Value Definition.)

In delineating the valuation requirements, the GIPS standards restate provisions and, in some cases, clarify the applicability of provisions we have described earlier. For periods beginning on or after 1 January 2011, portfolios must be valued in accordance with the definition of fair value and the GIPS Valuation Principles (I.1.A.2). Firms must comply with all applicable laws and regulations regarding the calculation and presentation of performance (I.0.A.2) and, if a compliant presentation conforms with laws and regulations that conflict with the requirements of the GIPS standards, firms must disclose and describe the conflict (I.4.A.22). Accordingly, firms must comply with applicable laws and regulations relating to valuation, and when there is a conflict they must disclose it (II.B.3-4). Firms must document their policies and procedures and apply them consistently (I.0.A.5); this requirement entails documenting and adhering to their valuation policies, procedures, methodologies, and hierarchy (and any changes to them). Firms must disclose that policies for valuing portfolios, calculating performance, and preparing compliant presentations are available upon request (I.4.A.12). For periods beginning on or after 1 January 2011, firms must disclose the use of subjective, unobservable inputs for valuing portfolio investments if the investments thus valued are material to the composite (I.4.A.27), and they must disclose if a composite's valuation hierarchy materially differs from the recommended hierarchy in the GIPS Valuation Principles (I.4.A.28).

We have referred several times to the GIPS standards' recommended valuation hierarchy, which firms should incorporate into their valuation policies and procedures on a composite-specific basis. Articulated in Section C of the GIPS Valuation Principles, it is a hierarchy in the strong sense that, if the inputs described at one stage are unavailable or inappropriate, then firms should proceed to the next stage. As we have indicated, investments *must* be valued using objective, observable, unadjusted quoted market prices for identical investments in active markets on the measurement date. If such prices are not available, then investments *should* be valued using objective, observable, quoted market prices for similar investments in active markets.

If such prices are unavailable or inappropriate, investments *should* be valued using, in descending order, the bases spelled out in Provision II.C.1:

1. Quoted prices for identical or similar investments in markets that are not active.
2. Market-based inputs other than quoted prices that are observable for the investment.
3. Subjective, unobservable inputs.

47 This requirement is reiterated in item II.B.2 in the GIPS Valuation Principles.

The GIPS Valuation Principles clarify that inactive markets include those in which there are few transactions for the investment, the prices are not current, or price quotations vary substantially over time and/or between market makers. Unobservable inputs reflect the firm's assumptions about the assumptions market participants would use in pricing the investment—assumptions about assumptions. They should be developed based on the best information available in the circumstances.

IMPLEMENTATION (12)

Valuation Policies and Procedures. Firms may enter transactions involving a wide range of financial instruments, including derivative securities, in many different markets. It is fitting, therefore, that the GIPS standards not only require firms to document their valuation policies, procedures, methodologies, and hierarchies but also recommend that the valuation hierarchies be composite-specific. Normally, for investment strategies that employ plain-vanilla securities trading in robust markets, quoted prices are readily available. Other composites, however, may represent strategies that materially make use of securities that trade infrequently in relatively illiquid markets where values must be imputed or estimated. Real estate and private equity are obvious examples, but valuing investments in swaps, options, and other derivatives that are tied to underlying securities uniquely issued by specific companies may prove problematic, especially if the firm cannot refer to recent transactions in identical or similar assets. Implementing the GIPS standards offers firms an opportunity to re-examine their valuation policies, procedures, and methodologies and to define valuation hierarchies reflecting the characteristics of the securities held in each composite and the markets in which the composite strategy is executed. For assets that are valued using quantitative models, it is useful to list input factors such as discount rates and risk-adjusted cash flow projections and to review the basis for estimating them. Portfolio managers, security analysts, quantitative analysts, and traders should participate in these discussions. Once established, the valuation policies must be documented, followed consistently, and made available to prospective clients upon request.

The GIPS standards also set forth additional requirements pertaining to real estate valuations. Recalling that real estate investments must have an external valuation (I.6.A.4), the GIPS Valuation Principles further require that the external valuation process adhere to practices of the relevant valuation governing and standard-setting body (II.B.10). The GIPS Valuation Principles also state that the firm *must not* use external valuations where the valuer's or appraiser's fee is contingent upon the appraised value (II.B.11). Clearly, such financial arrangements would incentivize the appraiser to inflate the asset's value. The GIPS Valuation Principles proceed to restate other requirements, chiefly having to do with disclosures, that we mentioned in the section on real estate investing earlier. They also include, however, some additional recommendations. Although appraisal standards may allow for a range of estimated values, the GIPS standards recommend that a single value be obtained from external valuers or appraisers because only one value is used in performance reporting (II.C.6). It is also recommended that the external appraisal firm be rotated every three to five years (II.C.7).

Similarly, the GIPS Valuation Principles restate private equity disclosure requirements that we discussed earlier in this reading and add another requirement: The valuation methodology selected must be the most appropriate for a particular investment based on the nature, facts, and circumstances of the investment (II.B.17). There is also a recommendation having to do with private equity valuations that we have not previously mentioned. The following considerations should be incorporated into the

valuation process: (a) the quality and reliability of the data used in each methodology; (b) the comparability of enterprise or transaction data; (c) the stage of development of the enterprise; and (d) any additional considerations unique to the enterprise (II.C.12).

Fair representation means developing and adhering to policies and procedures designed to determine asset values as accurately as possible. Full disclosure means documenting those policies and providing the valuation-related information required by the GIPS standards—and, optimally, the recommended information as well—so that prospective investors can evaluate the reported performance and have a greater degree of confidence in the performance information presented to them.

GIPS ADVERTISING GUIDELINES

5

A firm may wish to claim that it complies with the GIPS standards in advertisements that do not accommodate a compliant performance presentation. For instance, space may be limited, or the creative design and marketing message may not call for communicating investment results in full. To address this need, the GIPS standards include requirements which apply to firms that already satisfy all the requirements of the GIPS standards on a firm-wide basis and claim compliance with the GIPS standards in an advertisement. Firms that choose to claim compliance in an advertisement must either follow the GIPS Advertising Guidelines—for convenience, we will refer to them as "the Guidelines" in this section—or include a compliant presentation in the advertisement.

The Guidelines do not replace the GIPS standards, nor do they in any way exempt firms from providing compliant presentations as the GIPS standards require. Here as elsewhere, in cases where there is a conflict between applicable laws or regulations and the requirements of the GIPS standards, firms must comply with the law or regulation. If an advertisement conforms with legal and/or regulatory requirements that conflict with the GIPS standards and/or the Guidelines, firms must disclose this fact and disclose the manner in which they conflict (III.B.13).

For the purpose of the Guidelines, advertisements include any written or electronic materials addressed to more than one prospective client, whether in newspapers, magazines, firm brochures, letters, media, websites, or any other written or electronic material addressed to more than one prospective client. Under this definition, "one-on-one" presentations and individual client reports are not considered advertisements. This rule applies on a relationship basis. Presentations and reports to a single prospective or existing client are not considered advertisements despite the fact that a number of people may be in attendance, such as a board of trustees or the members of an investment committee. The Guidelines pertain to any written material disseminated more broadly to retain existing clients or solicit new clients.

IMPLEMENTATION (13)

Communicating the GIPS Advertising Guidelines. Applying the Guidelines affects the work of marketing and other departments that may be unfamiliar with the GIPS standards. The firm's performance practitioners might conduct an educational session or workshop to present the Guidelines and discuss implementation with the marketing department, including copywriters and graphic designers, and with other areas of the firm including the firm's legal and compliance experts. Here are some suggestions to facilitate the discussion:

- Explain that the GIPS standards are ethical standards for fair representation and full disclosure of investment performance.

- Describe in general terms the sections included within the GIPS standards (fundamentals of compliance, input data, calculation methodology, composite construction, disclosures, presentation and reporting, real estate, private equity, and verification, as well as advertising).
- Explain how the firm is defined.
- Distribute the firm's list of composite descriptions.
- Explain how advertisements are defined for the purpose of the Guidelines.
- Explain the relationship between applicable laws and regulations and the GIPS standards, including the Guidelines.
- Present the requirements and recommendations of the Guidelines in detail as they apply to advertisements in which the firm claims compliance with the GIPS standards and (1) does or (2) does not present performance.
- Review the sample advertisements provided in Appendix B of the 2010 edition of the GIPS standards.
- Explain how other information can be used in advertisements.
- Reach agreement on compliance review procedures for new advertising materials. Because information used in advertisements that are subject to the Guidelines must be taken or derived from GIPS-compliant performance presentations, it is advisable for both a legal or compliance professional, and a member of the performance measurement group to approve new advertising materials.

All advertisements that state a claim of compliance must include a definition of the firm and information about how to obtain a compliant presentation and/or a list of the firm's composite descriptions (III.B.1–2). The required wording of the GIPS compliance statement for advertisements is: "[Name of firm] claims compliance with the Global Investment Performance Standards (GIPS®)." (III.B.3).

All advertisements that not only state a claim of compliance, but also present performance, must disclose further information as detailed below, and the relevant information must be taken or derived from a compliant presentation. The required information includes, among other elements, the composite description (III.B.4), an indication whether performance is shown gross of fees, net of fees, or both (III.B.6), and the currency used to express returns (III.B.10). In advertisements presenting performance information for periods prior to 1 January 2000 that does not comply with the GIPS standards, firms must disclose the periods of non-compliance (III.B.12).

Advertisements that state a claim of compliance *and present performance* must also present one of the following sets of total returns:

a one-, three-, and five-year annualized composite returns through the most recent period;

b period-to-date composite returns in addition to one-, three-, and five-year annualized composite returns through the same period of time as presented in the corresponding compliant presentation; or

c period-to-date composite returns in addition to five years of annual composite returns calculated through the same period of time as presented in the corresponding compliant presentation.

If the composite has been in existence for less than five years, firms must also present the corresponding returns since the composite inception date. Under option (a), for instance, if the composite has been in existence for four years, the firm must present the composite's annualized one-year, three-year, and four-year returns. Whichever alternative is chosen, the period-end date must be clearly identified and returns for less than one year must not be annualized. These requirements are set forth in Provision III.B.5.a–c.

Advertisements asserting a claim of compliance with the GIPS standards must also disclose the benchmark description (III.B.8) and present the benchmark total returns for the same periods as those for which composite performance is presented in the advertisement. The benchmark used in the advertisement must be the same benchmark presented in the corresponding compliant presentation. (III.B.7.) If the firm determines no appropriate benchmark for the composite exists, it must disclose why no benchmark is presented (III.B.9).

In advertisements stating compliance with the GIPS standards and presenting performance, firms must also disclose the presence, use, and extent of leverage, derivatives, and short positions, if material, including a description of the frequency of use and the characteristics of the instruments sufficient to identify risks (III.B.11).

Firms may also include other information in advertisements that are subject to the Guidelines, provided it is not given greater prominence than the required information and it does not conflict with the GIPS standards and/or the Guidelines. The Guidelines emphasize that firms must adhere to the principles of fair representation and full disclosure when advertising, and they must not present performance or performance-related information that is false or misleading.

Appendix B in the 2010 edition of the GIPS standards provides sample advertisements which adhere to the requirements of the Guidelines.

VERIFICATION

6

Verification may be informally and unofficially characterized as a process in which an independent expert assesses a firm's policies and procedures for constructing composites and calculating and presenting performance in light of the requirements of the GIPS standards.[48] Verification is intended to provide the firm and the users of its performance presentations greater confidence in its claim of compliance with the GIPS standards. Verification does not ensure the accuracy of any particular composite presentation. However, in addition to making the claim of compliance on a firm-wide basis more credible, the verification process may benefit the firm in other ways: increased knowledge in the performance measurement team, consistently higher quality of performance presentations, improved internal processes and procedures, and potential marketing advantages. Above all, verification supports the guiding principles of fair representation and full disclosure of investment performance.

The GIPS standards strongly encourage firms to undergo **verification**. Chapter IV of the GIPS standards reviews the scope and purpose of verification and sets forth the minimum procedures that verifiers must follow prior to issuing a **verification report** to the firm. The verification procedures attempt to strike a balance between ensuring the quality, accuracy, and relevance of performance presentations and minimizing the cost to firms.

IMPLEMENTATION (14)

Selecting a Verification Firm. Verification is a major undertaking, and it is crucial for the investment management firm to choose an independent verifier whose resources match the firm's needs. At the outset of the selection process, the investment management

48 The GIPS Glossary defines verification as "a process by which an independent verifier assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards."

firm approaching verification should consider the scope of its operations and the nature of its products. The requirements of a large investment management organization with a presence in markets around the world will differ from those of a firm operating in only a single country. Similarly, a hedge fund manager, a manager who engages in real estate or private equity investing, a quantitatively oriented manager whose investment strategies rely heavily on the use of derivative securities, or a manager who manages tax-aware portfolios for individuals may have more specialized requirements than a manager who manages funds for tax-exempt institutions such as pension plans and charitable foundations. These factors should be communicated to potential verifiers and reflected in the selection criteria.

Some organizations have standard request-for-proposal templates that can be adapted for specific purposes. The RFP should include a description of the issuing organization and a statement on the scope of the project. Firms investigating verifiers' qualifications might consider conducting an internet search and initially asking RFP respondents for the following information:

- A description of the verification firm, including its history, ownership, and organizational structure; a description of the performance-related services it offers; and a representative list of verification assignments completed indicating the nature of the investment management firm verified (e.g., "institutional trust division of a regional bank").
- An explanation of the firm's approach to project management, sampling, and testing.
- The roles and biographies, including professional designations, of the verifiers who will be assigned to this project.
- Client references, including contact details, and information about the number of clients added and lost over some period of time (for instance, the last three years).
- The verification firm's fees.
- A preliminary project plan setting forth the major tasks and estimated timeframes for completion of the verification.

The reader is also referred to "Suggested Questions to Ask Prospective Verification Firms," a paper published by the former Investment Performance Council (IPC). This resource, which is *not* considered a part of the GIPS standards, is available on the GIPS standards website (www.gipsstandards.org).

Understanding the scope and purpose of verification, as described in Chapter IV.A of the GIPS standards related to verification, is vitally important. Verification, which must be performed by a qualified and independent[49] third party (IV.A.1), assesses whether (a) the firm has complied with all composite construction requirements of the GIPS standards on a firm-wide basis and (b) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards (IV.A.2). A verification report must opine that the firm meets these two criteria, and a firm must not state that it has been verified unless a verification report has been issued (IV.A.5). A single verification report is issued with respect to the whole firm; verification cannot be carried out on a composite and, accordingly, does not provide assurance about the investment performance of any specific composite. The GIPS standards stress that firms must not state or imply that a particular composite has been "verified." (IV.A.3.) A firm that is verified (as evidenced by a verification report) may additionally choose to have a detailed performance examination conducted on one or more specific composites, and it may state that a composite has been examined *if* a performance examination report has been issued for the specific composite (IV.C).

49 The GIPS Guidance Statement on Verifier Independence defines the term *independence* in the context of verification and addresses potential independence issues. It is available on the GIPS standards website.

The minimum initial period for which verification can be performed is one year, or from the firm's inception date through the period-end if that timeframe is less than one year. The GIPS standards recommend that verification cover all periods for which the firm claims compliance (IV.A.4).

We have seen that a firm that does not meet all the requirements of the GIPS standards may not claim compliance; the firm must not represent that it is in compliance with the GIPS standards "except for" certain requirements (I.0.A.6). We have seen, too, that firms must document their policies and procedures for establishing and maintaining compliance with the GIPS standards (I.0.A.5), and they must capture and maintain all data and information necessary to support all items included in a compliant presentation (I.1.A.1). After conducting the required verification procedures summarized below, however, a verifier may conclude that the firm is not in compliance with these or other requirements of the GIPS standards. In such situations, the verifier must provide a statement to the firm explaining why a verification report cannot be issued. The GIPS standards clearly state that a verification report must not be issued when the verifier knows that the firm is not in compliance with the GIPS standards or the records of the firm cannot support a verification (IV.A.8).

In setting forth the scope and purpose of verification, the GIPS standards address the question whether verifiers can rely upon the work of others. As part of the basis for an opinion, a principal verifier may accept the work of another verifier. The principal verifier may also choose to rely on the audit and/or internal control work done by an independent, qualified, reputable third party or by the verification firm itself. However, when deciding whether to rely on the work of another independent third party, the principal verifier must assess the qualifications, competency, objectivity, and reputation of the other party as well as the scope of that party's work, including the time period, and the results of the procedures that were performed. In addition, the principal verifier must document the considerations taken into account in reaching a conclusion about the reliability of the other party's work. The GIPS standards instruct principal verifiers to exercise professional skepticism when making this decision (IV.A.6.)

Because verification is conducted on a firm-wide basis, verifiers must subject the entire firm to testing. (In applying this rule, verifiers may take two factors into account. First, as noted earlier, with due deliberation verifiers may place reliance on work performed by another qualified and reputable independent third party. Second, the GIPS standards allow for verifiers to perform "appropriate alternative control procedures.") However, verifiers may use a sampling methodology to conduct the required firm-wide testing. The minimum factors to be considered when selecting sample portfolios include the number of composites at the firm, the number of portfolios in each composite, and the type of composites. In addition, verifiers must minimally take into account the total assets under management, the internal control structure at the firm, the number of years under examination, the computer applications used to calculate performance and to construct and maintain composites, the method of calculating performance, and whether the firm uses external performance measurement services. The selection of sample accounts for testing is a critical step in the verification process. If the verifier encounters errors or discovers that the firm's record-keeping is deficient, a larger sample or additional verification procedures may be warranted (IV.A.7.)

Chapter IV.A, Scope and Purpose of Verification, has one more requirement: The verification report must state that the verification has been conducted in accordance with the required verification procedures (IV.A.9), to which we now turn. Chapter IV.B, Required Verification Procedures, sets forth the minimum procedures that must be followed.

Under the heading "pre-verification procedures," the GIPS standards describe what is initially required of verifiers. Specifically, verifiers must understand all the requirements and recommendations of the GIPS standards, including any updates, Guidance Statements, interpretations, Questions & Answers (Q&As), and clarifications published by CFA Institute and the GIPS Executive Committee. In addition, verifiers must be knowledgeable about laws and regulations regarding the calculation and presentation of performance, and they must consider any differences between these laws and regulations and the GIPS standards. Equipped with the foregoing expertise, verifiers must learn about the firm, including its corporate structure and how it operates, and they must understand the firm's policies and procedures for complying with all applicable requirements and adopted recommendations of the GIPS standards. It is emphasized that verifiers must not only obtain a copy of the firm's GIPS-related policies and procedures but also ensure that all applicable policies and procedures are properly included and adequately documented. Finally, verifiers must understand the policies, procedures, and methodologies the firm uses to value portfolios and compute investment performance. (IV.B.1.a–e.)

IMPLEMENTATION (15)

Preparing for Verification. The investment management firm undertaking verification should gather the following information. The verifiers may use this information to prepare a fee estimate and a project plan, and they will need it in the course of the review.

- Information about the firm, including its corporate structure and the types of investment product it manages.
- Sample performance presentations and marketing materials.
- *All* of the firm's performance-related policies, such as the firm's definition of discretion, the sources, methods, and review procedures for asset valuations, the time-weighted rate-of-return calculation methodology, the treatment of external cash flows, the computation of composite returns, the correction of errors, etc.
- The complete list of composite descriptions.
- Composite definitions, including benchmarks and the criteria for including portfolios.
- A list of all portfolios under management.
- A list of all the portfolios that have been in each composite during the verification period, the dates they were in the composites, and documentation supporting any changes to the portfolios in the composites.

The verifiers will require the investment management agreements and investment policy statements for selected portfolios and historical portfolio- and composite-level performance data for sampling and testing. The items listed above represent a good start; other information requirements will come to light in the course of the verification.

Having summarized the prerequisites, let us describe some of the verification procedures. Verifiers must perform sufficient procedures to determine that the firm satisfies certain fundamental requirements. They must determine that the firm has been and remains appropriately defined; total firm assets are appropriately calculated and disclosed; the firm's list of composite descriptions is complete; the firm's definition of discretion has been consistently applied over time; and the firm's policies and procedures for ensuring the existence and ownership of client assets are appropriate and have been consistently applied. They must also determine that the firm has defined and maintained composites in compliance with the GIPS standards; the firm's policies and procedures for creating and maintaining composites have been consistently applied; all actual, fee-paying, discretionary portfolios are included in at

least one composite; all portfolios are included in their respective composites at all times, and no portfolios that belong in a particular composite have been excluded; and the composite benchmark reflects the investment mandate, objective, or strategy of the composite (IV.B.2.a.i–x.)

Verifiers must review selected portfolios to determine that the treatment of certain input data is consistent with the firm's policies. The GIPS standards specifically identify the classification of portfolio flows (for example, receipts, disbursements, dividends, interest, fees, and taxes) as one such item. Verifiers must perform sufficient procedures to determine that the treatment of the following items is consistent with the firm's policy: income, interest, and dividend accruals and receipts; taxes, tax reclaims, and tax accruals; purchases, sales, and the opening and closing of other positions; and accounting treatment and valuation methodologies for investments, including derivatives (IV.B.2.d.i–v.)

We have already stressed that verification does not provide assurance that specific composite returns are correctly calculated and presented. Nonetheless, testing the firm's performance-related calculations is an important element of the verification process. Verifiers must determine that the firm has calculated and presented performance in accordance with the firm's policies and procedures. In so doing, they must recalculate rates of return for selected portfolios and confirm that a return formula that meets the requirements of the GIPS standards is used. Fees and expenses must be treated in conformity with the GIPS standards and the firm's policies and procedures. Verifiers must also take a sample of composite and benchmark calculations to determine the accuracy of all required numerical data such as risk measures and internal dispersion. In addition, if a custom benchmark or a combination of multiple benchmarks is used, verifiers must take a sample of the firm's benchmark data to determine that the calculation methodology has been correctly applied and the data used are consistent with the benchmark disclosure in the compliant presentation (IV.B.2.e.i–iii.)

In order to validate the discretionary status of portfolios, verifiers must obtain a list of all portfolios, select portfolios for review, and perform sufficient procedures to determine that the selected portfolios are appropriately classified as discretionary or non-discretionary. In making this determination, verifiers will refer to the firm's policies and procedures related to investment discretion and the selected portfolios' investment management agreements and/or investment guidelines (IV.B.2.b.)

Testing the construction and maintenance of composites is central to the verification process. To this end, verifiers must obtain lists of all open portfolios, including both new and existing ones, and of all closed portfolios for all composites for the periods under verification. They must select portfolios from these lists and conduct sufficient procedures to determine that the selected portfolios' investment mandate, objective, or strategy (as appropriately documented, for example, by the investment management agreement, investment guidelines, and/or portfolio summary) is consistent with the composite definition. They must further determine that portfolios are completely and accurately included in composites by tracing selected composites from the investment management agreement and/or investment guidelines to the composites and vice-versa. Verifiers must also determine that portfolios sharing the same investment mandate, objective, or strategy are included in the same composite, and that the timing of portfolios' inclusion in and exclusion from composites is in accordance with the firm's policies and procedures. Finally, verifiers must determine that portfolios' movements from one composite to another are appropriate and consistent with the redefinition of the composite or documented changes to the investment mandate, objective, or strategy (IV.B.2.c.i–vi.) Verifiers must review a sample of composite presentations to ensure that they include all the required information and disclosures. Moreover, the information and disclosures must be consistent with the firm's documented policies and procedures, the firm's records, and the results of the verifier's procedures (IV.B.2.f.)

Finally, under the GIPS standards, verifiers must maintain sufficient information to support all procedures performed in support of the verification report, including all significant judgments made and conclusions reached by the verifier. As part of the supporting documentation, verifiers must obtain a representation letter from the firm confirming that policies and procedures used in establishing and maintaining compliance with the GIPS standards are as described in the firm's documents and have been consistently applied throughout the periods being verified. The representation letter must confirm that the firm complies with the GIPS standards for the periods being verified, and it must also contain any other specific representations made to the verifier during the course of the verification engagement (IV.B.2.g–h.)

We have remarked that verification alone, without a specifically focused performance examination, does not ensure that any particular presentation of composite performance meets the requirements of the GIPS standards or represents investment results fairly, completely, and accurately. However, a verification report issued by a verifier who meets or exceeds the minimum requirements summarized above lends additional credibility to the firm's claim of compliance with the GIPS standards.

7 OTHER ISSUES

We have finished reviewing the 2010 edition of the GIPS standards. In this part of the reading, we will introduce after-tax performance measurement issues and comment on ways to keep informed about future developments affecting the application of the GIPS standards.

7.1 After-Tax Return Calculation Challenges

The GIPS standards do not require compliant firms to present after-tax returns for composites made up of portfolios managed on a tax-aware basis. Many firms engage in investment management on behalf of taxable institutions, individuals, and family offices, however, and they market tax-aware strategies to prospective clients. The interaction of complex regional tax codes with clients' varied circumstances and objectives not only renders tax-aware investing extremely arduous but also complicates performance measurement. In this section, we will discuss major issues surrounding after-tax performance evaluation and present fundamental concepts for after-tax return calculations. Although country-specific tax regulations vary widely, some principles of after-tax performance measurement apply universally.

In writing this section, we consulted the GIPS Guidance Statement for Country-Specific Taxation Issues, among other sources. However, in the interest of fully acknowledging and maintaining a unified, global standard, the GIPS Executive Committee decided to remove this tax-related guidance from the GIPS standards and to transfer responsibility for country-specific provisions and/or guidance to the GIPS country sponsors. Firms that comply with the GIPS standards were encouraged to provide after-tax returns to prospective clients, but effective 1 January 2011, all after-tax performance reporting presented as part of a compliant presentation will be supplemental information and, as such, it will be subject to the requirements and recommendations of the GIPS Guidance Statement on the Use of Supplemental Information.

Let us first consider certain theoretical aspects and practical factors that make valid after-tax performance measurement, analysis, and evaluation problematic.

The timeframe in which estimated tax liabilities are assumed to be realized affects the after-tax rate of return. A pre-liquidation calculation method takes into account only the taxes realized during the measurement period. That is, the before-tax return

is reduced by the taxes associated with investment income earned and gains and losses realized during the period. This calculation may understate the tax effect, however, because it does not recognize any tax liability or benefit for unrealized gains and losses embedded in the portfolio's ending value. Although the securities in the portfolio are subject to future price-driven changes in value, and the tax-aware portfolio manager will take advantage of opportunities to offset gains with losses and to defer taxes, the preliquidation method entirely disregards the prospective tax effects that may result from the portfolio's currently unrealized capital gains and losses. In other words, the pre-liquidation method effectively assumes that unrealized capital gains are untaxed.[50]

Another calculation method, the mark-to-liquidation method, assumes that all taxes on unrealized gains are immediately payable as of the end of the measurement period. This method may overstate the tax effect, however, because in addition to disregarding future value changes affecting the actual tax liability, it neglects the time value of money. Portfolios are generally managed on an ongoing basis, and in the normal course of events, taxable gains and losses will be realized as securities are sold, and the proceeds distributed or reinvested, at an indeterminate pace over the planning horizon.

For analytical purposes, we may derive potentially useful information from estimating the timing and amount of future tax assessments over suitably extended periods.[51] Such estimates of the portfolio's "true economic value," however, necessarily rest on debatable assumptions about future returns, among other parameters, and at present no generally accepted guidelines exist for modeling prospective tax outcomes in a manner that ensures the methodological comparability warranted for performance reporting. After-tax returns calculated in accordance with the pre-liquidation and mark-to-liquidation methods are meant to reflect actual before-tax results achieved during the measurement period rather than projected investment experience. Given the known deficiencies of these latter methods, however, the prospective client must interpret after-tax returns with care.

We have seen that the historical cost of securities held in a portfolio is irrelevant to before-tax performance measurement, where assets are valued at fair value and no distinction is made between realized and unrealized gains and losses. The taxable cost basis of portfolio investments is used, however, in determining tax liabilities for the purpose of after-tax return calculations. In addition, different tax regulations and rates may apply depending on the length of the holding period and the types of securities held. Clients' anticipated tax rates—the tax rates that guide the portfolio manager's investment decisions—also vary, contingent on such factors as their level of income and the tax jurisdictions to which they belong. As a practical matter, therefore, substantially more extensive input data must be captured and managed to support reasonable after-tax performance calculations.[52]

Not only is calculating after-tax portfolio returns intricate, selecting or devising appropriate after-tax performance benchmarks is also difficult. Valid before-tax benchmarks have certain properties. Among other attributes, they are unambiguous, investable, measurable, specified or agreed upon in advance, and consistent with the investment strategy or style of the portfolio or composite. After-tax benchmarks should have all the desirable properties of suitable before-tax benchmarks, and one more: They should additionally reflect the client's tax status.

---

50 See Poterba (1999).

51 Stein (1998) proposes a method for estimating a "full cost equivalent" portfolio value. Horan, Lawton, and Johnson (2008) define an after-tax performance measurement methodology that discounts future after-tax cash flows at an appropriate tax-adjusted and risk-adjusted discount rate.

52 From an implementation perspective, the input data requirements and after-tax return calculation methodology have significant implications for the development or selection of portfolio accounting and performance measurement systems. See Rogers and Price (2002) and Simpson (2003).

Financial services firms publish capital market indexes representing a wide range of investment strategies and styles. Some providers calculate index returns net of withholding taxes on dividends, but at this writing none have published index returns fully reflecting imputed effects of taxation. Conceptually, given information on the constituent securities or the price and income return components, investment management firms could adjust reported before-tax index results to construct an after-tax benchmark. Adjusting standard before-tax indexes is easier said than done, however. The adjustment methodology would have to incorporate the provider's rules for constructing and rebalancing the original index (e.g., whether it is equal weighted, capitalization weighted, or float weighted), the taxable turnover of securities held in the index, and issuers' corporate actions such as stock splits, as well as security-specific dividend and interest payments and price changes. A firm might formulate some simplifying assumptions to lessen the data requirements and reduce the computational intensity introduced by these factors.[53]

Alternatives to modifying standard before-tax indexes include using mutual funds or exchange-traded funds as benchmarks, or developing customized shadow portfolios. Mutual funds and exchange-traded funds benchmarked to capital market indexes are imperfect benchmarks because they are subject to fees, and their returns may deviate from those of the indexes they emulate. The tax liabilities of mutual funds are affected by the portfolio manager's security transactions and by the collective deposit and redemption activities of shareholders. Exchange-traded funds likewise have turnover, but they do not incur taxes as a result of other investors' actions, so they may be better suited as benchmarks for after-tax performance evaluation.

Nonetheless, the investment management firm seeking a valid after-tax benchmark must address the fact that any one particular client's tax experience depends not only on the rates at which the investment income and capital gains are taxed but also the cost of the securities and the sequence of cash flows in the portfolio. The firm that uses custom security-based benchmarks for performance evaluation is well positioned to simulate the tax impact of external cash flows on benchmark results. Firms that use standard indexes for before-tax performance evaluation can simulate the effect of client-specific cash flows on estimated after-tax benchmark returns by assuming that the benchmark pays proportionately the same capital gains taxes for withdrawals as the actual portfolio and invests contributions at the cost basis of the index at the time the contribution is made.[54] Alternately, firms can use mutual funds or exchange-traded funds to build shadow portfolios in which simulated purchases and sales are triggered by client-initiated cash flows. These approaches, however, are also data and computation intensive. Moreover, a customized shadow portfolio that works well for a single portfolio is unlikely to be useful for a composite made up of multiple client portfolios. Constructing valid benchmarks remains one of the greatest challenges in after-tax performance evaluation.

We have observed that performance measurement attempts to quantify the value added by a portfolio manager's investment actions. Because managers should not be held accountable for factors beyond their control, the GIPS standards exclude non-discretionary portfolios from composites and prescribe time-weighted returns to eliminate the impact of external cash flows. Portfolio managers may be compelled to liquidate securities to meet client-directed withdrawals, however, and taxes may be realized as a result of the non-discretionary asset sales. Firms may wish to make an adjustment to remove the tax effect of non-discretionary capital gains. In effect, the adjustment adds back the hypothetical realized taxes that were not incurred at

53 Stein, Langstraat, and Narasimhan (1999) suggest a method to approximate after-tax benchmark returns.
54 Price (2001) presents three increasingly accurate levels of approximation in constructing after-tax benchmarks from pretax indexes and describes the "shadow portfolio" approach to adjusting indexes for client-specific cash flows.

the manager's discretion.[55] To avoid creating a perverse incentive for the portfolio manager to maximize the adjustment credit by selecting highly appreciated assets for sale, the adjustment term should reflect the capital gains tax that would be sustained if all the securities in the portfolio were proportionately liquidated.

There is another situation in which client actions affect after-tax returns (in this case, favorably). The client may instruct a portfolio manager to realize tax losses to offset gains realized either within the portfolio or in other assets held outside the portfolio. For the client, such "tax loss harvesting" reduces his tax liability on net capital gains. This practice is entirely consistent with the fundamental wealth management principle that investors should consider all their assets when making investment decisions. For the portfolio manager who has realized gains or who handles only a portion of the client's assets, however, the non-discretionary directive to harvest tax losses improves reported after-tax results. Firms should disclose the percentage benefit of tax-loss harvesting for the composite if realized losses are greater than realized gains during the period. This suggestion implicitly assumes that tax benefits not used within the portfolio in the measurement period can be used outside the portfolio or in the future. The wealth benefit derived from tax-loss harvesting may be computed by applying the appropriate capital gains tax rate to the net losses realized in the period; the percentage benefit may be calculated by dividing the money benefit by the simple average assets in the portfolio.

With this, we conclude the introduction to after-tax return calculations for individual portfolios. It is evident even from this abbreviated, non-mathematical presentation that after-tax performance measurement requires considerable expertise as well as extensive data and powerful technological resources, particularly when advancing from the portfolio to the composite level. After-tax performance measurement and analysis is both a science and an art: "The *'scientific'* aspects are manifested in the discrete requirements and details, while the *'artisanal'* aspects recognize that cash flows, substantial unrealized capital gains, and composite definitions can have a significant impact on after-tax results." Supplemental information, including tax efficiency measures not presented here, can materially assist prospective clients in evaluating a firm's after-tax performance record.

7.2 Keeping Current with the GIPS Standards

At the beginning of this reading, we surveyed the evolution of performance presentation standards, marking as particularly noteworthy events the publication of Peter Dietz's work in 1966 and the report of the Financial Analysts Federation's Committee for Performance Presentation Standards in 1987. The Global Investment Performance Standards are now fairly comprehensive and well-defined, the integrated product of thoughtful contributions from many academicians and practitioners committed to the ethical ideals of fair representation and full disclosure in reporting investment results. The revised GIPS standards issued in 2010 represent a significant advance in the globalization of performance presentation norms.

Nonetheless, the GIPS standards will continue to evolve over time to address additional aspects of performance presentation. Firms that claim compliance must meet all applicable requirements, including not only the provisions of the GIPS standards but also any updated information, Guidance Statements, interpretations, Questions & Answers (Q&As), and clarifications published by CFA Institute and the GIPS Executive Committee which are available on the GIPS standards website. Practitioners should visit the GIPS standards website frequently in order to stay informed about existing

55 Price (1996) presents the logic and implications of this adjustment factor.

and new requirements and recommended best practices. CFA Institute and other organizations also offer publications and conduct conferences and workshops designed to help practitioners implement and maintain compliance with the GIPS standards.

SUMMARY

The Global Investment Performance Standards meet the need for globally accepted standards for investment management firms in calculating and presenting their results to clients and potential clients. This reading has made the following points:

- The GIPS standards are ethical standards that promote fair representation and full disclosure of an investment firm's performance history.
- The GIPS standards were created and funded by CFA Institute (formerly known as the Association for Investment Management and Research, or AIMR) with the participation of many experts and local sponsorship from numerous industry groups. The GIPS Executive Committee is the governance body responsible for developing and interpreting the GIPS standards.
- The GIPS standards include provisions for fundamentals of compliance, input data, calculation methodology, composite construction, disclosure, presentation and reporting, real estate, private equity, and wrap fee/Separately Managed Account (SMA) along with valuation principles, advertising guidelines, and verification requirements.
- Only investment management firms can claim compliance with the GIPS standards. The GIPS standards must be applied on a firm-wide basis, and a firm may claim compliance only when it has satisfied all the requirements of the GIPS standards.
- Accrual accounting must be used for all assets that accrue interest income, and for periods beginning on or after 1 January 2005, trade-date accounting must be used. For periods beginning on or after 1 January 2011, all portfolios must be valued in accordance with the definition of fair value and the GIPS Valuation Principles.
- Firms must calculate total returns that include returns from cash and cash equivalents and are reduced by actual trading expenses. For periods beginning on or after 1 January 2005, if a firm uses approximated rates of return, it must adjust them for daily-weighted external cash flows. For periods beginning on or after 1 January 2010, firms must value portfolios on the date of all large external cash flows.
- Large external cash flows can substantially distort the accuracy of estimated returns when markets are volatile. The GIPS standards require firms to document composite-specific policies for the treatment of external cash flows and to adhere to those policies consistently.
- Composites must be defined according to their investment mandate, objective, or strategy.
- All actual, fee-paying, discretionary portfolios must be included in at least one composite. Portfolios are discretionary if client-imposed restrictions do not prevent the firm from implementing the intended investment strategy.
- Composite returns must be calculated by asset-weighting the individual portfolio returns using beginning-of-period values or a method that reflects both beginning-of-period values and external cash flows.

- Firms must include new portfolios in composites on a timely and consistent basis. Terminated portfolios must be included in the historical performance of the appropriate composite up to the last full measurement period they were under management. A firm cannot switch portfolios from one composite to another unless documented changes to a portfolio's investment mandate, objective, or strategy or the redefinition of a composite makes it appropriate.
- For periods beginning on or after 1 January 2010, the returns of a single asset class (e.g., equities) carved out of a multiple asset class portfolio (e.g., a balanced account invested in equity and fixed-income securities) are not permitted to be included in single asset class composite returns unless the carved-out segment is actually managed separately with its own cash balance.
- The GIPS standards include detailed disclosure requirements related to the firm, performance calculations, benchmarks, fees, composites, composite performance presentations, and other items. Additional disclosures are also recommended.
- The GIPS provisions for presentation and reporting require that at least five years of compliant performance must initially be shown (or from inception if the firm or composite has been existence for a shorter period). The compliant performance record must then be extended each year until at least 10 years of results are presented.
- The GIPS standards specify required items to be contained in composite performance presentations, including composite and benchmark total returns for each annual period presented, the number of portfolios in the composite (if more than five) at annual period end, the amount of assets in the composite at annual period end, either the percentage of the firm's total assets represented by the composite or the amount of total firm assets at the end of each annual period, a measure of dispersion of individual portfolio returns within the composite and, for periods ending on or after 1 January 2011, the three-year annualized ex-post standard deviation of composite and benchmark returns. Other items may be required in certain cases, and additional items are recommended.
- Acceptable measures of internal dispersion include, but are not limited to, high/low, range, and standard deviation.
- Performance of a past firm or affiliation must be linked to or used to represent the historical performance of a new or acquiring firm if all the following conditions are met on a composite specific basis: substantially all the investment decision makers are employed by the new or acquiring firm; the decision-making process remains substantially intact and independent within the new or acquiring firm; and the new or acquiring firm has records that document and support the performance.
- If a firm uses a custom benchmark or a combination of multiple benchmarks, it must disclose the benchmark components, weights, and rebalancing process. The frequency of rebalancing can affect the reported benchmark return.
- For periods beginning on or after 1 January 2008, real estate investments must be valued at least quarterly. For periods beginning on or after 1 January 2011, real estate investments must be valued in accordance with the definition of fair value and the GIPS Valuation Principles. Real estate investments must be valued by an external professionally designated, certified or licensed commercial property valuer or appraiser at least once every 36 months for periods prior to 1 January 2012 and, unless client agreements stipulate otherwise, at least once every 12 months thereafter.

- In addition to total return for real estate, firms must calculate the time-weighted returns of the income and capital return components. For closed-end real estate fund composites, the GIPS standards also require firms to present the net-of-fees since-inception internal rate of return (SI-IRR) of the composite through each annual period-end.
- For periods ending on or after 1 January 2011, private equity investments must be valued in accordance with the definition of fair value and the GIPS Valuation Principles, and the annualized SI-IRR must be calculated using daily cash flows.
- Performance presentations for private equity composites must include the gross-of-fees and net-of-fees SI-IRR of the composite through the end of each annual period. For closed-end real estate and private equity composites, the composite's cumulative committed capital, since-inception paid-in capital, and since-inception distributions must be presented as of each annual period end. In addition, firms must present as of each annual period end the investment multiple (the ratio of total value to since-inception paid-in capital, or TVPI), the realization multiple (the ratio of since-inception distributions to since-inception paid-in capital, or DPI), the PIC multiple (the ratio of since-inception paid-in capital to cumulative committed capital), and the unrealized multiple (the ratio of residual value to since-inception paid-in capital, or RVPI).
- When firms present performance to prospective wrap fee/SMA clients, they must present the performance net of the entire wrap fee.
- Verification is a process by which an independent verifier assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards. A single verification report is issued for the entire firm; verification cannot be carried out for an individual composite. Firms that have been verified may choose to have a further in-depth examination of a specific composite presentation.
- The GIPS Advertising Guidelines allow a firm to claim compliance with the GIPS standards in an advertisement without presenting the compliant presentation. All advertisements stating a claim of compliance following the GIPS Advertising Guidelines must use the prescribed wording for the GIPS compliance statement for advertisements. Advertisements that state this claim of compliance and show performance results must also present in the advertisement additional required information taken or derived from a compliant performance presentation.
- Effective 1 January 2011, after-tax performance reporting, if presented as part of a compliant presentation, will be considered supplemental information and subject to the requirements and recommendations of the GIPS Guidance Statement on the Use of Supplemental Information.

APPENDIX: GIPS GLOSSARY

Accrual accounting	The recording of financial transactions as they come into existence rather than when they are paid or settled.
Administrative fee	All fees other than trading expenses and the investment management fee. Administrative fees include custody fees, accounting fees, auditing fees, consulting fees, legal fees, performance measurement fees, and other related fees. See "bundled fees."
Benchmark description	General information regarding the investments, structure, and/or characteristics of the benchmark. The description must include the key features of the benchmark, or the name of the benchmark for a readily recognized index or other point of reference.
Bundled fee	A fee that combines multiple fees into one total or "bundled" fee. Bundled fees can include any combination of investment management fees, trading expenses, custody fees, and/or administrative fees. Two examples of bundled fees are wrap fees and all-in fees.
Capital return	The change in value of the real estate investments and cash and/or cash equivalent assets held throughout the measurement period, adjusted for all capital expenditures (subtracted) and net proceeds from sales (added). The capital return is computed as a percentage of the capital employed. Also known as "capital appreciation return" or "appreciation return."
Carried interest	The profits that general partners are allocated from the profits on the investments made by the investment vehicle. Also known as "carry" or "promote."
Carve-out	A portion of a portfolio that is by itself representative of a distinct investment strategy. It is used to create a track record for a narrower mandate from a multiple-strategy portfolio managed to a broader mandate. For periods beginning on or after 1 January 2010, a carve-out must be managed separately with its own cash balance.
Closed-end funds	A type of investment vehicle where the number of investors, total committed capital, and life are fixed and not open for subscriptions and/or redemptions. Closed-end funds have a capital call (drawdown) process in place that is controlled by the general partner.
Committed capital	Pledges of capital to an investment vehicle by investors (limited partners and the general partner) or by the firm. Committed capital is typically not drawn down at once but drawn down over a period of time. Also known as "commitments."
Composite	An aggregation of one or more portfolios managed according to a similar investment mandate, objective, or strategy.

(continued)

Composite creation date — The date when the firm first groups one or more portfolios to create a composite. The composite creation date is not necessarily the same as the composite inception date.

Composite definition — Detailed criteria that determine the assignment of portfolios to composites. Criteria may include investment mandate, style or strategy, asset class, the use of derivatives, leverage and/or hedging, targeted risk metrics, investment constraints or restrictions, and/or portfolio type (e.g., segregated or pooled, taxable versus tax exempt).

Composite description — General information regarding the investment mandate, objective, or strategy of the composite. The composite description may be more abbreviated than the composite definition but must include all key features of the composite and must include enough information to allow a prospective client to understand the key characteristics of the composite's investment mandate, objective, or strategy. (See the Sample List of Composite Descriptions in Appendix C to the Global Investment Performance Standards.)

Custody fee — The fees payable to the custodian for the safe-keeping of portfolio assets. Custody fees are considered to be administrative fees and typically contain an asset-based portion and a transaction-based portion. The custody fee may also include charges for additional services, including accounting, securities lending, and/or performance measurement. Custodial fees that are charged per transaction should be included in the custody fee and not included as part of trading expenses.

Distinct business entity — A unit, division, department, or office that is organizationally and functionally segregated from other units, divisions, departments, or offices and that retains discretion over the assets it manages and that should have autonomy over the investment decision-making process. Possible criteria that can be used to determine this include:

- being a legal entity,
- having a distinct market or client type (e.g., institutional, retail, private client, etc.), and
- using a separate and distinct investment process.

Distribution — Cash or stock distributed to limited partners (or investors) from an investment vehicle. Distributions are typically at the discretion of the general partner (or the firm). Distributions include both recallable and non-recallable distributions.

DPI — Since inception distributions divided by since inception paid-in capital. See "realization multiple."

Evergreen fund — An open-end fund that allows for on-going subscriptions and/or redemptions by investors.

External cash flow — Capital (cash or investments) that enters or exits a portfolio.

Fair value	The amount at which an investment could be exchanged in a current arm's length transaction between willing parties in which the parties each act knowledgeably and prudently. The valuation must be determined using the objective, observable, unadjusted quoted market price for an identical investment in an active market on the measurement date, if available. In the absence of an objective, observable, unadjusted quoted market price for an identical investment in an active market on the measurement date, the valuation must represent the firm's best estimate of the market value. Fair value must include accrued income.
Fee schedule	The firm's current schedule of investment management fees or bundled fees relevant to the particular compliant presentation.
Final liquidation date	The date when the last portfolio in a composite is fully distributed.
Firm	The entity defined for compliance with the GIPS standards. See "distinct business entity."
Fund of funds	An investment vehicle that invests in underlying investment vehicles. Private equity funds of funds predominately invest in closed-end funds and may make opportunistic direct investments.
General partner	A class of partner in a limited partnership. The general partner retains liability for the actions of the limited partnership. The general partner is typically the fund manager, and the limited partners (LPs) are the other investors in the limited partnership. The general partner earns an investment management fee that typically includes a percentage of the limited partnership's profits. See "carried interest."
Gross-of-fees return	The return on investments reduced by any trading expenses incurred during the period; in real estate and private equity, the return on investments reduced by any transaction expenses incurred during the period.
Income return	The investment income earned on all investments (including cash and cash equivalents) during the measurement period net of all non-recoverable expenditure, interest expense on debt, and property taxes. The income return is computed as a percentage of the capital employed.
Internal dispersion	A measure of the spread of the annual returns of individual portfolios within a composite. Measures may include, but are not limited to, high/low, range, or standard deviation (asset weighted or equal weighted) of portfolio returns.
Investment management fee	A fee payable to the firm for the management of a portfolio. Investment management fees are typically asset based (percentage of assets), performance based (see "performance-based fee"), or a combination of the two but may take different forms as well. Investment management fees also include carried interest.

(continued)

Investment multiple — Total value divided by since inception paid-in capital.

Large cash flow — The level at which the firm determines that an external cash flow may distort performance if the portfolio is not valued. Firms must define the amount in terms of the value of cash/asset flow or in terms of a percentage of the portfolio assets or the composite assets.

Limited partner — An investor in a limited partnership. The general partner is liable for the actions of the limited partnership, and the limited partners are generally protected from legal actions and any losses beyond their committed capital.

Limited partnership — The legal structure used by most private equity and real estate closed-end funds. Limited partnerships are usually fixed life investment vehicles. The general partner manages the limited partnership pursuant to the partnership agreement.

Link

1. Mathematical linking: The method by which sub-period returns are geometrically combined to calculate the period return using the following formula:

   $$\text{Period return} = [(1 + R_1) \times (1 + R_2) \ldots (1 + R_n)] - 1$$

   Where R_1, $R_2 \ldots R_n$ are the sub-period returns sub-period 1 through n, respectively.

2. Presentational linking: To be visually connected or otherwise associated with a compliant presentation (e.g., two pieces of information are linked by placing them next to each other.

Market value — The price at which investors can buy or sell an investment at a given time multiplied by the quantity held plus any accrued income.

Must — A provision, task, or action that is mandatory or required to be followed or performed. See "require/requirement."

Open-end fund — A type of investment vehicle where the number of investors and the total committed capital is not fixed and is open for subscriptions and/or redemptions. See "evergreen fund."

Paid-in capital — Capital inflows to an investment vehicle. Committed capital is typically drawn down from limited partners (or investors) over a period of time through a series of capital calls, which are at the discretion of the general partner or firm. Paid-in capital is equal to the amount of committed capital that has been drawn down since inception. Paid-in capital includes distributions that are subsequently recalled by the general partner or firm and reinvested into the investment vehicle.

PIC multiple — Since inception paid-in capital divided by cumulative committed capital.

Portfolio — An individually managed group of investments. A portfolio may be an account or pooled investment vehicle.

Primary fund vehicle	An investment vehicle that makes direct investments rather than investing in other investment vehicles.
Private equity	Investment strategies include, but are not limited to, venture capital, leveraged buyouts, consolidations, mezzanine and distressed debt investments, and a variety of hybrids, such as venture leasing and venture factoring.
Professionally designated, certified, or licensed commercial property valuer/appraiser	In Europe, Canada, and parts of Southeast Asia, the predominant professional designation is that of the Royal Institution of Chartered Surveyors (RICS). In the United States, the professional designation is Member [of the] Appraisal Institute (MAI). In addition, each state regulates real estate appraisers and registers, licenses, or certifies them based on their experience and test results.
Prospective client	Any person or entity that has expressed interest in one of the firm's composite strategies and qualifies to invest in the composite. Existing clients may also qualify as prospective clients for any strategy that is different from their current investment strategy. Investment consultants and other third parties are included as prospective clients if they represent investors that qualify as prospective clients.
Public market equivalent	The performance of a public market index expressed in terms of an internal rate of return (IRR), using the same cash flows and timing as those of the composite over the same time period. A PME can be used as a benchmark by comparing the IRR of a private equity composite with the PME of a public market index.
Realization multiple	Since inception distributions divided by since inception paid-in capital.
Recommend/Recommendation	A suggested provision, task, or action that should be followed or performed. A recommendation is considered to be best practice but is not a requirement. See "should."
Require/Requirement	A provision, task, or action that must be followed or performed. See "must."
Residual value	The remaining equity that limited partners (or investors) have in an investment vehicle at the end of the performance reporting period.
RVPI	Residual value divided by since inception paid-in capital. See "unrealized multiple."
Secondary fund vehicle	An investment vehicle that buys interests in existing investment vehicles.
Settlement date accounting	Recognizing the asset or liability on the date when the exchange of cash and investments is completed.
Should	A provision, task, or action that is recommended to be followed or performed and is considered to be best practice, but is not required. (See "recommend/recommendation."

(continued)

Since inception internal rate of return (SI-IRR)	The internal rate of return (IRR) is the implied discount rate or effective compounded rate of return that equates the present value of cash outflows with the present value of cash inflows. The SI-IRR is a special case of the IRR that equates the present value of all cash flows (capital calls and distributions) with the period end value. The SI-IRR is always annualized except when the reporting period is less than one year, in which case the SI-IRR is not annualized.
Supplemental information	Any performance-related information included as part of a compliant presentation that supplements or enhances the required and/or recommended provisions of the GIPS standards.
Temporary new account	An account for temporarily holding client-directed external cash flows until they are invested according to the composite strategy or disbursed. Firms can use a temporary new account to remove the effect of a significant cash flow on a portfolio. When a significant cash flow occurs in a portfolio, the firm may direct the external cash flow to a temporary new account according to the composite's significant cash flow policy.
Time-weighted rate of return	A method of calculating period-by-period returns that negates the effects of external cash flows.
Total firm assets	All discretionary and non-discretionary assets for which a firm has investment management responsibility. Total firm assets includes assets assigned to a sub-advisor provided the firm has discretion over the selection of the sub-advisor.
Total value	Residual value plus distributions.
Trade date accounting	Recognizing the asset or liability on the date of the purchase or sale and not on the settlement date. Recognizing the asset or liability within three days of the date the transaction is entered into (trade date, T + 1, T + 2, or T + 3) satisfies the trade date accounting requirement for purposes of the GIPS standards. See "settlement date accounting."
Trading expenses	The actual costs of buying or selling investments. These costs typically take the form of brokerage commissions, exchange fees and/or taxes, and/or bid–offer spreads from either internal or external brokers. Custodial fees charged per transaction should be considered custody fees and not trading expenses.
Transaction expenses	All actual legal, financial, advisory, and investment banking fees related to buying, selling, restructuring, and/or recapitalizing portfolio investments as well as trading expenses, if any.
TVPI	Total value divided by since inception paid-in capital. See "investment multiple."
Unrealized multiple	Residual value divided by since inception paid-in capital.

Verification A process by which an independent verifier assesses whether 1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and 2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards.

Verification report A verification report is issued after a verification has been performed and opines that the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and that the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards.

Vintage year Two methods used to determine vintage year are:

1. The year of the investment vehicle's first drawdown or capital call from its investors; or
2. The year when the first committed capital from outside investors is closed and legally binding.

REFERENCES

Committee for Performance Presentation Standards (CPPS). 1987. "A Report on Setting Performance Presentation Standards." *Financial Analysts Journal*, vol. 43, no. 5:8.

Dietz, Peter. 1966. *Pension Funds: Measuring Investment Performance*. New York: The Free Press.

Gaudette, Stephen C., and Philip Lawton. 2007. "Equity Portfolio Characteristics in Performance Analysis." CFA Institute.

Harris, Larry. 2003. *Trading and Exchanges: Market Microstructure for Practitioners*. Oxford University Press.

Horan, Stephen M., Philip Lawton, and Robert R. Johnson. 2008. "After-Tax Performance Measurement." *Journal of Wealth Management*, vol. 11, no. 1:69–83.

Poterba, James. 1999. "Unrealized Capital Gains and the Measurement of After-Tax Portfolio Performance." *Journal of Private Portfolio Management*, vol. 1, no. 4.

Price, Lee. 1996. "Calculation and Reporting of After-Tax Performance." *Journal of Performance Measurement*, vol. 1, no. 2.

Price, Lee. 2001. "Taxable Benchmarks: The Complexity Increases." *AIMR Conference Proceedings: Investment Counseling for Private Clients III*. No. 4.

Rogers, Douglas, and Lee Price. 2002. "Challenges with Developing Portfolio Accounting Software for After-Tax Reporting." *Journal of Performance Measurement*, vol. 6 (Technology Supplement.).

Shilling, James. 2002. *Real Estate*, 13th edition. Mason, OH: South-Western.

Simpson, John. 2003. "Searching for a System to Meet Your After-Tax Performance Reporting Needs." *Journal of Performance Measurement*, vol. 7 (Performance Presentation Standards Supplement).

Stein, David. 1998. "Measuring and Evaluating Portfolio Performance After Taxes." *Journal of Portfolio Management*, vol. 24, no. 2.

Stein, David, Brian Langstraat, and Premkumar Narasimhan. 1999. "Reporting After-Tax Returns: A Pragmatic Approach." *Journal of Private Portfolio Management*. Spring.

PRACTICE PROBLEMS

1 Company C manages money for both retail and institutional clients. There are two autonomous groups within Company C: "Company C Institutional Investment Management," which manages institutional assets, and "Company C Retail Investors," which manages retail assets. How should Company C define itself as a firm to comply with the GIPS standards?

2 Firm A is a multinational investment firm, with offices around the world including Japan, Australia, the United Kingdom, and the United States. Although all of its offices are part of the global parent, each office is registered with the appropriate national regulatory authority and each is held out to clients and potential clients as a distinct business entity. Firm A (US) claims compliance with the GIPS standards. What should the definition of the firm disclosure be?

3 The GIPS standards do **not** require firms to value portfolios in accordance with:

A the definition of fair value.

B composite-specific valuation policies.

C generally accepted principles of financial accounting.

4 For periods beginning on or after 1 January 2011, firms must **not** value portfolios:

A when objective, observable market prices are unavailable.

B more frequently than required by the composite-specific valuation policy.

C as of the last business day of the month unless it is the calendar month-end.

5 Firm A claims compliance with the GIPS standards. It maintains hard copies of the records supporting compliance for three years and discards all records older than three years in an effort to save office space. The performance reported on all its composite presentations shows five years of history. Is the firm in compliance with the GIPS standards?

6 Use the information in the following table to answer this question (amounts in €):

Date	Market Value	External Cash Flow	Market Value Post Cash Flow
31 December 1997	200,000		
31 January 1998	208,000		
16 February 1998	217,000	+40,000	257,000
28 February 1998	263,000		
22 March 1998	270,000	–30,000	240,000
31 March 1998	245,000		

Calculate the rate of return for this portfolio for January, February, March, and the first quarter of 1998 using revaluing for large cash flows methodology (assume "large" is defined as greater than 5%).

7 A European equity composite contains three portfolios. For convenience, the cash flow weighting factors are presented below.

© 2013 CFA Institute. All rights reserved.

	Cash Flow Weighting Factor	Portfolio (€ millions)		
		A	B	C
Fair value as of 31 July		74.9	127.6	110.4
External cash flows:				
8 August	0.742		–15	
12 August	0.613	7.5		
19 August	0.387		–5	15
Fair value as of 31 August		85.3	109.8	128.4

A Calculate the returns of Portfolio A, Portfolio B, and Portfolio C for the month of August using the Modified Dietz formula.

B Calculate the August composite return by asset-weighting the individual portfolio returns using beginning-of-period values.

C Calculate the August composite return by asset-weighting the individual portfolio returns using a method that reflects both beginning-of-period values and external cash flows.

8 Convenable Capital Management manages an equity portfolio for the Flender Company. Cash held in the portfolio is invested by the Flender's existing custodial bank. Must Convenable include cash and cash equivalents in the portfolio return calculations?

A Yes.

B No; the cash is not invested by Convenable.

C No; Convenable does not have discretion over the selection of the custodian.

9 Under the GIPS standards, the *most* accurate statement is that actual direct trading expenses do **not** include:

A spreads from internal brokers.

B brokerage commissions.

C custody fees charged per transaction.

10 Can a firm include a single portfolio in more than one of the firm's composites?

11 Barry Smith Investment Management (Barry Smith) specializes in balanced account management for midsize pension plans. On 12 March 2006, a contribution of $2,265,000 is made to Dennett Electronics' Pension Plan, which is included in Barry Smith's Balanced Tax-Exempt Composite. This is the only external cash flow for March. Barry Smith invests the contribution on 13 March. The pension plan's portfolio had a fair value of $16,575,000 at the beginning of March. For the purpose of calculating portfolio performance, how should Barry Smith handle the external cash flow? Assume that Barry Smith has adopted a large cash flow policy as of 1 January 2006, all external cash flows are assumed to take place at the end of day, and the 12 March 2006 cash flow meets the definition of "large".

12 In March 2007, Smith & Jones Asset Management, a GIPS-compliant firm, introduced a new technical analysis model that management believed would be a powerful tool in tactical asset allocation. After extensive back-testing, Smith & Jones began to use the model to manage actual "live" portfolios in June 2007, and managers constructed a composite composed of actual, fee-paying, discretionary portfolios managed in accordance with the model. In 2010, after three very successful years of managing client funds in this way, management decided that because the actual performance of live portfolios validated the performance of the model, it should present the simulated performance of the model through

the back-testing period to prospective clients. Smith & Jones proceeded to link the back-tested returns to the actual performance of the composite and presents 3-, 5- and 10-year performance as a continuous record to prospects. Does this practice comply with the GIPS standards?

13 A charitable foundation transfers securities in kind to Taurus Asset Management Ltd. to fund a new private equity portfolio. Taurus estimates that, after liquidating the transferred securities, it will take five months to invest the foundation's assets in privately held companies. Which statement *best* describes a requirement of the GIPS standards? Taurus must include the foundation's portfolio in the appropriate private equity composite:

A on a timely and consistent basis.

B when the assets are substantially invested.

C as of the beginning of the next full measurement period.

14 Ord Capital Management, an investment management firm that claims to comply with the GIPS standards, manages a global equity portfolio for a pension plan sponsored by Chimie bio-industrielle. On 15 April, the plan sponsor notifies Ord that the firm will be terminated as of the end of the month and instructs the manager to stop trading immediately. Ord should include the Chimie portfolio in the historical returns of the composite to which it belongs up to:

A 31 March.

B 15 April.

C 30 April.

15 Southwest Capital Advisors LLC manages a fixed-income composite in accordance with an enhanced indexing strategy which makes strategic use of high-yield and emerging market bonds in addition to investment grade bonds issued in developed markets. The Merrimack Company, a family office, has a portfolio that is included in the firm's fixed-income enhanced indexing composite. Merrimack informs Southwest in writing that, due to changes in its investment policy, the portfolio can no longer hold high-yield or emerging market bonds. In accordance with the GIPS standards, Southwest decides to switch the Merrimack portfolio to another composite. The historical performance of the portfolio must be:

A reflected in both composites.

B switched to the new composite.

C retained in the enhanced indexing composite.

The following information relates to Questions 16–18

Belltower Investment Management defines its core-plus fixed-income composite as containing all discretionary portfolios over $10 million that are invested in accordance with a strategy that includes domestic high-yield debt in addition to US government

and agency securities and investment-grade bonds issued by US corporations. The composite benchmark is 75% Bloomberg Barclays Capital US Government/Credit Index and 25% Bloomberg Barclays Capital US High Yield Index, rebalanced monthly.

16 The core-plus fixed-income composite includes a portfolio managed on behalf of the Avonfield Academy endowment fund. The trustees of Avonfield inform Belltower in writing that, due to a change in investment policy, the endowment fund is no longer permitted to hold below-investment-grade securities. Belltower determines that henceforth the Avonfield portfolio should be included in the core fixed-income composite, rather than the core-plus fixed-income composite. The historical record of the portfolio must be:

A included in both composites.

B kept in the core-plus fixed income composite.

C excluded from the core-plus fixed income composite.

17 After an extended period of rising interest rates, the market value of Hartford Special Machinery Company's core-plus fixed-income portfolio falls below the composite minimum of $10 million. The Hartford portfolio remains below the composite-specific minimum asset level for nine months until the client makes an additional contribution that brings it back above $10 million in assets. Belltower must:

A temporarily switch the Hartford portfolio to the firm's miscellaneous composite.

B include the Hartford portfolio in the core-plus fixed income composite in all measurement periods.

C exclude the Hartford portfolio from the core-plus fixed income composite for the period it was below the minimum asset level.

18 Kingswood Manufacturing Company, a core-plus fixed-income client, informs Belltower in writing that, in the future, all security transactions must be approved in advance by Kingswood's controller. The *most likely* consequence is that Belltower must prospectively exclude the Kingswood portfolio from:

A all composites.

B total firm assets.

C the core-plus fixed-income composite only.

---

19 Midwest National Bank manages a domestic equity portfolio for the Springfield Municipal Employees' Retirement Fund (SMERF), a mature defined-benefit pension plan. The SMERF portfolio belongs to Midwest's Institutional Equity composite. The composite description states, "Portfolios included in the Institutional Equity composite are actively managed for long-term capital appreciation." SMERF's investment policy statement includes the following provisions:

All security transactions must be approved in advance by the SMERF Investment Committee. SMERF anticipates making regular net withdrawals in substantial amounts from the portfolio to meet pension liabilities. SMERF staff will prepare a schedule of withdrawals at the beginning of each fiscal year. The portfolio manager must manage liquidity so as to disburse funds in accordance with the withdrawal schedule.

In view of these restrictions, discuss whether Midwest National Bank can justify including the SMERF portfolio in the composite.

20 Which statement *most accurately* expresses a requirement of the GIPS standards?

A Non-fee-paying portfolios must not be included in composites.

B All actual fee-paying discretionary portfolios must be included in at least one composite.

C All actual fee-paying discretionary portfolios must be included in one and only one composite.

21 A fixed-income portfolio is *most likely* to be considered non-discretionary if the client's investment policy states that:

A securities held at a gain must not be sold.

B the average credit quality must be investment grade.

C securities held in the portfolio must be issued in developed markets.

22 What is the minimum number of portfolios that a composite must contain to comply with the GIPS standards? Must a firm disclose the number of portfolios in a composite?

23 Firms that claim to comply with the GIPS standards must disclose the use of a sub-advisor and the:

A identity of the sub-advisors.

B period the sub-advisors were used.

C investment strategies employed by the sub-advisors.

24 Gravite Asset Management started managing tax-efficient fixed income portfolios in January 1999. However, because the firm initially did not have a suitable portfolio accounting system, accrued income was not included in market valuations until June 1999. Under the GIPS standards, if Gravite presents the performance of the tax efficient fixed income composite since inception, it must:

A disclose the period of non-compliance.

B bring the non-compliant returns into compliance.

C estimate the return including accrued income in the first half of 1999.

25 The GIPS standards require firms to disclose the presence, use, and extent of leverage, derivatives, and short positions if material, including a description of the:

A characteristics of the instruments.

B composite's net exposure to systematic risk.

C firm's risk management policies and procedures.

26 Bentwood Institutional Asset Management has been managing equity, fixed-income, and balanced accounts since 1986. The firm became GIPS-compliant on 1 January 2001 and prepared composite performance presentations for the 1996-2000 period. Fixed-income performance was poor prior to 2001, when a new team of managers was brought on board. When Christopher Cooper joins Bentwood as marketing director in June 2006, he suggests showing performance starting with calendar 2001, the first year that performance started to improve. He proposes to show composites with returns for the five calendar years 2001 through 2005. Does this course of action comply with the GIPS standards?

27 It is 2011. Bristol Capital Management is the intermediate global fixed-income manager for the Jarvis University endowment fund. Bristol has prepared the performance report shown below. James Chan, consultant to Jarvis University, reviews the report and tells the fund's investment committee that the report does not meet the minimum requirements of the GIPS standards.

Identify *four* omissions that prevent the Bristol Capital Management performance report from being in compliance with GIPS standards. Also identify *four* items included in the Bristol Capital Management performance report (other than omissions) that do not comply with GIPS standards.

Year	Gross-of-Fees Return (%)	Benchmark Return (%)	Number of Portfolios	Composite Dispersion (%)	Composite Assets; End of Period ($ millions)	Percent of Firm Assets	Total Firm Assets ($ millions)
2006	12.7	10.7	8	6.6	512	21	2,438
2007	9.5	7.2	12	4.7	780	23	3,391
2008	2.1	1.5	22	6.5	1,250	27	4,629
2009	14.2	14.1	25	3.0	1,425	32	4,453
2010	4.9	6.1	29	1.9	1,712	32	4,891
1Q 2011	7.1	5.9	34	4.4	1,994	37	5,389

(Returns for 1Q 2011 are annualized.)
Bristol Capital Management has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®), except for the use of cash-basis accounting for the recognition of interest income. Allied Verification, Ltd. has verified the Bristol Capital Management Intermediate Global Fixed Income Composite.
Notes:

7 Bristol Capital Management is an independent investment management firm founded in November 1999.

8 Performance results are presented before investment management and custodial fees.

9 Portfolio valuations are computed quarterly and are denominated in US dollars.

10 Bristol Capital Management uses derivative products to enhance portfolio returns.

11 All accounts worth more than $1 million that are invested in the Intermediate Global Fixed Income strategy are included in the composite at the beginning of the first full quarter under management.

12 The Intermediate Global Fixed Income composite includes several non-fee-paying accounts.

The following information relates to Questions 28–30

Tidewater Investment Management's performance presentation for its large cap US value composite is shown below.

Large-Cap US Value Composite
Composite Creation Date: 1 July 2001 ($ in millions)

Period	Composite Return %	Composite Median Return %	Benchmark Return %	Internal Dispersion	Number of Accounts	Total Composite Assets ($)	Total Firm Assets ($)
2005	6.37	6.52	6.14	1.54	15	922.4	9,752.3
2004	12.03	11.97	12.73	2.37	17	985.6	9,889.9
2003	26.52	26.74	26.01	4.05	19	1,028.3	10,779.5

(continued)

(Continued)

Period	Composite Return %	Composite Median Return %	Benchmark Return %	Internal Dispersion	Number of Accounts	Total Composite Assets ($)	Total Firm Assets ($)
2002	–19.06	–18.11	–21.52	3.97	22	1,354.8	11,845.3
2001	–12.00	–8.51	–12.16	2.13	27	1,227.5	11,253.6

Notes:

- Tidewater Investment Management has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®).
- For the purposes of compliance with the GIPS standards, the firm is defined as all institutional accounts managed by Tidewater Investment Management. A complete list and description of all the firm's composites is available upon request.
- The strategy of the US Large Cap Value Composite (formerly the Core Domestic Equity Composite) is to invest in US large cap value equity securities. The composite consists of all fee-paying and non-fee-paying discretionary accounts with a minimum market value of $5 million.
- The benchmark for periods beginning 1 January 2003 is a custom security-based benchmark that is rebalanced to target sector weights monthly. The benchmark for periods prior to 1 January 2003 is the Russell 1000® Value Index.
- Between 25% and 35% of the assets contained in the composite in 2001 and 2002 were carved out of portfolios managed according to the firm's Large Cap Value Balanced style.
- For new clients acquired in periods starting 1 January 2004, Tidewater charges a bundled fee of 1.0% on assets up to $10 million and 0.85% on assets in excess of $10 million. The bundled fee includes investment management and administrative fees.
- Additional information regarding policies for calculating and reporting returns is available upon request.

(There are numerous errors and omissions in Tidewater's performance presentation. The following questions do not address all of them.)

28 Tidewater's performance presentation for the large cap US value composite fails to comply with the GIPS standards because it does **not** present:

A cumulative composite and benchmark returns.

B the percentage of the total firm assets represented by the composite.

C the percentage of composite assets represented by non-fee-paying portfolios.

29 Tidewater's performance presentation *most likely* fails to comply with the GIPS standards because it does **not** disclose the:

A custom benchmark weights and components.

B presence, use, and extent of leverage or derivatives.

C date and reasons for the change in the composite name.

30 In order to comply with the GIPS standards, Tidewater's disclosures related to fees must include the:

A fee schedule for periods prior to 1 January 2004.

B investment management and administrative fees on a segregated basis.

C bundled fee portfolios as a percentage of composite assets for each annual period.

---

31 At Firm T, Manager D is responsible for Firm T's Emerging Market Composite. Although Manager D makes all the investment decisions for the portfolios in the composite, Manager D is supported by Firm T's research department and trading desk. Firm U is seeking to establish an emerging market investment strategy and hires Manager D to join Firm U. Can Firm U link the historical performance of Manager D while at Firm T to the performance of its new strategy and comply with the GIPS standards?

The following information relates to Questions 32–35

Techno Investment Partners serves as general partner in a limited partnership whose strategy is to invest in privately owned software companies with innovative products designed to improve productivity in the service sector of the economy. The investment results of the limited partnership are presented in the firm's GIPS-compliant Service Productivity Enhancement Software (SPES) composite.

Paul Reid, a performance analyst, is updating the SPES composite performance presentation through the end of the third year since inception. The information shown in Exhibit 1 is taken from one of Reid's worksheets.

Exhibit 1 SPES Composite Data as of the End of Year 3 ($ in millions)

Paid-In Capital	Invested Capital	Cumulative Distributions	Realization Multiple (DPI)	PIC Multiple	Ratio of Residual Value to Paid in Capital (RVPI)
20.0	16.6	2.5	0.13	0.80	0.99

32 The market value of the SPES composite is *closest* to:

A $16.6 million.

B $19.8 million.

C $20.2 million.

33 The SPES composite's investment multiple (TVPI) is *closest* to:

A 0.13.

B 0.86.

C 1.12.

34 What percentage of the limited partners' paid-in capital has been returned to them?

A 13%

B 15%

C 80%

35 The limited partnership's committed capital is *closest* to:

A $16.6 million.

B $20.4 million.

C $25.0 million.

---

36 Bugle Capital Advisors places an advertisement for its Targeted Maturity Composite in major newspapers on 30 April. The advertisement includes the GIPS Advertising Guidelines compliance statement and presents annualized composite and benchmark returns for the 1-year, 3-year, and 5-year periods ended 31 December. Does the advertisement satisfy the requirements of the GIPS Advertising Guidelines?

A Yes.

B No; it omits the period-to-date return.

C No; it omits five years of annual returns.

37 Which of the following is *least likely* to be considered an advertisement for the purposes of the GIPS Advertising Guidelines?

A A letter addressed to prospective clients.

B Written material used in one-on-one presentations.

C A quarterly report e-mailed to multiple existing clients.

38 Greene Springs Asset Management complies with the GIPS standards but has not been verified. The firm wishes to prepare an advertisement that includes a claim of compliance. Which of the following is the correct wording of the GIPS compliance statement for advertisements?

A "Greene Springs Asset Management claims compliance with the Global Investment Performance Standards (GIPS®)."

B "Greene Springs Asset Management claims compliance with the Global Investment Performance Standards (GIPS®). The firm's compliance has not been independently verified."

C "Greene Springs Asset Management claims compliance with the Global Investment Performance Standards (GIPS®). A list of composite descriptions is available upon request."

The following information relates to Questions 39–42

Amelia Gordon, the head of compliance at Herrschaft Asset Management Corporation, is examining an advertisement that promotes the firm's fundamental value strategy. The advertisement is shown in Exhibit 1.

Exhibit 1 "Herrschaft. Master the market."

Herrschaft Asset Management
Fundamental Value Composite Performance

	3 Months Ended 31 March 2006	Periods Ended 31 December 2005		
		1 Year	3 Years (Annualized)	5 Years (Annualized)
Composite	5.51%	14.56%	22.03%	5.17%
Custom Benchmark	5.35%	14.72%	21.47%	4.86%

- Herrschaft Asset Management Corporation meets all applicable requirements of the Global Investment Performance Standards (GIPS®).
- Herrschaft Asset Management Corporation is a registered investment advisory firm offering a full suite of equity and fixed-income products for individuals and institutions.
- The Fundamental Value Composite contains all discretionary portfolios that are invested in accordance with Herrschaft's proprietary fundamental value strategy.
- Portfolios in the Fundamental Value Composite may include futures solely to equitize portfolio cash during inflows and outflows. Futures are not used to add leverage to the portfolio.
- To receive a complete list and description of Herrschaft Asset Management Corporation's composites, contact Jules Arnauld at (212) 555-0000 or write Herrschaft Asset Management Corporation, 1250 15th Avenue, New York, NY or jarnauld@herrschaftam.com

39 Which of the following statements is *most* accurate? Herrschaft's advertisement does **not** meet the requirements of the GIPS Advertising Guidelines because it fails to disclose:

A a description of the benchmark.

B the benchmark construction rules.

C how often the benchmark is rebalanced.

40 Which of the following statements is *most* accurate? Herrschaft's advertisement does **not** meet the requirements of the GIPS Advertising Guidelines because it fails to:

A present five years of annual composite returns.

B present a measure of dispersion of individual portfolio returns.

C disclose whether performance is shown gross or net of investment management fees.

41 Herrschaft's compliance statement does **not** meet the requirements of the GIPS Advertising Guidelines. The correct statement is:

A Herrschaft Asset Management Corporation claims compliance with the Global Investment Performance Standards (GIPS®).

B Herrschaft Asset Management Corporation has prepared and presented this report in compliance with the Global Investment Performance Standards (GIPS®).

C Herrschaft Asset Management Corporation has prepared and presented this advertisement in compliance with the Advertising Guidelines of the Global Investment Performance Standards (GIPS®).

42 Which of the following statements is *most* accurate? Herrschaft's advertisement does **not** satisfy an applicable requirement of the GIPS Advertising Guidelines because it fails to include all salient features in its description of the:

A firm.

B composite strategy.

C extent and use of leverage and derivatives.

---

43 It is *most* accurate to say that verification:

A makes the claim of compliance more credible.

B certifies that the firm has adequate internal controls.

C ensures the accuracy of specific composite presentations.

44 Renner, Williams & Woods decides to have its equity and balanced composites verified. Because the firm has only a handful of fixed-income accounts and does not present fixed-income management results in marketing materials shown to prospects, management decides that it would be a waste of time and money to hire a verification firm to verify such a small composite. Is it possible for Renner, Williams & Woods to obtain a firm-wide verification that covers only the equity and balanced composites?

The following information relates to Questions 45 and 46

Excedent Asset Management hires Maven Performance Consulting, Inc. to verify its claim of compliance with the GIPS standards.

Excedent offers equity and fixed-income portfolio management services to US-based institutional clients. Maven's services include customized training programs, technology and operational consulting, and GIPS verification.

At the outset of the verification process, Maven reviews Excedent's performance-related policies and procedures. The verifier also obtains a list of open and closed accounts for all composites for the years under examination.

While the verification is still in progress, Excedent asks Maven to serve as its technology consultant for the selection and implementation of a new fixed-income performance measurement and attribution system.

45 Which statement *most* accurately describes a requirement of the GIPS standards? Maven must be satisfied that Excedent's composite benchmarks are:

A free from systematic bias.

B consistently applied over time.

C unambiguous, investable, and measurable.

46 Maven asks Excedent to provide the account agreements for certain open and closed accounts. Reviewing the selected account agreements is *least likely* to be useful in determining whether:

A Excedent's treatment of taxes, tax reclaims, and tax accruals are correct.

B Excedent has appropriately classified accounts as discretionary or non-discretionary.

C the accounts' objectives are consistent with the definitions of the composites in which they are included.

SOLUTIONS

1 The GIPS standards encourage firms to adopt the broadest, most meaningful definition of a firm. Company C should consider defining itself to include the assets managed by both the institutional entity and the retail entity for the purposes of claiming compliance with the GIPS standards. However, Company C could define the two autonomous entities as separate firms if each subsidiary is held out to clients and potential clients as a distinct business unit. (See Section 3.1 of the reading.)

2 Sample Disclosure: "Firm A is defined as an independent management firm with offices in Japan, Australia, the United Kingdom, and the United States. Firm A (US) is a subsidiary of Firm A serving US clients. Firm A also has subsidiaries in the United Kingdom, Australia, and Japan." (See Section 3.1 of the reading.)

3 C is correct. Provision 1.1.A.2 states that, for periods beginning on or after 1 January 2011, portfolios must be valued in accordance with the definition of fair value, and Provision 1.1.A.3 states in pertinent part that firms must value portfolios in accordance with the composite-specific valuation policy. The GIPS standards do not require firms to adhere to the principles of financial accounting. (See Section 3.2 of the reading.)

4 B is correct. Provision 1.1.A.3.c states that portfolios must be valued "no more frequently than required by the valuation policy." The definition of fair value includes the statement, "In the absence of an objective, observable, unadjusted quoted market price for an identical investment in an active market on the measurement date, the valuation must represent the firm's best estimate of the market value." Provision 1.1.A.4 states, "For periods beginning on or after 1 January 2010, firms must value portfolios as of the calendar month end or the last business day of the month." (See Section 3.2 of the reading.)

5 No. A firm must maintain data necessary to support a firm's claim of compliance. Because Firm A presents five years of performance history, it must maintain the records to support the firm's five-year history and all other relevant data on the firm's composite presentations. Because the Standards require firms to build a ten-year performance history, the firm must continue to maintain the records to support the firm's eventual ten-year performance history. (See Section 3.2 of the reading.)

6 January:

$$R_{\text{Jan}} = (208{,}000 - 200{,}000)/200{,}000 = \mathbf{4.00}\%$$

February:

$$R_{\text{Feb1-15}} = (217{,}000 - 208{,}000)/208{,}000 = 4.33\%$$

$$R_{\text{Feb16-28}} = (263{,}000 - 257{,}000)/257{,}000 = 2.33\%$$

$$R_{\text{Feb1-28}} = [(1 + 0.0433) \times (1 + 0.0233)] - 1 = \mathbf{6.76}\%$$

March:

$$R_{\text{Mar1-21}} = (270{,}000 - 263{,}000)/263{,}000 = 2.66\%$$

$$R_{\text{Mar22-31}} = (245{,}000 - 240{,}000)/240{,}000 = 2.08\%$$

$$R_{\text{Mar1-31}} = [(1 + 0.0266) \times (1 + 0.0208)] - 1 = \mathbf{4.80}\%$$

Quarter 1:

$$R_{QT1} = [(1 + 0.0400) \times (1 + 0.0676) \times (1 + 0.0480)] - 1 = \mathbf{16.36}\%$$

(See Section 3.3 of the reading.)

7 **A** Portfolio returns:

$$r_A = \frac{85.3 - 74.9 - 7.5}{74.9 + (7.5 \times 0.613)} = \frac{2.9}{79.5} = 0.0365 = 3.65\%$$

$$r_B = \frac{109.8 - 127.6 - (-15) - (-5)}{127.6 + (-15 \times 0.742) + (-5 \times 0.387)} = \frac{2.2}{114.535} = 0.0192 = 1.92\%$$

$$r_C = \frac{128.4 - 110.4 - 15}{110.4 + (15 \times 0.387)} = \frac{3}{116.205} = 0.0258 = 2.58\%$$

B To calculate the composite return based on beginning assets, first determine the percent of beginning composite assets represented by each portfolio; then determine the weighted-average return for the month:

Beginning composite assets = 74.9 + 127.6 + 110.4 = 312.9

Portfolio A = 74.9/312.9 = 0.239 = 23.9%

Portfolio B = 127.6/312.9 = 0.408 = 40.8%

Portfolio C = 110.4/312.9 = 0.353 = 35.3%

$$r_{Comp} = (0.0365 \times 0.239) + (0.0192 \times 0.408) + (0.0258 \times 0.353)$$
$$= 0.0257 = 2.57\%$$

C To calculate the composite return based on beginning assets plus cash flows, first use the denominator of the Modified Dietz formula to determine the percentage of total beginning assets plus weighted cash flows represented by each portfolio, and then calculate the weighted-average return:

Beginning composite assets + Weighted cash flows = [74.9 + (7.5 × 0.613)] + [127.6 + (–15 × 0.742) + (–5 × 0.387)] + [110.4 + (15 × 0.387)] = 79.5 + 114.535 + 116.205 = 310.24

Portfolio A = 79.5/310.24 = 0.256 = 25.6%

Portfolio B = 114.535/310.24 = 0.369 = 36.9%

Portfolio C = 116.205/310.24 = 0.375 = 37.5%

$$r_{Comp} = (0.0365 \times 0.256) + (0.0192 \times 0.369) + (0.0258 \times 0.375)$$
$$= 0.0261 = 2.61\%$$

A mathematically equivalent method consists simply in summing beginning assets and intra-period external cash flows, treating the entire composite as though it were a single portfolio and then computing the return directly with the Modified Dietz formula.

$$r_{Comp} = \frac{323.5 - 312.9 - (-15 + 7.5 + 10)}{312.9 + [(-15) \times 0.742 + 7.5 \times 0.613 + 10 \times 0.387]}$$
$$= 0.0261 = 2.61\%$$

8 A is correct. Provision 1.2.A.3 states, "Returns from cash and cash equivalents held in portfolios must be included in all return calculations." Lawton writes, "Cash and cash equivalents must be included in the total return calculation even if the cash is not actually invested by the same person or group." Whether the custodian is selected by the client or the manager is pertinent to the calculation of total firm assets but irrelevant to this question. (See Section 3.5 of the reading.)

9 C is correct. The GIPS Glossary defines trading expenses as "the actual costs of buying or selling investments" and states, "These costs typically take the form of brokerage commissions, exchange fees and/ or taxes, and/ or bid-offer spreads from either internal or external brokers. Custodial fees charged per transaction should be considered custody fees and not trading expenses." (See Section 3.5 of the reading.)

10 Yes. The Standards state that firms must include all actual, discretionary, fee-paying portfolios in at least one of the firm's composites. If the portfolio meets the defined criteria for inclusion in more than one composite, the firm must include the portfolio in all the firm's appropriate composites. For example, a firm may have a large-cap composite and a large-cap growth composite. If the firm manages a portfolio that meets the criteria for inclusion in the large-cap composite as well as the large-cap growth composite, the firm must include the portfolio in both composites. (See Section 3.7 of the reading.)

11 Barry Smith must have a documented, composite-specific policy for the treatment of external cash flows and must compute time-weighted total returns that adjust for external cash flows. For periods beginning 1 January 2005, rate-of-return approximation methods must adjust for cash flows on a day-weighted basis (I.2.A.2). Accordingly, Barry Smith must use a return-calculation methodology that adjusts for daily-weighted external cash flows, such as the Modified Dietz method. However, the 12 March 2006 contribution to the Dennett portfolio represents 13.67 percent of the portfolio's value, and it may be classified as a large external cash flow. Barry Smith must establish in advance a policy for the treatment of external cash flows for the Balanced Tax-Exempt composite. "Large" external cash flows may distort approximated returns. (See Sections 3.2, 3.5, and 3.9 of the reading.)

The 2010 version of the Standards includes a recommendation to value portfolios on the date of "all" external cash flows. This recommendation is effective for periods beginning on or after January 1, 2011 (I.1.B.1). As Barry Smith has adopted a large cash flow policy as of 1 January 2006 and assumes all external cash flows take place at the end of the day, given that the 12 March 2006 cash flow meets the definition of "large", the firm must value the portfolio as of the end of the day on 12 March 2006. Barry Smith would then compute sub-period returns for the March partial periods before and after the cash flow and link them to calculate a true time-weighted rate of return for the month of March. Alternately, if Barry Smith had adopted a "significant" cash flow policy for this composite and the 12 March cash flow met this definition, the firm would either determine that this entire portfolio be excluded from the composite for the month of March or treat the cash flow as a temporary new account (I.3.B.2).

12 Smith & Jones may not claim to be in compliance with the GIPS standards if model performance is linked to actual performance. The GIPS standards state that composites must include only actual assets under management within the defined firm, and they expressly prohibit linking the performance of simulated or model portfolios with actual performance (I.3.A.3). (See Section 3.7 of the reading.)

13 A is correct. Provision I.3.A.5 states, "Composites must include new portfolios on a timely and consistent basis after each portfolio comes under management." In this case, it is expected to take an extended period to invest the new client's assets in accordance with the composite strategy. Assuming Taurus complies with the GIPS standards, its documented policy would provide for the inclusion of new private equity portfolios in the composite on a timely basis. For example, Taurus's policy may require new portfolios to be included in the composite as of the first full measurement period that the assets are fully invested. Taurus must apply its policy consistently. (See Section 3.9 of the reading.)

14 A is correct. Provision I.3.A.6 states, "Terminated portfolios must be included in the historical performance of the composite up to the last full measurement period that each portfolio was under management." The last full measurement period that the Chimie bio-industrielle portfolio was under the management of Ord Capital Management was the month of March. (See Section 3.9 of the reading.)

15 C is correct. Provision I.3.A.7 states, "Portfolios must not be switched from one composite to another unless documented changes to a portfolio's investment mandate, objective, or strategy or the redefinition of the composite makes it appropriate. The historical performance of the portfolio must remain with the original composite." (See Section 3.9 of the reading.)

16 B is correct. Provision I.3.A.7 states, "Portfolios must not be switched from one composite to another unless documented changes to a portfolio's investment mandate, objective, or strategy or the redefinition of the composite make it appropriate. *The historical performance of the portfolio must remain with the original composite.*" (Emphasis added.) (See Section 3.9 of the reading.)

17 C is correct. Provision I.3.A.9 states in pertinent part, "If the firm sets a minimum asset level for portfolios to be included in a composite, the firm must not include portfolios below the minimum asset level in that composite." Belltower must remove the Hartford portfolio from the core-plus fixed-income composite when the portfolio's assets fall below the minimum, and return it to the composite when it once again qualifies for inclusion. A is incorrect because composites must be defined according to similar investment objectives and/or strategies; there should be no "miscellaneous" composite. (See Section 3.9 of the reading.)

18 A is correct. The client's prior approval authority for security transactions appears to render the portfolio non-discretionary. Provision I.3.A.1 states, in part, that "non-discretionary portfolios must not be included in a firm's composites." B is incorrect because, in accordance with Provision I.0.A.13, total firm assets must include all discretionary and non-discretionary assets managed by the firm. (See Sections 3.1 and 3.7 of the reading.)

19 The GIPS standards prohibit including non-discretionary portfolios in composites. IPS restrictions do not necessarily render a portfolio non-discretionary. It is up to the investment management firm to define discretion and to determine whether it has the discretion to implement the investment strategy, given the restrictions of the IPS. In this case, however, it appears likely that SMERF's policy requiring transactions to be approved in advance by the Investment Committee and the pension plan's liquidity needs prevent Midwest National Bank from fully implementing the investment objective of achieving long-term capital appreciation through active management. If so, Midwest National Bank should classify the SMERF portfolio as non-discretionary and exclude it from all composites. (See Section 3.7 of the reading.)

20 B is correct. Provision I.3.A.1 states, "All actual, fee-paying, discretionary portfolios must be included in at least one composite. Although non-fee-paying discretionary portfolios may be included in a composite (with appropriate disclosure), non-discretionary portfolios must not be included in a firm's composites." (See Section 3.7 of the reading.)

21 A is correct. Such a restriction would most likely alter portfolio structure and would also be likely client specific. The restrictions in B and C are not necessarily client specific and could already be part of the investment strategy of the manager. (See Section 3.7 of the reading.)

22 Under the Standards, there is no minimum or maximum number of portfolios that a composite may include. The Standards require that firms disclose the number of portfolios in each composite as of the end of each annual period presented, unless there are five or fewer portfolios (I.5.A.1f). (See Section 3.12 of the reading.)

23 B is correct. Provision I.4.A.25 states, "For periods beginning on or after 1 January 2006, firms must disclose the use of a sub-advisor and the periods a sub-advisor was used." (See Section 3.11 of the reading.)

24 A is correct. "For any performance presented for periods prior to 1 January 2000 that does not comply with the GIPS standards, firms must disclose the periods of non-compliance (I.4.A.15)." Provision I.5.B.8 recommends that firms comply with the GIPS Standards for all historical periods. (See Sections 3.11 and 3.13 of the reading.)

25 A is correct. Provision I.4.A.13 states, "Firms must disclose the presence, use, and extent of leverage, derivatives, and short positions, if material, including a description of the frequency of use and characteristics of the instruments sufficient to identify risks." (See Section 3.11 of the reading.)

26 The GIPS standards require that at least five years of GIPS-compliant performance be reported (or for the period since firm's inception or the composite inception date if the firm or the composite has been in existence less than five years). After presenting a minimum of five years of GIPS-compliant performance (or for the period since firm's inception or the composite inception date if the firm or composite has been in existence less than five years), the firm must present an additional year of performance each year, building up to a minimum of 10 years of GIPS-compliant performance (I.5.A.1a). Bentwood Institutional Asset Management could not drop the years prior to 2001 at the time Cooper suggests it do so. In addition to violating a specific requirement, Cooper's suggestion was not in the spirit of fair representation and full disclosure of performance. Technically, the firm will be able drop the early years of its composite presentation once it has established a 10-year GIPS-compliant record, as long as it continues to show at least the most recent 10 years. For instance, it will be able to show just the 10 calendar years 2001-2010 after the composite returns for 2010 become available. However, it is recommended that Bentwood show its entire GIPS-compliant performance record (I.5.B.7). (See Sections 3.12 and 3.13 of the reading.)

27 The report has a large number of omissions and errors.

Omissions that prevent the Bristol Capital Management performance report from being GIPS-compliant includes the following:

- The availability of a list of composite descriptions is not disclosed as is required (I.4.A.11).
- The availability of policies for valuing portfolios, calculating performance, and preparing compliant presentations is not disclosed (I.4.A.12).

- Although Bristol does disclose the use of derivatives, it appears that the firm has not included all the required disclosure in this area. The firm must disclose the presence, use, and extent of leverage, derivatives and short positions, if material, including a description of the frequency of use and characteristics of the instruments sufficient to identify risks (I.4.A.13).
- If the firm has included non-fee-paying portfolios in its composite, the percentage of the composite assets represented by non-fee-paying portfolios must be disclosed as of the end of each annual period (I.5.A.6).
- The composite creation date must be disclosed (I.4.A.10).
- Because the composite represents a global investment strategy, the presentation must include information about the treatment of withholding taxes on dividends, interest income, and capital gains, if material (I.4.A.20).
- Both a composite description and benchmark description must be disclosed (I.4.A.3-4).
- A fee schedule appropriate to the compliant presentation must be disclosed (I.4.A.9).

There are many items included in the Bristol Capital Management performance report that are *not compliant* with GIPS, including the following:

- The GIPS standards state that performance periods of less than one year must not be annualized, as Bristol does for the first quarter of 2011 (I.5.A.4).
- GIPS verification cannot be performed for a single composite as is stated in the presentation. Verification does not provide assurance about the performance of any specific composite. Firms must not state that a particular composite has been "verified" or make any claim to that effect (IV.A.3).
- For periods beginning on or after 1 January 2001, portfolios must be valued at least monthly. For periods beginning on or after 1 January 2010, portfolios must be valued on the date of all large cash flows. Bristol is valuing portfolios quarterly (I.1.A.3).
- A firm must use the appropriate compliance statement as specified in the GIPS standards. There are no allowances for partial compliance. If a firm does not meet all the requirements of the GIPS standards, the firm must not represent or state that it is "in compliance with the Global Investment Performance Standards except for..." or make any other statements that may indicate partial compliance with the GIPS standards. Bristol's use of the "except for" compliance statement violates the Standards (I.0.A.6) and the appropriate compliance statement has not been used (I.4.A.1).
- The firm must disclose which measure of internal dispersion is presented (I.4.A.8).
- The GIPS standards state that accrual accounting must be used for fixed-income securities and all other investments that earn interest income (I.1.A.6). Bristol states that it uses cash-basis accounting for the recognition of interest income.

28 C is correct. The composite description indicates that the composite contains both fee-paying and non-fee-paying portfolios. GIPS Provision I.5.A.6 states, "If a composite includes non-fee-paying portfolios, the firm must present the percentage of composite assets represented by non-fee-paying portfolios as of each annual period end." A is incorrect because the Standards recommend but do not require that firms present cumulative returns for all periods. B is incorrect because the Standards permit firms to present either the percentage of the total firm assets represented by the composite or the amount of total firm assets at the end of each annual period. (See Sections 3.12 and 3.13 of the reading.)

29 A is correct. GIPS Provision I.4.A.31 states, "If a custom benchmark or combination of multiple benchmarks is used, the firm must disclose the benchmark components, weights and re-balancing process." Tidewater discloses the frequency of custom benchmark rebalancing but does not describe the custom benchmark weights and components. B is not the best answer because the Standards require disclosure of the presence, use, and extent of leverage or derivatives only if the use of leverage or derivatives is material. C is incorrect because the Standards require only that firms disclose any changes to the name of a composite. Firms are not required to disclose the date and reasons for the composite name change. (See Section 3.11 of the reading.)

30 C is correct. GIPS Provision I.5.A.7 states, "If a composite includes portfolios with bundled fees, the firm must present the percentage of composite assets represented by portfolios with bundled fees as of each annual period end." The Standards do not require firms to disclose the fee schedule in effect for prior periods or the segregated components of bundled fees. (See Section 3.12 of the reading.)

31 The firm must determine if the decision-making process remains intact (unchanged) in Firm U. If Firm U continues the original strategy of the composite with all of its continuing factors, appropriate disclosures are made and documentation is in place, the performance must be linked. (See Section 3.12 of the reading.)

32 B is correct. The GIPS Glossary gives this definition of Residual Value (private equity and real estate): "The remaining equity that limited partners (or investors) have in an investment vehicle at the end of the performance reporting period." The GIPS Glossary defines the RVPI (real estate and private equity) as "residual value divided by since inception paid-in capital". Accordingly, the market value of the SPES composite can be estimated by multiplying the paid-in capital by the RVPI measure. The calculation is $20.0 × 0.99 = $19.8 million. (See Section 3.15 of the reading.)

33 C is correct. The GIPS Glossary defines the TVPI (real estate and private equity) as "total value divided by since inception paid-in capital." The GIPS Glossary defines Total Value (real estate and private equity) as "residual value plus distributions". Using the data given in Exhibit I, the simplest way to find TVPI is to add RVPI and DPI. The calculation is: 0.99 + 0.13 = 1.12. Alternately, one can multiply the monetary amount of paid-in capital by RVPI to determine the residual value, add it to cumulative distributions, and divide the sum by paid-in capital. In this approach, the calculation is [(20 × 0.99) + 2.5]/20 = 1.12. (See Section 3.15 of the reading.)

34 A is correct. The GIPS Glossary defines the Realization Multiple (DPI) (real estate and private equity) as "since inception distributions divided by since inception paid-in capital". The realization multiple (DPI) may be described as a measure of how much of the investors' capital has been returned to them. Exhibit I displays the realization multiple (0.13 or 13%), and it can also be calculated by dividing cumulative distributions by paid-in capital. (See Section 3.15 of the reading.)

35 C is correct. The GIPS Glossary defines the PIC Multiple (real estate and private equity) as "since inception paid-in capital divided by cumulative committed capital". Accordingly, given paid-in capital of $20 million and a PIC multiple of 0.80, committed capital is $20/0.80 = $25.0. (See Section 3.15 of the reading.)

36 B is correct. The GIPS Advertising Guidelines specify that advertisements that include a claim of compliance and that present performance results must include period-to-date composite performance results in addition to either one-, three-, and five-year annualized composite returns or five years of annual composite returns. (See Section 5 of the reading.)

37 B is correct. The following definition of "advertisement" is provided in the GIPS Advertising Guidelines: "For the purposes of these guidelines, an advertisement includes any materials that are distributed to or designed for use in newspapers, magazines, firm brochures, letters, media, or any other written or electronic material addressed to more than one prospective client. Any written material, other than one-on-one presentations and individual client reporting, distributed to maintain existing clients or solicit new clients for a firm is considered an advertisement." (See Section 5 of the reading.)

38 A is correct. Chapter III.B.3 of the GIPS Advertising Guidelines provides the correct wording of the compliance statement that must be used in advertisements that include a claim of compliance. The advertisements must also state how prospective client can obtain a compliant presentation and/or the firm's list of composite descriptions, but that disclosure is not a part of the GIPS compliance statement for advertisements. (See Section 5 of the reading.)

39 A is correct. GIPS Provision III.B.8 states, "All advertisements that include a claim of compliance with the GIPS standards by following the GIPS Advertising Guidelines must disclose the following: The benchmark description." (See Section 5 of the reading.)

40 C is correct. GIPS Provision III.B.6 states, "All advertisements that include a claim of compliance with the GIPS standards by following the GIPS Advertising Guidelines must disclose the following: Whether returns are presented gross-of-fees and/or net-of-fees". A is incorrect because GIPS-compliant advertisements may show either five years of annual composite returns or period-to-date, one-, three-, and five-year cumulative annualized composite returns. Herrschaft's advertisement shows the latter. B is incorrect because the GIPS Advertising Guidelines do not require firms to present a measure of dispersion. (See Section 5 of the reading.)

41 A is correct. Answer A presents the prescribed wording of the GIPS Advertising Guidelines compliance statement. (See Section 5 of the reading.)

42 B is correct. Herrschaft's description of the composite strategy is uninformative. It would most likely be possible for Herrschaft to provide a more satisfactory description without revealing its trade secrets. A is incorrect because the description of the firm is adequate. C is incorrect because Herrschaft states that derivatives are used solely for the purpose of efficient management of cash flows. GIPS Provision III.B.11 states, "All advertisements that include a claim of compliance with the GIPS standards by following the GIPS Advertising Guidelines must disclose the following: The presence, use, and extent of leverage, derivatives, and short positions, if material, including a description of the frequency of use and characteristics of the instruments sufficient to identify risks". Consequently, a description of the use and extent of leverage or derivatives is not required in this case. (See Sections 3.11 and 5 of the reading.)

43 A is correct. The GIPS standards state that verification "brings additional credibility to the claim of compliance" but that it "does not ensure the accuracy of any specific composite presentation." (IV, Verification.) The Standards do not indicate that verification attests to the adequacy of the firm's internal controls. (See Section 6 of the reading.)

44 Under the GIPS standards, a single verification report is issued with respect to the whole firm. Verification cannot be carried out on a composite, and, accordingly, does not provide assurance about the performance of any specific composite. Firms must not state that a particular composite has been "verified" or make any claim to that effect (See IV.A.3). A qualified verification firm would not accept an assignment from Renner, Williams & Woods to conduct verification only with regard to the firm's equity and balanced account composites while excluding the fixed-income composites from the scope of the verification. (See Section 6 of the reading.)

45 B is correct. GIPS Provision IV.B.2.a.vii states, "Verifiers must perform sufficient procedures to determine that: The composite benchmark reflects the investment mandate, objective, or strategy of the composite." (See Section 6 of the reading.)

46 A is correct. The account agreements are unlikely to shed light on whether the firm's treatment of taxes, tax reclaims, and tax accruals is correct. B is incorrect because GIPS Provision IV.B.2.b states, in part, "Verifiers must obtain a list of all portfolios. Verifiers must select portfolios from this list and perform sufficient procedures to determine that the firm's classification of the portfolios as discretionary or non-discretionary is appropriate by referring to the portfolio's investment management agreement and/or investment guidelines and the firm's policies and procedures for determining investment discretion." C is incorrect because GIPS Provision IV.B.2.c.iii states, in part, "Verifiers must...determine that: The portfolio's investment mandate, objective, or strategy, as indicated by the portfolio's investment management agreement, investment guidelines, portfolio summary, and/or other appropriate documentation, is consistent with the composite definition." (See Section 6 of the reading.)

CUSTOMER SERVICE

68

Glossary

Absolute return benchmark A minimum target return that an investment manager is expected to beat.

Absolute return vehicles Investments that have no direct benchmark portfolio.

Accounting defeasance Also called in-substance defeasance, accounting defeasance is a way of extinguishing a debt obligation by setting aside sufficient high-quality securities to repay the liability.

Accounting risk The risk associated with accounting standards that vary from country to country or with any uncertainty about how certain transactions should be recorded.

Accumulated benefit obligation (ABO) The present value of pension benefits, assuming the pension plan terminated immediately such that it had to provide retirement income to all beneficiaries for their years of service up to that date.

Accumulated service Years of service of a pension plan participant as of a specified date.

Active investment strategies An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active-lives The portion of a pension fund's liabilities associated with active workers.

Active management An approach to investing in which the portfolio manager seeks to outperform a given benchmark portfolio.

Active return The portfolio's return in excess of the return on the portfolio's benchmark.

Active risk The annualized standard deviation of active returns, also referred to as *tracking error* (also sometimes called *tracking risk*).

Active risk budgeting Risk budgeting that concerns active risk (risk relative to a portfolio's benchmark).

Actual extreme events A type of scenario analysis used in stress testing. It involves evaluating how a portfolio would have performed given movements in interest rates, exchange rates, stock prices, or commodity prices at magnitudes such as occurred during past extreme market events (e.g., the stock market crash of October 1987).

Ad valorem fees Fees that are calculated by multiplying a percentage by the value of assets managed; also called assets under management (AUM) fees.

Adaptive markets hypothesis (AMH) A hypothesis that applies principles of evolution—such as competition, adaptation, and natural selection—to financial markets in an attempt to reconcile efficient market theories with behavioral alternatives.

Adverse selection risk The risk associated with information asymmetry; in the context of trading, the risk of trading with a more informed trader.

Algorithmic trading Automated electronic trading subject to quantitative rules and user-specified benchmarks and constraints.

Allocation/selection interaction return A measure of the joint effect of weights assigned to both sectors and individual securities; the difference between the weight of the portfolio in a given sector and the portfolio's benchmark for that sector, times the difference between the portfolio's and the benchmark's returns in that sector, summed across all sectors.

Alpha Excess risk-adjusted return.

Alpha and beta separation An approach to portfolio construction that views investing to earn alpha and investing to establish systematic risk exposures as tasks that can and should be pursued separately.

Alpha research Research related to capturing excess risk-adjusted returns by a particular strategy; a way investment research is organized in some investment management firms.

Alternative investments Groups of investments with risk and return characteristics that differ markedly from those of traditional stock and bond investments.

Anchoring and adjustment An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring and adjustment bias An information-processing bias in which the use of a psychological heuristic influences the way people estimate probabilities.

Anchoring trap The tendency of the mind to give disproportionate weight to the first information it receives on a topic.

Angel investor An accredited individual investing chiefly in seed- and early-stage companies.

Anomalies Apparent deviations from market efficiency.

Ask price The price at which a dealer will sell a specified quantity of a security. Also called *ask*, *offer price*, or *offer*.

Ask size The quantity associated with the ask price.

Aspirational risk bucket In goal-based portfolio planning, that part of wealth allocated to investments that have the potential to increase a client's wealth substantially.

Asset covariance matrix The covariance matrix for the asset classes or markets under consideration.

Asset/liability management The management of financial risks created by the interaction of assets and liabilities.

Asset location The type of account an asset is held within, e.g., taxable or tax deferred.

Asset-only With respect to asset allocation, an approach that focuses directly on the characteristics of the assets without explicitly modeling the liabilities.

Assurity of completion In the context of trading, confidence that trades will settle without problems under all market conditions.

Assurity of the contract In the context of trading, confidence that the parties to trades will be held to fulfilling their obligations.

Asynchronism A discrepancy in the dating of observations that occurs because stale (out-of-date) data may be used in the absence of current data.

AUM fee A fee based on assets under management; an *ad valorem* fee.

Authorized participants Broker/dealers who enter into an agreement with the distributor of the fund.

Automated trading Any form of trading that is not manual, including trading based on algorithms.

Availability bias An information-processing bias in which people take a heuristic approach to estimating the probability of an outcome based on how easily the outcome comes to mind.

Average effective spread A measure of the liquidity of a security's market. The mean effective spread (sometimes dollar weighted) over all transactions in the stock in the period under study.

Back office Administrative functions at an investment firm such as those pertaining to transaction processing, record keeping, and regulatory compliance.

Backtesting A method for gaining information about a model using past data. As used in reference to VaR, it is the process of comparing the number of violations of VaR thresholds over a time period with the figure implied by the user-selected probability level.

Backwardation With respect to the futures curve in a commodity futures market, the condition of being downward sloping.

Balance of payments An accounting of all cash flows between residents and nonresidents of a country.

Bancassurance The sale of insurance by banks.

Barbell A fixed income portfolio combining securities concentrated in short and long maturities relative to the benchmark.

Base With respect to a foreign exchange quotation of the price of one unit of a currency, the currency referred to in "one unit of a currency."

Base-rate neglect A type of representativeness bias in which the base rate or probability of the categorization is not adequately considered.

Basis point value (BPV) The change in the bond price for a 1 basis point change in yield. Also called *present value of a basis point* or *price value of a basis point (PVBP)*.

Basis risk The risk resulting from using a hedging instrument that is imperfectly matched to the investment being hedged; in general, the risk that the basis will change in an unpredictable way.

Batch auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Bayes' formula A mathematical rule explaining how existing probability beliefs should be changed given new information; it is essentially an application of conditional probabilities.

Bear spread An option strategy that involves selling a put with a lower exercise price and buying a put with a higher exercise price. It can also be executed with calls.

Behavioral finance An approach to finance based on the observation that psychological variables affect and often distort individuals' investment decision making.

Behavioral finance macro A focus on market level behavior that considers market anomalies that distinguish markets from the efficient markets of traditional finance.

Behavioral finance micro A focus on individual level behavior that examines the behavioral biases that distinguish individual investors from the rational decision makers of traditional finance.

Benchmark In an investments context, a standard or point of reference for evaluating the performance of an investment portfolio.

Benchmark spread The yield on a credit security over the yield on a security with little or no credit risk (benchmark bond) and with a similar duration.

Best efforts order A type of order that gives the trader's agent discretion to execute the order only when the agent judges market conditions to be favorable.

Beta A measure of the sensitivity of a given investment or portfolio to movements in the overall market.

Beta research Research related to systematic (market) risk and return; a way investment research is organized in some investment management firms.

Bid The price at which a dealer will buy a specified quantity of a security. Also called *bid price*.

Bid–ask spread The difference between the current bid price and the current ask price of a security.

Bid price In a price quotation, the price at which the party making the quotation is willing to buy a specified quantity of an asset or security.

Bid size The quantity associated with the bid price.

Block order An order to sell or buy in a quantity that is large relative to the liquidity ordinarily available from dealers in the security or in other markets.

Bond-yield-plus-risk-premium method An approach to estimating the required return on equity which specifies that required return as a bond yield plus a risk premium.

Bottom-up Focusing on company-specific fundamentals or factors such as revenues, earnings, cash flow, or new product development.

Bottom-up approach A credit strategy approach that involves selecting the individual bonds or issuers that the investor views as having the best relative value from among a set of bonds or issuers with similar features.

Bounded rationality The notion that people have informational and cognitive limitations when making decisions and do not necessarily optimize when arriving at their decisions.

Box spread An option strategy that combines a bull spread and a bear spread having two different exercise prices, which produces a risk-free payoff of the difference in the exercise prices.

Broad market indexes An index that is intended to measure the performance of an entire asset class. For example, the S&P 500 Index, Wilshire 5000, and Russell 3000 indexes for US common stocks.

Broker An agent of a trader in executing trades.

Brokered markets Markets in which transactions are largely effected through a search-brokerage mechanism away from public markets.

Bubbles Episodes in which asset market prices move to extremely high levels in relation to estimated intrinsic value.

Buffering With respect to style index construction, rules for maintaining the style assignment of a stock consistent with a previous assignment when the stock has not clearly moved to a new style.

Build-up approach Synonym for the risk premium approach.

Bull spread An option strategy that involves buying a call with a lower exercise price and selling a call with a higher exercise price. It can also be executed with puts.

Bullet A fixed income portfolio made up of securities targeting a single segment of the curve.

Business cycle Fluctuations in GDP in relation to long-term trend growth, usually lasting 9–11 years.

Business risk The equity risk that comes from the nature of the firm's operating activities.

Butterfly spread An option strategy that combines two bull or bear spreads and has three exercise prices, or, a measure of yield curve curvature.

Buy side Investment management companies and other investors that use the services of brokerages.

Buy-side traders Professional traders that are employed by investment managers and institutional investors.

Calendar-and-percentage-of-portfolio rebalancing Monitoring a portfolio at regular frequencies, such as quarterly. Rebalancing decisions are then made based upon percentage-of-portfolio principles.

Calendar rebalancing Rebalancing a portfolio to target weights on a periodic basis; for example, monthly, quarterly, semiannually, or annually.

Calmar ratio The compound annualized rate of return over a specified time period divided by the absolute value of maximum drawdown over the same time period.

Cap A combination of interest rate call options designed to hedge a borrower against rate increases on a floating-rate loan.

Cap weighting See *capitalization weighting*.

Capital adequacy ratio A measure of the adequacy of capital in relation to assets.

Capital flows forecasting approach An exchange rate forecasting approach that focuses on expected capital flows, particularly long-term flows such as equity investment and foreign direct investment.

Capital market expectations (CME) Expectations concerning the risk and return prospects of asset classes.

Capitalization weighting The most common security weighting scheme in which constituents are held in proportion to their market capitalizations, calculated as price times available shares. Also known as *market value*, *market cap*, or *cap weighting*.

Caplet Each component call option in a cap.

Carried interest A private equity fund manager's incentive fee; the share of the private equity fund's profits that the fund manager is due once the fund has returned the outside investors' capital.

Carry trade A trading strategy that involves buying a security and financing it at a rate that is lower than the yield on that security.

Cash balance plan A defined-benefit plan whose benefits are displayed in individual recordkeeping accounts.

Cash flow at risk A variation of VaR that measures the risk to a company's cash flow, instead of its market value; the minimum cash flow loss expected to be exceeded with a given probability over a specified time period.

Cash flow matching Immunization approach that attempts to ensure that all future liability payouts are matched precisely by cash flows from bonds or fixed-income derivatives, such as interest rate futures, options, or swaps.

Cell approach See *stratified sampling*.

Certainty equivalent The maximum sum of money a person would pay to participate or the minimum sum of money a person would accept to not participate in an opportunity.

Chain-linking A process for combining periodic returns to produce an overall time-weighted rate of return.

Cheapest-to-deliver A bond in which the amount received for delivering the bond is largest compared with the amount paid in the market for the bond.

Civil law A legal system derived from Roman law, in which judges apply general, abstract rules or concepts to particular cases. In civil systems, law is developed primarily through legislative statutes or executive action.

Clawback provision With respect to the compensation of private equity fund managers, a provision that specifies that money paid to the fund manager be returned to the investors if, at the end of a fund's life, the investors have not received back their capital contributions and contractual share of profits.

Closed-book markets Markets in which a trader does not have real-time access to all quotes in a security.

Closeout netting In a bankruptcy, a process by which multiple obligations between two counterparties are consolidated into a single overall value owed by one of the counterparties to the other.

Cobb-Douglas model A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cobb-Douglas production function A production function (model for economic output) based on factors of labor and capital that exhibits constant returns to scale.

Cognitive dissonance The mental discomfort that occurs when new information conflicts with previously held beliefs or cognitions.

Cognitive errors Behavioral biases resulting from faulty reasoning; cognitive errors stem from basic statistical, information processing, or memory errors.

Collar An option strategy involving the purchase of a put and sale of a call in which the holder of an asset gains protection below a certain level, the exercise price of the put, and pays for it by giving up gains above a certain level, the exercise price of the call. Collars also can be used to provide protection against rising interest rates on a floating-rate loan by giving up gains from lower interest rates.

Commingled real estate funds (CREFs) Professionally managed vehicles for substantial commingled (i.e., pooled) investment in real estate properties.

Commitment period The period of time over which committed funds are advanced to a private equity fund.

Commodities Articles of commerce such as agricultural goods, metals, and petroleum; tangible assets that are typically relatively homogeneous in nature.

Commodity trading advisers (CTAs) Registered advisers who manage futures funds.

Common law A legal system which draws abstract rules from specific cases. In common law systems, law is developed primarily through decisions of the courts.

Community property regime A marital property regime under which each spouse has an indivisible one-half interest in property received during marriage.

Company-specific risk The non-systematic or idiosyncratic risk specific to a particular company's operations, reputation, and business environment.

Completeness fund A portfolio that, when added to active managers' positions, establishes an overall portfolio with approximately the same risk exposures as the investor's overall equity benchmark.

Confidence band With reference to a quality control chart for performance evaluation, a range in which the manager's value-added returns are anticipated to fall a specified percentage of the time.

Confirmation bias A belief perseverance bias in which people tend to look for and notice what confirms their beliefs, to ignore or undervalue what contradicts their beliefs, and to misinterpret information as support for their beliefs.

Confirming evidence trap The bias that leads individuals to give greater weight to information that supports an existing or preferred point of view than to evidence that contradicts it.

Conjunction fallacy An inappropriate combining of probabilities of independent events to support a belief. In fact, the probability of two independent events occurring in conjunction is never greater than the probability of either event occurring alone; the probability of two independent events occurring together is equal to the multiplication of the probabilities of the independent events.

Conservatism bias A belief perseverance bias in which people maintain their prior views or forecasts by inadequately incorporating new information.

Consistent growth A growth investment substyle that focuses on companies with consistent growth having a long history of unit-sales growth, superior profitability, and predictable earnings.

Constant returns to scale A characteristic of a production function such that a given percentage increase in capital stock and labor input results in an equal percentage increase in output.

Contingent immunization Hybrid approach that combines immunization with an active management approach when the asset portfolio's value exceeds the present value of the liability portfolio.

Continuous auction markets Auction markets where orders can be executed at any time during the trading day.

Contrarian A value investment substyle focusing on stocks that have been beset by problems.

Controlled foreign corporation A company located outside a taxpayer's home country and in which the taxpayer has a controlling interest as defined under the home country law.

Convexity A measure of how interest rate sensitivity changes with a change in interest rates.

Core capital The amount of capital required to fund spending to maintain a given lifestyle, fund goals, and provide adequate reserves for unexpected commitments.

Core–satellite A way of thinking about allocating money that seeks to define each investment's place in the portfolio in relation to specific investment objectives or roles.

Core-satellite portfolio A portfolio in which certain investments (often indexed or semi-active) are viewed as the core and the balance are viewed as satellite investments fulfilling specific roles.

Corporate governance The system of internal controls and procedures used to define and protect the rights and responsibilities of various stakeholders.

Corporate venturing Investments by companies in promising young companies in the same or a related industry.

Covered call An option strategy involving the holding of an asset and sale of a call on the asset.

Creation units Large blocks of ETF shares often traded against a basket of underlying securities.

Credit default swap A swap used to transfer credit risk to another party. A protection buyer pays the protection seller in return for the right to receive a payment from the seller in the event of a specified credit event.

Credit derivative A contract in which one party has the right to claim a payment from another party in the event that a specific credit event occurs over the life of the contract.

Credit method When the residence country reduces its taxpayers' domestic tax liability by the amount of taxes paid to a foreign country that exercises source jurisdiction.

Credit risk The risk of loss caused by a counterparty's or debtor's failure to make a timely payment or by the change in value of a financial instrument based on changes in default risk. Also called *default risk*.

Credit spread forward A forward contract used to transfer credit risk to another party; a forward contract on a yield spread.

Credit spread option An option based on the yield spread between two securities that is used to transfer credit risk.

Credit VaR A variation of VaR related to credit risk; it reflects the minimum loss due to credit exposure with a given probability during a period of time.

Credited rates Rates of interest credited to a policyholder's reserve account.

Cross-default provision A provision stipulating that if a borrower defaults on any outstanding credit obligations, the borrower is considered to be in default on all obligations.

Cross hedge A hedge involving a hedging instrument that is imperfectly correlated with the asset being hedged; an example is hedging a bond investment with futures on a non-identical bond.

Currency overlay programs A currency overlay program is a program to manage a portfolio's currency exposures for the case in which those exposures are managed separately from the management of the portfolio itself.

Current credit risk The risk of credit-related events happening in the immediate future; it relates to the risk that a payment currently due will not be paid. Also called *jump-to-default risk*.

Custom security-based benchmark Benchmarks that are custom built to accurately reflect the investment discipline of a particular investment manager. Also called *strategy benchmarks* because they reflect a manager's particular strategy.

Cyclical stocks The shares of companies whose earnings have above-average sensitivity to the business cycle.

Cyclically Adjusted P/E Ratio (CAPE) A price-to-earnings ratio in which the numerator (in a US context) is defined as the real S&P 500 price index and the denominator as the moving average of the preceding 10 years of real reported earnings on the S&P 500.

Day traders Traders that rapidly buy and sell stocks in the hope that the stocks will continue to rise or fall in value for the seconds or minutes they are prepared to hold a position. Day traders hold a position open somewhat longer than a scalper but closing all positions at the end of the day.

Dealer A business entity that is ready to buy an asset for inventory or sell an asset from inventory to provide the other side of an order. Also called *market maker*.

Decision price The prevailing price when the decision to trade is made. Also called *arrival price* or *strike price*.

Decision-reversal risk The risk of reversing a chosen course of action at the point of maximum loss.

Decision risk The risk of changing strategies at the point of maximum loss.

Deduction method When the residence country allows taxpayers to reduce their taxable income by the amount of taxes paid to foreign governments in respect of foreign-source income.

Deemed dispositions Tax treatment that assumes property is sold. It is sometimes seen as an alternative to estate or inheritance tax.

Deemed distribution When shareholders of a controlled foreign corporation are taxed as if the earnings were distributed to shareholders, even though no distribution has been made.

Default risk The probability that a borrower defaults or fails to meet its obligation to make full and timely payments of principal and interest, according to the terms of the debt security.

Default risk premium Compensation for the possibility that the issue of a debt instrument will fail to make a promised payment at the contracted time and in the contracted amount.

Defaultable debt Debt with some meaningful amount of credit risk.

Deferred annuity An annuity that enables an individual to purchase an income stream that will begin at a later date.

Defined-benefit plan A pension plan that specifies the plan sponsor's obligations in terms of the benefit to plan participants.

Defined-contribution plan A pension plan that specifies the sponsor's obligations in terms of contributions to the pension fund rather than benefits to plan participants.

Deflation A decrease in the general level of prices; an increase in the purchasing power of a unit of currency.

Delay costs Implicit trading costs that arise from the inability to complete desired trades immediately due to order size or market liquidity. Also called *slippage*.

Delta The relationship between the option price and the underlying price, which reflects the sensitivity of the price of the option to changes in the price of the underlying.

Delta hedge An option strategy in which a position in an asset is converted to a risk-free position with a position in a specific number of options. The number of options per unit of the underlying changes through time, and the position must be revised to maintain the hedge.

Delta hedging Hedging that involves matching the price response of the position being hedged over a narrow range of prices.

Delta-normal method A measure of VaR equivalent to the analytical method but that refers to the use of delta to estimate the option's price sensitivity.

Demand deposit A deposit that can be drawn upon without prior notice, such as a checking account.

Demutualizing The process of converting an insurance company from mutual form to stock.

Descriptive statistics Methods for effectively summarizing data to describe important aspects of a dataset.

Differential returns Returns that deviate from a manager's benchmark.

Diffusion index An index that measures how many indicators are pointing up and how many are pointing down.

Direct commodity investment Commodity investment that involves the cash market purchase of physical commodities or exposure to changes in spot market values via derivatives, such as futures.

Direct market access Platforms sponsored by brokers that permit buy-side traders to directly access equities, fixed income, futures, and foreign exchange markets, clearing via the broker.

Disability income insurance A type of insurance designed to mitigate earnings risk as a result of a disability in which an individual becomes less than fully employed.

Discounted cash flow models (DCF models) Valuation models that express the idea that an asset's value is the present value of its (expected) cash flows.

Discretionary trust A trust structure in which the trustee determines whether and how much to distribute in the sole discretion of the trustee.

Disintermediation To withdraw funds from financial intermediaries for placement with other financial intermediaries offering a higher return or yield. Or, to withdraw funds from a financial intermediary for the purposes of direct investment, such as withdrawing from a mutual fund to make direct stock investments.

Dispersion The weighted *variance* of the times to receipt of cash flow; it measures the extent to which the payments are spread out around the duration.

Disposition effect As a result of loss aversion, an emotional bias whereby investors are reluctant to dispose of losers. This results in an inefficient and gradual adjustment to deterioration in fundamental value.

Distressed debt arbitrage A distressed securities investment discipline that involves purchasing the traded bonds of bankrupt companies and selling the common equity short.

Distressed securities Securities of companies that are in financial distress or near bankruptcy; the name given to various investment disciplines employing the securities of companies in distress.

Diversification effect In reference to VaR across several portfolios (for example, across an entire firm), this effect equals the difference between the sum of the individual VaRs and total VaR.

Dividend recapitalization A method by which a buyout fund can realize the value of a holding; involves the issuance of debt by the holding to finance a special dividend to owners.

Domestic asset An asset that trades in the investor's domestic currency (or home currency).

Domestic currency The currency of the investor, i.e., the currency in which he or she typically makes consumption purchases, e.g., the Swiss franc for an investor domiciled in Switzerland.

Domestic-currency return A rate of return stated in domestic currency terms from the perspective of the investor; reflects both the foreign-currency return on an asset as well as percentage movement in the spot exchange rate between the domestic and foreign currencies.

Donor-advised fund A fund administered by a tax-exempt entity in which the donor advises on where to grant the money that he or she has donated.

Double inflection utility function A utility function that changes based on levels of wealth.

Downside deviation A measure of volatility using only rate of return data points below the investor's minimum acceptable return.

Due diligence Investigation and analysis in support of an investment action or recommendation, such as the scrutiny of operations and management and the verification of material facts.

Duration A measure of the approximate sensitivity of a security to a change in interest rates (i.e., a measure of interest rate risk).

Duration matching Immunization approach based on the duration of assets and liabilities. Ideally, the liabilities being matched (the liability portfolio) and the portfolio of assets (the bond portfolio) should be affected similarly by a change in interest rates.

Dynamic asset allocation A strategy incorporating deviations from the strategic asset allocation that are motivated by longer-term valuation signals or economic views than usually associated with tactical asset allocation.

Dynamic hedge A hedge requiring adjustment as the price of the hedged asset changes.

Earnings at risk (EAR) A variation of VaR that reflects the risk of a company's earnings instead of its market value.

Earnings momentum A growth investment substyle that focuses on companies with earnings momentum (high quarterly year-over-year earnings growth).

Earnings risk The risk associated with the earning potential of an individual.

Econometrics The application of quantitative modeling and analysis grounded in economic theory to the analysis of economic data.

Economic balance sheet A balance sheet that provides an individual's total wealth portfolio, supplementing traditional balance sheet assets with human capital and pension wealth, and expanding liabilities to include consumption and bequest goals. Also known as *holistic balance sheet.*

Economic exposure The risk associated with changes in the relative attractiveness of products and services offered for sale, arising out of the competitive effects of changes in exchange rates.

Economic indicators Economic statistics provided by government and established private organizations that contain information on an economy's recent past activity or its current or future position in the business cycle.

Effective convexity A second-order effect that describes how a bond's interest rate sensitivity changes with changes in yield. Effective convexity is used when the bond has cash flows that change when yields change (as in the case of callable bonds or mortgage-backed securities).

Effective duration Duration adjusted to account for embedded options.

Effective spread Two times the distance between the actual execution price and the midpoint of the market quote at the time an order is entered; a measure of execution costs that captures the effects of price improvement and market impact.

Electronic communications networks (ECNs) Computer-based auctions that operate continuously within the day using a specified set of rules to execute orders.

Emerging market debt The sovereign debt of nondeveloped countries.

Emotional biases Behavioral biases resulting from reasoning influenced by feelings; emotional biases stem from impulse or intuition.

Empirical duration A measure of interest rate sensitivity that is determined from market data.

Endogenous variable A variable whose values are determined within the system.

Endowment bias An emotional bias in which people value an asset more when they hold rights to it than when they do not.

Endowments Long-term funds generally owned by operating nonprofit institutions such as universities and colleges, museums, hospitals, and other organizations involved in charitable activities.

Enhanced derivatives products companies A type of subsidiary separate from an entity's other activities and not liable for the parent's debts. They are often used by derivatives dealers to control exposure to ratings downgrades. Also called *special purpose vehicles.*

Enhanced indexing strategy Method investors use to match an underlying market index in which the investor purchases fewer securities than the full set of index constituents but matches primary risk factors reflected in the index.

Enterprise risk management An overall assessment of a company's risk position. A centralized approach to risk management sometimes called firmwide risk management.

Environmental, social, and corporate governance (ESG) Also called socially responsible investing, refers to the explicit inclusion of ethical, environmental, or social criteria when selecting a portfolio.

Equal probability rebalancing Rebalancing in which the manager specifies a corridor for each asset class as a common multiple of the standard deviation of the asset class's returns. Rebalancing to the target proportions occurs when any asset class weight moves outside its corridor.

Equal weighted In an equal-weighted index, each stock in the index is weighted equally.

Equal weighting Security weighting scheme in which all constituents are held at equal weights at specified rebalancing times.

Equitized Given equity market systematic risk exposure.

Equity forward sale contract A private contract for the forward sale of an equity position.

Equity monetization The realization of cash for an equity position through a manner other than an outright sale.

Equity *q* The ratio of a company's equity market capitalization divided by net worth measured at replacement cost.

Equity risk premium Compensation for the additional risk of equity compared with debt.

ESG risk The risk to a company's market valuation resulting from environmental, social, and governance factors.

Estate All of the property a person owns or controls; may consist of financial assets, tangible personal assets, immovable property, or intellectual property.

Estate planning The process of preparing for the disposition of one's estate (e.g., the transfer of property) upon death and during one's lifetime.

Estate tax freeze A plan usually involving a corporation, partnership, or limited liability company with the goal to transfer *future* appreciation to the next generation at little or no gift or estate tax cost.

Eurozone The region of countries using the euro as a currency.

Evaluated pricing See *matrix pricing.*

***Ex post* alpha** (or Jensen's alpha) The average return achieved in a portfolio in excess of what would have been predicted by CAPM given the portfolio's risk level; an after-the-fact measure of excess risk-adjusted return.

Excess capital An investor's capital over and above that which is necessary to fund their lifestyle and reserves.

Excess return The difference between the benchmark return and the portfolio return, which may be either positive or negative.

Exchange A regulated venue for the trading of investment instruments.

Exchange fund A fund into which several investors place their different share holdings in exchange for shares in the diversified fund itself.

Exchange-traded funds Exchange-traded Funds or ETFs are hybrid investment products with many features of mutual funds combined with the trading features of common stocks or bonds. Essentially, ETFs are typically portfolios of stocks or bonds or commodities that trade throughout the day like common stocks.

Execution uncertainty Uncertainty pertaining to the timing of execution, or if execution will even occur at all.

Exemption method When the residence country imposes no tax on foreign-source income by providing taxpayers with an exemption, in effect having only one jurisdiction impose tax.

Exogenous shocks Events from outside the economic system that affect its course. These could be short-lived political events, changes in government policy, or natural disasters, for example.

Exogenous variable A variable whose values are determined outside the system.

Extended portfolio assets and liabilities Assets and liabilities beyond those shown on a conventional balance sheet that are relevant in making asset allocation decisions; an example of an extended asset is human capital.

Externality Those consequences of a transaction (or process) that do not fall on the parties to the transaction (or process).

Factor covariance matrix The covariance matrix of factors.

Factor-model-based benchmark Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the return for a broad market index, company earnings growth, industry, or financial leverage.

Factor push A simple stress test that involves pushing prices and risk factors of an underlying model in the most disadvantageous way to estimate the impact of factor extremes on the portfolio's value.

Factor sensitivities In a multifactor model, the responsiveness of the dependent variable to factor movements. Also called *factor betas* or *factor loadings*.

Fallen angels Debt that has crossed the threshold from investment grade to high yield.

Fed model An equity valuation model that relates the earnings yield on the S&P 500 to the yield to maturity on 10-year US Treasury bonds.

Federal funds rate The interest rate on overnight loans of reserves (deposits) between US Federal Reserve System member banks.

Fee cap A limit on the total fee paid regardless of performance.

Fiduciary A person or entity standing in a special relation of trust and responsibility with respect to other parties.

Financial buyers Buyers who lack a strategic motive.

Financial capital The tangible and intangible assets (excluding human capital) owned by an individual or household.

Financial equilibrium models Models describing relationships between expected return and risk in which supply and demand are in balance.

Financial risk Risks derived from events in the external financial markets, such as changes in equity prices, interest rates, or currency exchange rates.

Fiscal policy Government activity concerning taxation and governmental spending.

Fixed trust A trust structure in which distributions to beneficiaries are prescribed in the trust document to occur at certain times or in certain amounts.

Flexible-premium variable life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *variable universal life*.

Floating supply of shares The number of shares outstanding that are actually available to investors. Also called *free float*.

Floor A combination of interest rate options designed to provide protection against interest rate decreases.

Floor broker An agent of the broker who, for certain exchanges, physically represents the trade on the exchange floor.

Floorlet Each component put option in a floor.

Forced heirship rules Legal ownership principles whereby children have the right to a fixed share of a parent's estate.

Foreign assets Assets denominated in currencies other than the investor's home currency.

Foreign currency Currency that is not the currency in which an investor makes consumption purchases, e.g., the US dollar from the perspective of a Swiss investor.

Foreign-currency return The return of the foreign asset measured in foreign-currency terms.

Formal tools Established research methods amenable to precise definition and independent replication of results.

Forward conversion with options The construction of a synthetic short forward position against the asset held long.

Forward rate bias Persistent violation of uncovered interest rate parity that is exploited by the carry trade.

Foundations Typically, grant-making institutions funded by gifts and investment assets.

Fourth market A term occasionally used for direct trading of securities between institutional investors; the fourth market would include trading on electronic crossing networks.

Framing An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Framing bias An information-processing bias in which a person answers a question differently based on the way in which it is asked (framed).

Front office The revenue generating functions at an investment firm such as those pertaining to trading and sales.

Front-run To trade ahead of the initiator, exploiting privileged information about the initiator's trading intentions.

Full replication When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Full replication approach When every issue in an index is represented in the portfolio, and each portfolio position has approximately the same weight in the fund as in the index.

Fully funded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is 100 percent or greater.

Fund manager The professional manager of separate accounts or pooled assets structured in a variety of ways.

Fund of funds A fund that invests in a number of underlying funds.

Fundamental law of active management The relation that the information ratio of a portfolio manager is approximately equal to the information coefficient multiplied by the square root of the investment discipline's breadth (the number of independent, active investment decisions made each year).

Fundamental weighting Patented by Research Affiliates LLC, this scheme uses company characteristics such as sales, cash flow, book value, and dividends to weight securities.

Funded status The relationship between the value of a plan's assets and the present value of its liabilities.

Funding currencies The low-yield currencies in which borrowing occurs in a carry trade.

Funding risk The risk that liabilities funding long asset positions cannot be rolled over at reasonable cost.

G-spread The yield on a credit security over the yield of an actual or interpolated government bond.

Gain-to-loss ratio The ratio of positive returns to negative returns over a specified period of time.

Gamblers' fallacy A misunderstanding of probabilities in which people wrongly project reversal to a long-term mean.

Gamma A numerical measure of the sensitivity of delta to a change in the underlying's value.

Global custodian An entity that effects trade settlement, safekeeping of assets, and the allocation of trades to individual custody accounts.

Global investable market A practical proxy for the world market portfolio consisting of traditional and alternative asset classes with sufficient capacity to absorb meaningful investment.

Goals-based With respect to asset allocation or investing, an approach that focuses on achieving an investor's goals (for example, related to supporting lifestyle needs or aspirations) based typically on constructing sub-portfolios aligned with those goals.

Goals-based investing An investment industry term for approaches to investing for individuals and families focused on aligning investments with goals (parallel to liability-driven investing for institutional investors).

Gordon (constant) growth model A version of the dividend discount model for common share value that assumes a constant growth rate in dividends.

Government structural policies Government policies that affect the limits of economic growth and incentives within the private sector.

Grinold–Kroner model An expression for the expected return on a share as the sum of an expected income return, an expected nominal earnings growth return, and an expected repricing return.

Growth in total factor productivity A component of trend growth in GDP that results from increased efficiency in using capital inputs; also known as technical progress.

H-model A variant of the two-stage dividend discount model in which growth begins at a high rate and declines linearly throughout the supernormal growth period until it reaches a normal growth rate that holds in perpetuity.

Hague Conference on Private International Law An intergovernmental organization working toward the convergence of private international law. Its 69 members consist of countries and regional economic integration organizations.

Halo effect An emotional bias that extends a favorable evaluation of some characteristics to other characteristics.

Health insurance A type of insurance used to cover health care and medical costs.

Health risk The risk associated with illness or injury.

Hedge funds A historically loosely regulated, pooled investment vehicle that may implement various investment strategies.

Hedge ratio The relationship of the quantity of an asset being hedged to the quantity of the derivative used for hedging.

Hedging A general strategy usually thought of as reducing, if not eliminating, risk.

Herding When a group of investors trade on the same side of the market in the same securities, or when investors ignore their own private information and act as other investors do.

High-water mark A specified net asset value level that a fund must exceed before performance fees are paid to the hedge fund manager.

High yield A value investment substyle that focuses on stocks offering high dividend yield with prospects of maintaining or increasing the dividend.

High-yield investing A distressed securities investment discipline that involves investment in high-yield bonds perceived to be undervalued.

Hindsight bias A bias with selective perception and retention aspects in which people may see past events as having been predictable and reasonable to expect.

Historical simulation method The application of historical price changes to the current portfolio.

Holdings-based style analysis An approach to style analysis that categorizes individual securities by their characteristics and aggregates results to reach a conclusion about the overall style of the portfolio at a given point in time.

Holistic balance sheet See *economic balance sheet.*

Home bias A preference for securities listed on the exchanges of one's home country.

Home-country bias The favoring of domestic over non-domestic investments relative to global market value weights.

Home currency See *domestic currency.*

Horizon matching Hybrid approach that combines cash flow and duration matching approaches. Under this approach, liabilities are categorized as short-and long-term liabilities.

Human capital An implied asset; the net present value of an investor's future expected labor income weighted by the probability of surviving to each future age. Also called *net employment capital.*

Hybrid markets Combinations of market types, which offer elements of batch auction markets and continuous auction markets, as well as quote-driven markets.

Hypothetical events A type of scenario analysis used in stress testing that involves the evaluation of performance given events that have never happened in the markets or market outcomes to which we attach a small probability.

I-spread The yield on a credit security over the swap rate (denominated in the same currency as the credit security). Also known as interpolated spread.

Illiquidity premium Compensation for the risk of loss relative to an investment's fair value if an investment needs to be converted to cash quickly.

Illusion of control A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Illusion of control bias A bias in which people tend to believe that they can control or influence outcomes when, in fact, they cannot. Illusion of knowledge and self-attribution biases contribute to the overconfidence bias.

Immediate annuity An annuity that provides a guarantee of specified future monthly payments over a specified period of time.

Immunization An asset/liability management approach that structures investments in bonds to match (offset) liabilities' weighted-average duration; a type of dedication strategy.

Implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return.

Implementation shortfall strategy A strategy that attempts to minimize trading costs as measured by the implementation shortfall method. Also called *arrival price strategy*.

Implied yield A measure of the yield on the underlying bond of a futures contract implied by pricing it as though the underlying will be delivered at the futures expiration.

Incremental VaR A measure of the incremental effect of an asset on the VaR of a portfolio by measuring the difference between the portfolio's VaR while including a specified asset and the portfolio's VaR with that asset eliminated.

Indexing A common passive approach to investing that involves holding a portfolio of securities designed to replicate the returns on a specified index of securities.

Indifference curve analysis A decision-making approach whereby curves of consumption bundles, among which the decision-maker is indifferent, are constructed to identify and choose the curve within budget constraints that generates the highest utility.

Indirect commodity investment Commodity investment that involves the acquisition of indirect claims on commodities, such as equity in companies specializing in commodity production.

Inferential statistics Methods for making estimates or forecasts about a larger group from a smaller group actually observed.

Inflation An increase in the general level of prices; a decrease in the purchasing power of a unit of currency.

Inflation hedge An asset whose returns are sufficient on average to preserve purchasing power during periods of inflation.

Inflation premium Compensation for expected inflation.

Information coefficient The correlation between forecast and actual returns.

Information-motivated traders Traders that seek to trade on information that has limited value if not quickly acted upon.

Information ratio The mean excess return of the account over the benchmark (i.e., mean active return) relative to the variability of that excess return (i.e., tracking risk); a measure of risk-adjusted performance.

Infrastructure funds Funds that make private investment in public infrastructure projects in return for rights to specified revenue streams over a contracted period.

Initial public offering The initial issuance of common stock registered for public trading by a formerly private corporation.

Input uncertainty Uncertainty concerning whether the inputs are correct.

Inside ask The lowest available ask price. Also called *market ask*.

Inside bid The highest available bid price. Also called *market bid*.

Inside bid–ask spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *market spread*.

Inside quote Combination of the highest available bid price with the lowest available ask price. Also called *market quote*.

Inside spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside bid–ask spread*, or *market spread*.

Institutional investors Corporations or other legal entities that ultimately serve as financial intermediaries between individuals and investment markets.

Interest rate management effect With respect to fixed-income attribution analysis, a return component reflecting how well a manager predicts interest rate changes.

Interest spread With respect to banks, the average yield on earning assets minus the average percent cost of interest-bearing liabilities.

Internal rate of return The growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows; money-weighted rate of return is a synonym.

Intestate Having made no valid will; a decedent without a valid will or with a will that does not dispose of their property is considered to have died intestate.

Intrinsic value The difference between the spot exchange rate and the strike price of a currency option.

Inventory cycle A cycle measured in terms of fluctuations in inventories, typically lasting 2–4 years.

Inverse floater A floating-rate note or bond in which the coupon is adjusted to move opposite to a benchmark interest rate.

Investment currencies The high-yielding currencies in a carry trade.

Investment skill The ability to outperform an appropriate benchmark consistently over time.

Investment style A natural grouping of investment disciplines that has some predictive power in explaining the future dispersion of returns across portfolios.

Investment style indexes Indexes that represent specific portions of an asset category. For example, subgroups within the US common stock asset category such as large-capitalization growth stocks.

Investment universe The set of assets that may be considered for investment.

Investor's benchmark The benchmark an investor uses to evaluate performance of a given portfolio or asset class.

Irrevocable trust A trust arrangement wherein the settlor has no ability to revoke the trust relationship.

J factor risk The risk associated with a judge's track record in adjudicating bankruptcies and restructurings.

Joint ownership with right of survivorship Jointly owned; assets held in joint ownership with right of survivorship automatically transfer to the surviving joint owner or owners outside the probate process.

Justified P/E The price-to-earnings ratio that is fair, warranted, or justified on the basis of forecasted fundamentals.

Key rate duration A method of measuring the interest rate sensitivities of a fixed-income instrument or portfolio to shifts in key points along the yield curve.

Knock-in/knock-out Features of a vanilla option that is created (or ceases to exist) when the spot exchange rate touches a pre-specified level.

Lagging economic indicators A set of economic variables whose values correlate with recent past economic activity.

Leading economic indicators A set of economic variables whose values vary with the business cycle but at a fairly consistent time interval before a turn in the business cycle.

Legal/contract risk The possibility of loss arising from the legal system's failure to enforce a contract in which an enterprise has a financial stake; for example, if a contract is voided through litigation.

Leverage-adjusted duration gap A leverage-adjusted measure of the difference between the durations of assets and liabilities which measures a bank's overall interest rate exposure.

Leveraged floating-rate note (leveraged floater) A floating-rate note or bond in which the coupon is adjusted at a multiple of a benchmark interest rate.

Leveraged recapitalization A leveraging of a company's balance sheet, usually accomplished by working with a private equity firm.

Liability-based benchmark A benchmark structured to accurately reflect the return required to meet the future obligations of an investor and to mimic the volatility of the liabilities.

Liability-driven investing An investment industry term that generally encompasses asset allocation that is focused on funding an investor's liabilities in institutional contexts.

Liability glide path A specification of desired proportions of liability-hedging assets and return-seeking assets and the duration of the liability hedge as funded status changes and contributions are made.

Liability insurance A type of insurance used to manage liability risk.

Liability-relative With respect to asset allocation, an approach that focuses directly only on funding liabilities as an investment objective.

Liability risk The possibility that an individual or household may be held legally liable for the financial costs associated with property damage or physical injury.

Life-cycle finance A concept in finance that recognizes as an investor ages, the fundamental nature of wealth and risk evolves.

Life insurance A type of insurance that protects against the loss of human capital for those who depend on an individual's future earnings.

Lifetime gratuitous transfer A lifetime gift made during the lifetime of the donor; also known as *inter vivos* transfers.

Limit order An instruction to execute an order when the best price available is at least as good as the limit price specified in the order.

Liquidity The ability to trade without delay at relatively low cost and in relatively large quantities.

Liquidity-motivated traders Traders that are motivated to trade based upon reasons other than an information advantage. For example, to release cash proceeds to facilitate the purchase of another security, adjust market exposure, or fund cash needs.

Liquidity risk Any risk of economic loss because of the need to sell relatively less liquid assets to meet liquidity requirements; the risk that a financial instrument cannot be purchased or sold without a significant concession in price because of the market's potential inability to efficiently accommodate the desired trading size.

Lock-up period A minimum initial holding period for investments during which no part of the investment can be withdrawn.

Locked up Said of investments that cannot be traded at all for some time.

Logical participation strategies Protocols for breaking up an order for execution over time. Typically used by institutional traders to participate in overall market volumes without being unduly visible.

Longevity risk The risk associated with living to an advanced age in retirement, including the uncertainty surrounding how long retirement will last; the risk of outliving one's financial resources.

Loss-aversion bias A bias in which people tend to strongly prefer avoiding losses as opposed to achieving gains.

Loss given default See *loss severity*.

Loss severity The amount of loss if a default occurs. Also called *loss given default*.

Low P/E A value investment substyle that focuses on shares selling at low prices relative to current or normal earnings.

M^2 A measure of what a portfolio would have returned if it had taken on the same total risk as the market index.

Macaulay duration The percentage change in price for a percentage change in yield. The term, named for one of the economists who first derived it, is used to distinguish the calculation from modified duration. (See also *modified duration*).

Macro attribution Performance attribution analysis conducted on the fund sponsor level.

Macro expectations Expectations concerning classes of assets.

Managed futures Pooled investment vehicles, frequently structured as limited partnerships, that invest in futures and options on futures and other instruments.

Managed futures funds Pools of private capital managed by commodity trading advisers.

Manager continuation policies Policies adopted to guide the manager evaluations conducted by fund sponsors. The goal of manager continuation policies is to reduce the costs of manager turnover while systematically acting on indications of future poor performance.

Manager monitoring A formal, documented procedure that assists fund sponsors in consistently collecting information relevant to evaluating the state of their managers' operations; used to identify warning signs of adverse changes in existing managers' organizations.

Manager peer group See *manager universe*.

Manager review A detailed examination of a manager that currently exists within a plan sponsor's program. The manager review closely resembles the manager selection process, in both the information considered and the comprehensiveness of the analysis. The staff should review all phases of the manager's operations, just as if the manager were being initially hired.

Manager universe A broad group of managers with similar investment disciplines. Also called *manager peer group*.

Market-adjusted implementation shortfall The difference between the money return on a notional or paper portfolio and the actual portfolio return, adjusted using beta to remove the effect of the return on the market.

Market ask The lowest available ask price.

Market bid The best available bid; highest price any buyer is currently willing to pay.

Market bid–ask spread Market ask price minus market bid price. Also called *inside bid–ask spread*, *inside spread*, or *market spread*.

Market cap weighting See *capitalization weighting*.

Market fragmentation A condition whereby a market contains no dominant group of sellers (or buyers) that are large enough to unduly influence the market.

Market impact The effect of the trade on transaction prices. Also called *price impact*.

Market index Represents the performance of a specified security market, market segment, or asset class.

Market integration The degree to which there are no impediments or barriers to capital mobility across markets.

Market microstructure The market structures and processes that affect how the manager's interest in buying or selling an asset is translated into executed trades (represented by trade prices and volumes).

Market model A regression equation that specifies a linear relationship between the return on a security (or portfolio) and the return on a broad market index.

Market-not-held order A variation of the market order designed to give the agent greater discretion than a simple market order would allow. "Not held" means that the floor broker is not required to trade at any specific price or in any specific time interval.

Market on close order A market order to be executed at the closing of the market.

Market on open order A market order to be executed at the opening of the market.

Market order An instruction to execute an order as soon as possible in the public markets at the best price available.

Market oriented With reference to equity investing, an intermediate grouping for investment disciplines that cannot be clearly categorized as value or growth.

Market quote Combination of the highest available bid price with the lowest available ask price. Also called *inside quote*.

Market risk The risk associated with interest rates, exchange rates, and equity prices.

Market risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to maintain the client's current standard of living.

Market segmentation The degree to which there are some meaningful impediments to capital movement across markets.

Market spread Market ask price minus market bid price. Also called *market bid–ask spread*, *inside spread*, or *inside bid–ask spread*.

Market value weighting See *capitalization weighting*.

Marking to market A procedure used primarily in futures markets in which the parties to a contract settle the amount owed daily. Also known as the *daily settlement*.

Mass affluent An industry term for a segment of the private wealth marketplace that is not sufficiently wealthy to command certain individualized services.

Matrix prices Prices determined by comparisons to other securities of similar credit risk and maturity; the result of matrix pricing.

Matrix pricing An approach for estimating the prices of thinly traded securities based on the prices of securities with similar attributions, such as similar credit rating, maturity, or economic sector. Also called *evaluated pricing*.

Maturity premium Compensation for the increased sensitivity of the market value of debt to a change in market interest rates as maturity is extended.

Maximum loss optimization A stress test in which we would try to optimize mathematically the risk variable that would produce the maximum loss.

Mega-cap buyout funds A class of buyout funds that take public companies private.

Mental accounting bias An information-processing bias in which people treat one sum of money differently from another equal-sized sum based on which mental account the money is assigned to.

Micro attribution Performance attribution analysis carried out on the investment manager level.

Micro expectations Expectations concerning individual assets.

Middle-market buyout funds A class of buyout funds that purchase private companies whose revenues and profits are too small for them to access capital from the public equity markets.

Midquote The halfway point between the market bid and ask prices.

Minimum-variance hedge ratio A mathematical approach to determining the optimal cross hedging ratio.

Mismatch in character The potential tax inefficiency that can result if the instrument being hedged, and the tool that is being used to hedge it, produce income and loss of a different character.

Missed trade opportunity costs Unrealized profit/loss arising from the failure to execute a trade in a timely manner.

Model risk The risk that a model is incorrect or misapplied; in investments, it often refers to valuation models.

Model uncertainty Uncertainty concerning whether a selected model is correct.

Modified duration An adjustment of the duration for the level of the yield. Contrast with *Macaulay duration*.

Monetary policy Government activity concerning interest rates and the money supply.

Monetize To access an item's cash value without transferring ownership of it.

Money duration A measure of the price change in units of the currency in which the bond is denominated given a change in its yield-to-maturity.

Money markets Markets for fixed-income securities with maturities of one year or less.

Money-weighted rate of return Same as the internal rate of return; the growth rate that will link the ending value of the account to its beginning value plus all intermediate cash flows.

Multifactor model A model that explains a variable in terms of the values of a set of factors.

Multiperiod Sharpe ratio A Sharpe ratio based on the investment's multiperiod wealth in excess of the wealth generated by the risk-free investment.

Mutual funds A professionally managed investment pool in which investors in the fund typically each have a pro-rata claim on the income and value of the fund.

Mutuals With respect to insurance companies, companies that are owned by their policyholders, who share in the company's surplus earnings.

Natural liquidity An extensive pool of investors who are aware of and have a potential interest in buying and/or selling a security.

Net asset value Value established at the end of each trading day based on the fund's valuation of all existing assets minus liabilities, divided by the total number of shares outstanding.

Net employment capital See *human capital*.

Net interest margin With respect to banks, net interest income (interest income minus interest expense) divided by average earning assets.

Net interest spread With respect to the operations of insurers, the difference between interest earned and interest credited to policyholders.

Net wealth The difference between an individual's assets and liabilities; extends traditional financial assets and liabilities to include human capital and future consumption needs.

Net worth tax or net wealth tax A tax based on a person's assets, less liabilities.

Nominal default-free bonds Conventional bonds that have no (or minimal) default risk.

Nominal gross domestic product A money measure of the goods and services produced within a country's borders. Also called *nominal GDP*.

Nominal risk-free interest rate The sum of the real risk-free interest rate and the inflation premium.

Non-deliverable forwards Forward contracts that are cash settled (in the non-controlled currency of the currency pair) rather than physically settled (the controlled currency is neither delivered nor received).

Nonfinancial risk Risks that arise from sources other than the external financial markets, such as changes in accounting rules, legal environment, or tax rates.

Nonparametric Involving minimal probability-distribution assumptions.

Nonstationarity A property of a data series that reflects more than one set of underlying statistical properties.

Normal portfolio A portfolio with exposure to sources of systematic risk that are typical for a manager, using the manager's past portfolios as a guide.

Objective function A quantitative expression of the objective or goal of a process.

Offer price The price at which a counterparty is willing to sell one unit of the base currency.

Open market operations The purchase or sale by a central bank of government securities, which are settled using reserves, to influence interest rates and the supply of credit by banks.

Open outcry auction market Public auction where representatives of buyers and sellers meet at a specified location and place verbal bids and offers.

Operational risk The risk of loss from failures in a company's systems and procedures (for example, due to computer failures or human failures) or events completely outside of the control of organizations (which would include "acts of God" and terrorist actions).

Opportunistic participation strategies Passive trading combined with the opportunistic seizing of liquidity.

Optimization With respect to portfolio construction, a procedure for determining the best portfolios according to some criterion.

Option-adjusted spread The constant spread that, when added to all the one-period forward rates on the interest rate tree, makes the arbitrage-free value of the bond equal to its market price.

Order-driven markets Markets in which transaction prices are established by public limit orders to buy or sell a security at specified prices.

Ordinary life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *whole life insurance*.

Orphan equities investing A distressed securities investment discipline that involves investment in orphan equities that are perceived to be undervalued.

Orphan equity The newly issued equity of a company emerging from reorganization.

Output gap The difference between the value of GDP estimated as if the economy were on its trend growth path (potential output) and the actual value of GDP.

Overall trade balance The sum of the current account (reflecting exports and imports) and the financial account (consisting of portfolio flows).

Overbought When a market has trended too far in one direction and is vulnerable to a trend reversal, or correction.

Overconfidence bias A bias in which people demonstrate unwarranted faith in their own intuitive reasoning, judgments, and/or cognitive abilities.

Overconfidence trap The tendency of individuals to overestimate the accuracy of their forecasts.

Oversold The opposite of overbought; see *overbought*.

Pairs trade A basic long–short trade in which an investor is long and short equal currency amounts of two common stocks in a single industry. Also called *pairs arbitrage*.

Panel method A method of capital market expectations setting that involves using the viewpoints of a panel of experts.

Partial correlation In multivariate problems, the correlation between two variables after controlling for the effects of the other variables in the system.

Partial fill Execution of a purchase or sale for fewer shares than was stipulated in the order.

Participate (do not initiate) order A variant of the market-not-held order. The broker is deliberately low-key and waits for and responds to the initiatives of more active traders.

Passive investment Investment that seeks to mimic the prevailing characteristics of the overall investments available in terms of credit quality, type of borrower, maturity, and duration rather than express a specific market view.

Passive investment strategies A buy-and-hold strategy to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive management A buy-and-hold approach to investing in which an investor does not make portfolio changes based upon short-term expectations of changing market or security performance.

Passive traders Traders that seek liquidity in their rebalancing transactions, but are much more concerned with the cost of trading.

Payment netting A means of settling payments in which the amount owed by the first party to the second is netted with the amount owed by the second party to the first; only the net difference is paid.

Pension funds Funds consisting of assets set aside to support a promise of retirement income.

Pension surplus Pension assets at market value minus the present value of pension liabilities.

Percent-range rebalancing An approach to rebalancing that involves setting rebalancing thresholds or trigger points, stated as a percentage of the portfolio's value, around target values.

Percentage-of-portfolio rebalancing Rebalancing is triggered based on set thresholds stated as a percentage of the portfolio's value.

Percentage-of-volume strategy A logical participation strategy in which trading takes place in proportion to overall market volume (typically at a rate of 5–20 percent) until the order is completed.

Perfect markets Markets without any frictional costs.

Performance appraisal The evaluation of portfolio performance; a quantitative assessment of a manager's investment skill.

Performance attribution A comparison of an account's performance with that of a designated benchmark and the identification and quantification of sources of differential returns.

Performance-based fee Fees specified by a combination of a base fee plus an incentive fee for performance in excess of a benchmark's.

Performance evaluation The measurement and assessment of the outcomes of investment management decisions.

Performance measurement A component of performance evaluation; the relatively simple procedure of calculating an asset's or portfolio's rate of return.

Performance netting risk For entities that fund more than one strategy and have asymmetric incentive fee arrangements with the portfolio managers, the potential for loss in cases where the net performance of the group of managers generates insufficient fee revenue to fully cover contractual payout obligations to all portfolio managers with positive performance.

Periodic auction markets Auction markets where multilateral trading occurs at a single price at a prespecified point in time.

Permanent income hypothesis The hypothesis that consumers' spending behavior is largely determined by their long-run income expectations.

Permanent life insurance A type of life insurance that provides lifetime coverage.

Personal risk bucket In goal-based portfolio planning, that part of wealth allocated to investments intended to protect the client from a drastic decrease in lifestyle.

Plan sponsor The trustee, company, or employer responsible for a public or private institutional investment plan.

Pledging requirement With respect to banks, a required collateral use of assets.

Point estimate A single-valued estimate of a quantity, as opposed to an estimate in terms of a range of values.

Policyholder reserves With respect to an insurance company, an amount representing the estimated payments to policyholders, as determined by actuaries, based on the types and terms of the various insurance policies issued by the company.

Political risk The risk of war, government collapse, political instability, expropriation, confiscation, or adverse changes in taxation. Also called *geopolitical risk*.

Portable Moveable. With reference to a pension plan, one in which a plan participant can move his or her share of plan assets to a new plan, subject to certain rules, vesting schedules, and possible tax penalties and payments.

Portable alpha A strategy involving the combining of multiple positions (e.g., long and short positions) so as to separate the alpha (unsystematic risk) from beta (systematic risk) in an investment.

Portfolio trade A trade in which a number of securities are traded as a single unit. Also called *program trade* or *basket trade*.

Position a trade To take the other side of a trade, acting as a principal with capital at risk.

Post-trade transparency Degree to which completed trades are quickly and accurately reported to the public.

Potential output The value of GDP if the economy were on its trend growth path.

Preferred return With respect to the compensation of private equity fund managers, a hurdle rate.

Premature death risk The risk of an individual dying earlier than anticipated; sometimes referred to as *mortality risk*.

Premium Regarding life insurance, the asset paid by the policy holder to an insurer who, in turn, has a contractual obligation to pay death benefit proceeds to the beneficiary named in the policy.

Prepackaged bankruptcy A bankruptcy in which the debtor seeks agreement from creditors on the terms of a reorganization before the reorganization filing.

Prepaid variable forward A collar and loan combined within a single instrument.

Present value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Present value of distribution of cash flows methodology Method used to address a portfolio's sensitivity to rate changes along the yield curve, this approach seeks to approximate and match the yield curve risk of an index over discrete time periods.

Pretrade transparency Ability of individuals to quickly, easily, and inexpensively obtain accurate information about quotes and trades.

Price discovery Adjustment of transaction prices to balance supply and demand.

Price improvement Execution at a price that is better than the price quoted at the time of order placement.

Price uncertainty Uncertainty about the price at which an order will execute.

Price value of a basis point (PVBP) The change in the bond price for a 1 basis point change in yield. Also called *basis point value* (BPV).

Price weighted With respect to index construction, an index in which each security in the index is weighted according to its absolute share price.

Price weighting Security weighting scheme in which constituents are weighted in proportion to their prices.

Priced risk Risk for which investors demand compensation.

Primary capital Assets held outside a concentrated position that are at least sufficient to provide for the owner's lifetime spending needs.

Prime brokerage A suite of services that is often specified to include support in accounting and reporting, leveraged trade execution, financing, securities lending (related to short-selling activities), and start-up advice (for new entities).

Principal trade A trade with a broker in which the broker commits capital to facilitate the prompt execution of the trader's order to buy or sell.

Private equity Ownership interests in non-publicly traded companies.

Private equity funds Pooled investment vehicles that generally invest in highly illiquid assets; include venture capital funds and buyout funds.

Private exchange A method for handling undiversified positions with built-in capital gains in which shares that are a component of an index are exchanged for shares of an index mutual fund in a privately arranged transaction with the fund.

Private placement memorandum A document used to raise venture capital financing when funds are raised through an agent.

Probate The legal process to confirm the validity of a will so that executors, heirs, and other interested parties can rely on its authenticity.

Profit-sharing plans A defined-contribution plan in which contributions are based, at least in part, on the plan sponsor's profits.

Projected benefit obligation (PBO) A measure of a pension plan's liability that reflects accumulated service in the same manner as the ABO but also projects future variables, such as compensation increases.

Property insurance A type of insurance used by individuals to manage property risk.

Property risk The possibility that a person's property may be damaged, destroyed, stolen, or lost.

Prospect theory An alternative to expected utility theory, it assigns value to gains and losses (changes in wealth) rather than to final wealth, and probabilities are replaced by decision weights. In prospect theory, the shape of a decision maker's value function is assumed to differ between the domain of gains and the domain of losses.

Protective put An option strategy in which a long position in an asset is combined with a long position in a put.

Proxy hedge See *cross hedge*.

Prudence trap The tendency to temper forecasts so that they do not appear extreme; the tendency to be overly cautious in forecasting.

Public good A good that is not divisible and not excludable (a consumer cannot be denied it).

Purchasing power parity The theory that movements in an exchange rate should offset any difference in the inflation rates between two countries.

Pure indexing Method investors use to match an underlying market index in which the investor aims to replicate an existing market index by purchasing all of the constituent securities in the index to minimize tracking risk.

Pure sector allocation return A component of attribution analysis that relates relative returns to the manager's sector-weighting decisions. Calculated as the difference between the allocation (weight) of the portfolio to a given sector and the portfolio's benchmark weight for that sector, multiplied by the difference between the sector benchmark's return and the overall portfolio's benchmark return, summed across all sectors.

Put spread A strategy used to reduce the upfront cost of buying a protective put, it involves buying a put option and writing another put option.

Quality control charts A graphical means of presenting performance appraisal data; charts illustrating the performance of an actively managed account versus a selected benchmark.

Quantitative easing A policy measure in which a central bank buys financial assets to inject a predetermined quantity of money in the financial system.

Quote-driven markets Markets that rely on dealers to establish firm prices at which securities can be bought and sold. Also called *dealer markets*.

Quoted depth The number of shares available for purchase or sale at the quoted bid and ask prices.

Ratio spread An option strategy in which a long position in a certain number of options is offset by a short position in a certain number of other options on the same underlying, resulting in a risk-free position.

Rational economic man A self-interested, risk-averse individual who has the ability to make judgments using all available information in order to maximize his/her expected utility.

Re-base With reference to index construction, to change the time period used as the base of the index.

Real estate Interests in land or structures attached to land.

Real estate investment trusts (REITs) Publicly traded equities representing pools of money invested in real estate properties and/or real estate debt.

Real option An option involving decisions related to tangible assets or processes.

Real risk-free interest rate The single-period interest rate for a completely risk-free security if no inflation were expected.

Rebalancing In the context of asset allocation, a discipline for adjusting the portfolio to align with the strategic asset allocation.

Rebalancing range A range of values for asset class weights defined by trigger points above and below target weights, such that if the portfolio value passes through a trigger point, rebalancing occurs. Also known as a corridor.

Rebate rate The portion of the collateral earnings rate that is repaid to the security borrower by the security lender.

Recallability trap The tendency of forecasts to be overly influenced by events that have left a strong impression on a person's memory.

Recession A broad-based economic downturn, conventionally defined as two successive quarterly declines in GDP.

Regime A distinct governing set of relationships.

Regret The feeling that an opportunity has been missed; typically an expression of *hindsight bias*.

Regret-aversion bias An emotional bias in which people tend to avoid making decisions that will result in action out of fear that the decision will turn out poorly.

Regulatory risk The risk associated with the uncertainty of how a transaction will be regulated or with the potential for regulations to change.

Reinvestment risk The risk of reinvesting coupon income or principal at a rate less than the original coupon or purchase rate.

Relative economic strength forecasting approach An exchange rate forecasting approach that suggests that a strong pace of economic growth in a country creates attractive investment opportunities, increasing the demand for the country's currency and causing it to appreciate.

Relative strength indicators A price momentum indicator that involves comparing a stock's performance during a specific period either to its own past performance or to the performance of some group of stocks.

Remaindermen Beneficiaries of a trust; having a claim on the residue.

Repo rate The interest rate on a repurchase agreement.

Representativeness bias A belief perseverance bias in which people tend to classify new information based on past experiences and classifications.

Repurchase agreements (repos) In a repurchase agreement, a security owner agrees to sell a security for a specific cash amount, while simultaneously agreeing to repurchase the security at a specified future date (typically one day later) and price.

Repurchase yield The negative of the expected percent change in number of shares outstanding, in the Grinold–Kroner model.

Residence jurisdiction A framework used by a country to determine the basis for taxing income, based on residency.

Residence–residence conflict When two countries claim residence of the same individual, subjecting the individual's income to taxation by both countries.

Residence–source conflict When tax jurisdiction is claimed by an individual's country of residence and the country where some of their assets are sourced; the most common source of double taxation.

Residue With respect to trusts, the funds remaining in a trust when the last income beneficiary dies.

Resistance levels Price points on dealers' order boards where one would expect to see a clustering of offers.

Retired-lives The portion of a pension fund's liabilities associated with retired workers.

Returns-based benchmarks Benchmarks constructed by examining a portfolio's sensitivity to a set of factors, such as the returns for various style indexes (e.g., small-cap value, small-cap growth, large-cap value, and large-cap growth).

Returns-based style analysis An approach to style analysis that focuses on characteristics of the overall portfolio as revealed by a portfolio's realized returns.

Reverse repos Repurchase agreement from the standpoint of the lender.

Revocable trust A trust arrangement wherein the settlor (who originally transfers assets to fund the trust) retains the right to rescind the trust relationship and regain title to the trust assets.

Risk budgeting The establishment of objectives for individuals, groups, or divisions of an organization that takes into account the allocation of an acceptable level of risk.

Risk exposure A source of risk. Also, the state of being exposed or vulnerable to a risk.

Risk premium approach An approach to forecasting the return of a risky asset that views its expected return as the sum of the risk-free rate of interest and one or more risk premiums.

Risk reversal With respect to foreign exchange option strategies, one involving a long position in a call option and a short position in a put option.

Risk tolerance The capacity to accept risk; the level of risk an investor (or organization) is willing and able to bear.

Rolling return The moving average of the holding-period returns for a specified period (e.g., a calendar year) that matches the investor's time horizon.

Sale and leaseback A transaction wherein the owner of a property sells that property and then immediately leases it back from the buyer at a rate and term acceptable to the new owner and on financial terms consistent with the marketplace.

Sample estimator A formula for assigning a unique value (a point estimate) to a population parameter.

Sample-size neglect A type of representativeness bias in which financial market participants incorrectly assume that small sample sizes are representative of populations (or "real" data).

Sandwich spread An option strategy that is equivalent to a short butterfly spread.

Satisfice A combination of "satisfy" and "suffice" describing decisions, actions, and outcomes that may not be optimal, but are adequate.

Savings–investment imbalances forecasting approach An exchange rate forecasting approach that explains currency movements in terms of the effects of domestic savings–investment imbalances on the exchange rate.

Scenario analysis A risk assessment technique involving the examination of the performance of a portfolio under specified situations.

Seagull spread An extension of the risk reversal foreign exchange option strategy that limits downside risk.

Secondary offering An offering after the initial public offering of securities.

Sector/quality effect In a fixed-income attribution analysis, a measure of a manager's ability to select the "right" issuing sector and quality group.

Security selection effect In a fixed-income attribution analysis, the residual of the security's total return after other effects are accounted for; a measure of the return due to ability in security selection.

Segmentation With respect to the management of insurance company portfolios, the notional subdivision of the overall portfolio into sub-portfolios each of which is associated with a specified group of insurance contracts.

Self-attribution bias A bias in which people take personal credit for successes and attribute failures to external factors outside the individual's control.

Self-control bias A bias in which people fail to act in pursuit of their long-term, overarching goals because of a lack of self-discipline.

Sell side Broker/dealers that sell securities and make recommendations for various customers, such as investment managers and institutional investors.

Semi-active management A variant of active management. In a semi-active portfolio, the manager seeks to outperform a given benchmark with tightly controlled risk relative to the benchmark. Also called *enhanced indexing* or *risk-controlled active management.*

Separate property regime A marital property regime under which each spouse is able to own and control property as an individual.

Settlement netting risk The risk that a liquidator of a counterparty in default could challenge a netting arrangement so that profitable transactions are realized for the benefit of creditors.

Settlement risk When settling a contract, the risk that one party could be in the process of paying the counterparty while the counterparty is declaring bankruptcy.

Settlor (or grantor) An entity that transfers assets to a trustee, to be held and managed for the benefit of the trust beneficiaries.

Shari'a The law of Islam. In addition to the law of the land, some follow guidance provided by Shari'a or Islamic law.

Sharpe ratio A measure of risk-adjusted performance that compares excess returns to the total risk of the account, where total risk is measured by the account's standard deviation of returns. Also called *reward-to-variability*.

Short sale against the box Shorting a security that is held long.

Shortfall probability The probability of failing to meet a specific liability or goal.

Shortfall risk The risk that portfolio value will fall below some minimum acceptable level during a stated time horizon; the risk of not achieving a specified return target.

Shrinkage estimation Estimation that involves taking a weighted average of a historical estimate of a parameter and some other parameter estimate, where the weights reflect the analyst's relative belief in the estimates.

Shrinkage estimator The formula used in shrinkage estimation of a parameter.

Smart beta Involves the use of simple, transparent, rules-based strategies as a basis for investment decisions.

Smart routing The use of algorithms to intelligently route an order to the most liquid venue.

Smoothing rule With respect to spending rates, a rule that averages asset values over a period of time in order to dampen the spending rate's response to asset value fluctuation.

Social proof A bias in which individuals tend to follow the beliefs of a group.

Socially responsible investing An approach to investing that integrates ethical values and societal concerns with investment decisions. Also called *ethical investing*.

Soft dollars The use of commissions to buy services other than execution services. Also called *soft dollar arrangements* or *soft commissions*.

Sole ownership Owned by one person; assets held in sole ownership are typically considered part of a decedent's estate. The transfer of their ownership is dictated by the decedent's will through the probate process.

Solow residual A measure of the growth in total factor productivity that is based on an economic growth model developed by economist Robert M. Solow.

Sortino ratio A performance appraisal ratio that divides the difference between a portfolio's return and a minimum acceptable return by downside deviation.

Source jurisdiction A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Source–source conflict When two countries claim source jurisdiction of the same asset; both countries may claim that the income is derived from their jurisdiction.

Sovereign risk A form of credit risk in which the borrower is the government of a sovereign nation.

Spread curve The fitted curve of credit spreads for each bond of an issuer plotted against either the maturity or duration of each of those bonds.

Spread duration A measure used in determining a portfolio's sensitivity to changes in credit spreads.

Stale price bias Bias that arises from using prices that are stale because of infrequent trading.

Static hedge A hedge that is not sensitive to changes in the price of the asset hedged.

Stationary A series of data for which the parameters that describe a return-generating process are stable.

Status quo bias An emotional bias in which people do nothing (i.e., maintain the "status quo") instead of making a change.

Status quo trap The tendency for forecasts to perpetuate recent observations—that is, to predict no change from the recent past.

Sterling ratio The compound annualized rate of return over a specified time period divided by the average yearly maximum drawdown over the same time period less an arbitrary 10%.

Stock companies With respect to insurance companies, companies that have issued common equity shares.

Stock index futures Futures contracts on a specified stock index.

Stops Stop-loss orders involve leaving bids or offers away from the current market price to be filled if the market reaches those levels.

Straddle An option strategy involving the purchase of a put and a call on the same underlying with the same exercise price and expiration date. If the put and call are held long, it is a long straddle; if they are held short, it is a short straddle.

Straight-through processing Systems that simplify transaction processing through the minimization of manual and/or duplicative intervention in the process from trade placement to settlement.

Strangle A variation on a straddle in which the put and call have different exercise prices; if the put and call are held long, it is a long strangle; if they are held short, it is a short strangle.

Strap An option strategy involving the purchase of two calls and one put.

Strategic asset allocation 1) The process of allocating money to IPS-permissible asset classes that integrates the investor's return objectives, risk tolerance, and investment constraints with long-run capital market expectations. 2) The result of the above process, also known as the policy portfolio.

Strategic buyers Buyers who have a strategic motive (e.g., realization of synergies) for seeking to buy a company.

Strategy benchmarks See custom security-based benchmarks.

Stratified sampling A sampling method that guarantees that subpopulations of interest are represented in the sample. Also called *representative sampling* or *cell approach*.

Strip An option strategy involving the purchase of two puts and one call.

Structural level of unemployment The level of unemployment resulting from scarcity of a factor of production.

Structural risk Risk that arises from portfolio design, particularly the choice of the portfolio allocations.

Structured note A variation of a floating-rate note that has some type of unusual characteristic such as a leverage factor or in which the rate moves opposite to interest rates.

Style drift Inconsistency in style.

Style index A securities index intended to reflect the average returns to a given style.

Stylized scenario A type of analysis often used in stress testing. It involves simulating the movement in at least one interest rate, exchange rate, stock price, or commodity price relevant to the portfolio.

Sunshine trades Public display of a transaction (usually high-volume) in advance of the actual order.

Support levels Price points on dealers' order boards where one would expect to see a clustering of bids.

Surplus The difference between the value of assets and the present value of liabilities. With respect to an insurance company, the net difference between the total assets and total liabilities (equivalent to policyholders' surplus for a mutual insurance company and stockholders' equity for a stock company).

Surplus capital Capital that is in excess of primary capital.

Survey method A method of capital market expectations setting that involves surveying experts.

Survival probability The probability an individual survives in a given year; used to determine expected cash flow required in retirement.

Survivorship bias Bias that arises in a data series when managers with poor track records exit the business and are dropped from the database whereas managers with good records remain; when a data series as of a given date reflects only entities that have survived to that date.

Swap rate The interest rate applicable to the pay-fixed-rate side of an interest rate swap.

Tactical asset allocation Asset allocation that involves making short-term adjustments to asset class weights based on short-term predictions of relative performance among asset classes.

Tactical rebalancing A variation of calendar rebalancing that specifies less frequent rebalancing when markets appear to be trending and more frequent rebalancing when they are characterized by reversals.

Tail risk The risk that there are more actual events in the tail of a probability distribution than would be predicted by probability models.

Tail value at risk (or conditional tail expectation) The VaR plus the expected loss in excess of VaR, when such excess loss occurs.

Target covariance matrix A component of shrinkage estimation; allows the analyst to model factors that are believed to influence the data over periods longer than observed in the historical sample.

Tax avoidance Developing strategies that minimize tax, while conforming to both the spirit and the letter of the tax codes of jurisdictions with taxing authority.

Tax efficiency The proportion of the expected pretax total return that will be retained after taxes.

Tax evasion The practice of circumventing tax obligations by illegal means such as misreporting or not reporting relevant information to tax authorities.

Tax premium Compensation for the effect of taxes on the after-tax return of an asset.

Tax risk The uncertainty associated with tax laws.

Taylor rule A rule linking a central bank's target short-term interest rate to the rate of growth of the economy and inflation.

Temporary life insurance A type of life insurance that covers a certain period of time, specified at purchase. Commonly referred to as "term" life insurance.

Term life insurance A type of life insurance policy that provides coverage for a specified length of time and accumulates little or no cash values.

Territorial tax system A framework used by a country to determine the basis for taxing income or transfers. A country that taxes income as a source within its borders imposes source jurisdiction.

Testamentary gratuitous transfer The bequeathing or transfer of assets upon one's death. From a recipient's perspective, it is called an inheritance.

Testator A person who makes a will.

Theta The change in price of an option associated with a one-day reduction in its time to expiration; the rate at which an option's time value decays.

Tick The smallest possible price movement of a security.

Time deposit A deposit requiring advance notice prior to a withdrawal.

Time-series estimators Estimators that are based on lagged values of the variable being forecast; often consist of lagged values of other selected variables.

Time to expiration The time remaining in the life of a derivative, typically expressed in years.

Time value The difference between the market price of an option and its intrinsic value, determined by the uncertainty of the underlying over the remaining life of the option.

Time-weighted average price (TWAP) strategy A logical participation strategy that assumes a flat volume profile and trades in proportion to time.

Time-weighted rate of return The compound rate of growth over a stated evaluation period of one unit of money initially invested in the account.

Tobin's *q* An asset-based valuation measure that is equal to the ratio of the market value of debt and equity to the replacement cost of total assets.

Top-down Proceeding from the macroeconomy, to the economic sector level, to the industry level, to the firm level.

Top-down approach A credit strategy approach that involves formulating a view on major macroeconomic trends and then selecting the bonds that the investor expects to perform best in the expected environment.

Total factor productivity (TFP) A variable which accounts for that part of Y not directly accounted for by the levels of the production factors (K and L).

Total future liability With respect to defined-benefit pension plans, the present value of accumulated and projected future service benefits, including the effects of projected future compensation increases.

Total rate of return A measure of the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized).

Total return equity swap A swap contract that involves a series of exchanges of the total return on a specified asset or equity index in return for specified fixed or floating rate payments.

Total return payer Party responsible for paying the reference obligation cash flows and return to the receiver, but will also be compensated by the receiver for any depreciation in the index or default losses incurred on the portfolio.

Total return receiver Party receives both the cash flows from the underlying index as well as any appreciation in the index over the period in exchange for paying Libor plus a pre-determined spread.

Total return swap A swap in which one party agrees to pay the total return on a security. Often used as a credit derivative, in which the underlying is a bond.

Tracking error The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking risk*.

Tracking risk The standard deviation of the differences between a portfolio's returns and its benchmark's returns; a synonym of active risk. Also called *tracking error*.

Trade blotter A device for entering and tracking trade executions and orders to trade.

Trade settlement Completion of a trade wherein purchased financial instruments are transferred to the buyer and the buyer transfers money to the seller.

Trading activity In fixed-income attribution analysis, the effect of sales and purchases of bonds over a given period; the total portfolio return minus the other components determining the management effect in an attribution analysis.

Transaction exposure The risk associated with a foreign exchange rate on a specific business transaction such as a purchase or sale.

Translation exposure The risk associated with the conversion of foreign financial statements into domestic currency.

Transparency Availability of timely and accurate market and trade information.

Trigger points In the context of portfolio rebalancing, the endpoints of a rebalancing range (corridor).

Twist With respect to the yield curve, a movement in contrary directions of interest rates at two maturities; a nonparallel movement in the yield curve.

Type I error With respect to manager selection, keeping (or hiring) managers with zero value-added. (Rejecting the null hypothesis when it is correct).

Type II error With respect to manager selection, firing (or not hiring) managers with positive value-added. (Not rejecting the null hypothesis when it is incorrect).

Underfunded plan A pension plan in which the ratio of the value of plan assets to the present value of plan liabilities is less than 100 percent.

Underwriting (profitability) cycle A cycle affecting the profitability of insurance companies' underwriting operations.

Unit-linked life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *variable life insurance*.

Universal life insurance A type of life insurance policy that provides for premium flexibility, an adjustable face amount of death benefits, and current market interest rates on the savings element.

Unrelated business income With respect to the US tax code, income that is not substantially related to a foundation's charitable purposes.

Unstructured modeling Modeling without a theory on the underlying structure.

Uptick rules Trading rules that specify that a short sale must not be on a downtick relative to the last trade at a different price.

Urgency of the trade The importance of certainty of execution.

Utility The level of relative satisfaction received from the consumption of goods and services.

Utility theory Theory whereby people maximize the present value of utility subject to a present value budget constraint.

Valuation reserve With respect to insurance companies, an allowance, created by a charge against earnings, to provide for losses in the value of the assets.

Value The amount for which one can sell something, or the amount one must pay to acquire something.

Value at risk (VaR) A probability-based measure of loss potential for a company, a fund, a portfolio, a transaction, or a strategy over a specified period of time.

Value-motivated traders Traders that act on value judgments based on careful, sometimes painstaking research. They trade only when the price moves into their value range.

Value weighted With respect to index construction, an index in which each security in the index is weighted according to its market capitalization. Also called *market-capitalization weighted*.

Variable life insurance A type of ordinary life insurance in which death benefits and cash values are linked to the investment performance of a policyholder-selected pool of investments held in a so-called separate account. Also called *unit-linked life insurance*.

Variable prepaid forward A monetization strategy that involves the combination of a collar with a loan against the value of the underlying shares. When the loan comes due, shares are sold to pay off the loan and part of any appreciation is shared with the lender.

Variable universal life A type of life insurance policy that combines the flexibility of universal life with the investment choice flexibility of variable life. Also called *flexible-premium variable life*.

Vega A measure of the sensitivity of an option's price to changes in the underlying's volatility.

Venture capital The equity financing of new or growing private companies.

Venture capital firms Firms representing dedicated pools of capital for providing equity or equity-linked financing to privately held companies.

Venture capital fund A pooled investment vehicle for venture capital investing.

Venture capital trust An exchange-traded, closed-end vehicle for venture capital investing.

Venture capitalists Specialists who seek to identify companies that have good business opportunities but need financial, managerial, and strategic support.

Vested With respect to pension benefits or assets, said of an unconditional ownership interest.

Vintage year With reference to a private equity fund, the year it closed.

Vintage year effects The effects on returns shared by private equity funds closed in the same year.

Volatility Represented by the Greek letter sigma (σ), the standard deviation of price outcomes associated with an underlying asset.

Volatility clustering The tendency for large (small) swings in prices to be followed by large (small) swings of random direction.

Volume-weighted average price (VWAP) The average price at which a security is traded during the day, where each trade price is weighted by the fraction of the day's volume associated with the trade.

Volume-weighted average price (VWAP) strategy A logical participation strategy that involves breaking up an order over time according to a prespecified volume profile.

Wealth relative The ending value of one unit of money invested at specified rates of return.

Whole life insurance A type of life insurance policy that involves coverage for the whole of the insured's life. Also called *ordinary life insurance*.

Will A document associated with estate planning that outlines the rights others will have over one's property after death. Also called *testament*.

Within-sector selection return In attribution analysis, a measure of the impact of a manager's security selection decisions relative to the holdings of the sector benchmark.

Worst-case scenario analysis A stress test in which we examine the worst case that we actually expect to occur.

Yardeni model An equity valuation model, more complex than the Fed model, that incorporates the expected growth rate in earnings.

Yield beta A measure of the sensitivity of a bond's yield to a general measure of bond yields in the market that is used to refine the hedge ratio.

Yield curve The relationship between yield and time to maturity.

Yield to worst The yield on a callable bond that assumes a bond is called at the earliest opportunity.

Z-spread The yield spread that must be added to each point of the implied spot yield curve to make the present value of a bond's cash flows equal its current market price. Also known as zero-volatility spread.

Zero-cost collar A transaction in which a position in the underlying is protected by buying a put and selling a call with the premium from the sale of the call offsetting the premium from the purchase of the put. It can also be used to protect a floating-rate borrower against interest rate increases with the premium on a long cap offsetting the premium on a short floor.

Zero-premium collar A hedging strategy involving the simultaneous purchase of puts and sale of call options on a stock. The puts are struck below and the calls are struck above the underlying's market price.

CUSTOMER SERVICE

68

Index

A
absolute benchmarks, 136
account(s)
  defined, 122
  historical beta relative to, 142
  temporary new, 243, 292
accrual accounting, 221, 222, 287
active investors, successful, 83–84
active management
  and macro attribution, 153–154
  returns due to, 134–135
active managers
  portfolio monitoring by, 82–84
  successful, 83–84
active positions, benchmark, 143
active return, 156, 170–171
active risk, 171. *see also* tracking error
administrative fees, 257–258, 287
adverse selection risk, 19
advertise-to-draw-liquidity trading focus, 39, 40
advertising. *see* GIPS Advertising Guidelines
after-tax return calculations, 280–283
agents, as trading focus, 38–40
AIMR. *see* Association for Investment Management and Research
AIMR Performance Presentation Standards Handbook, 210, 211
AIMR-PPS. *see* Association for Investment Management and Research Performance Presentation Standards
algorithmic execution systems, 42–45
  implementation shortfall strategies, 43–44
  opportunistic participation strategies, 44–45
  simple logical participation strategies, 43
  specialized strategies, 45
algorithmic trading, 40–47
  classification of algorithmic execution systems, 42–45
  defined, 40
  growth of, 41–42
  reasoning behind logical participation strategies, 45–47
Allocation Effects strategy, 154
Allocation/Selection Interaction return, 159
allowed range, rebalancing to, 93–94
alpha
  ex post, 168–169
  Jensen's, 168
Amazon, Inc., 52
annualized return, 132
appraisal, performance. *see* performance appraisal
appropriate benchmarks, 135, 140–141
arbitrageurs, 34
Archipelago Exchange, 42
arrival price strategy, 43–44
ask price, 10
ask size, 10
asset allocation
  tactical, 82
  tolerance bands for, 92–93
Asset Category strategy, 151–152
asset classes, corridors for, 91–93
asset risk attributes, changes in, 79
asset-weighted standard deviation, 253–254
Association for Investment Management and Research (AIMR), 210, 211
Association for Investment Management and Research Performance Presentation Standards (AIMR-PPS), 210, 211
assurity of completion, 9
assurity of the contract, 20
attribution, performance. *see* performance attribution
auction markets, 10, 16
automated auctions, 16
automated trading, 40–47
  algorithmic trading, 40–47
  classification of algorithmic execution systems, 42–45
    implementation shortfall strategies, 43–44
    opportunistic participation strategies, 44–45
    simple logical participation strategies, 43
    specialized strategies, 45
  defined, 40
  reasoning for logical participation algorithmic strategies, 45–47
average effective spread, 13

B
Bank Administration Institute (BAI), 126, 131, 132, 210
Barclays Capital US Aggregate Bond Index, 247
batch auction markets, 16
benchmark description, 248, 275, 287
benchmark portfolio returns, 149
benchmarks, 133–146
  absolute, 136
  for after-tax portfolio returns, 281–282
  broad market indexes, 136–137
  custom security-based, 139–140
  defined, 134–135
  factor-model-based, 137–138
  for hedge funds, 143–146
  manager universes, 136, 140–141
  returns-based, 138–139
  style indexes, 137
  tests of quality, 142–143
  types, 136–139
  valid, 135–136, 140–141
Benchmarks strategy, 152–153
best efforts order, 8
best execution, 37, 48
beta, 138, 142
biases
  style, 149n.19, 153
  survivor, 141
  systematic, 142
bid–ask spread, 10
  effective, 12–14
  inside, 11
  market, 11
  and market quality, 19
  and transaction costs, 22
bid price, 10
bid size, 10
block orders, 17
BP p.l.c., 7–8
broad market indexes, 136–137
brokerage, prime, 18
brokered markets, 17
brokers, 8, 18
bundled fees, 232, 268–269, 287
buy-and-hold strategies, 95–96, 157
buyers, in liquid markets, 20
buy-side traders, 6

C
Calculation Methodology (GIPS Section I.2)
  composite return calculation provisions, 232–235
  excerpt of, 216
  external cash flows, 226–229
    inputs, 226
    solutions, 226–229
  further calculation provisions, 229–232
  implementation of, 229
  time-weighted total return, 223–226
calendar-and-percentage-of-portfolio rebalancing, 93
calendar rebalancing, 90
capital asset pricing model (CAPM)
  and *ex post* SML, 168
  market model vs., 137n.11
  validity of, 171
Capital Market Line (CML), *ex post,* 169
capital returns, 260, 287
CAPM. *see* capital asset pricing model
carried interest, 266, 287
carve-out segments
  in composite construction, 244–245
  GIPS definition, 287
  presentation and reporting of, 256
cash flows
  external (*see* external cash flows)
  large, 222, 243n.20, 290
  significant, 243n.20
cash market trades, 99
central bank policy, 80
Certificate in Investment Performance Measurement (CIPM) program, 209n.3

CFA Institute, 210, 283, 284
chain-linking process, 127–128
Chicago Board of Trade, 10
CIPM program. *see* Certificate in Investment Performance Measurement program
Citigroup Broad Investment-Grade (US BIG) Bond Index, 136
client's interests, execution of portfolio decisions for, 47–49
closed-book markets, 11
closed-end funds, 259, 287
CML, *ex post. see* Capital Market Line, *ex post*
Code of Ethics, soft dollar policies in, 29
collar, zero-premium, 77
commissions, transaction costs and, 28–30
committed capital, 259, 265, 287
Committee for Performance Presentation Standards (CPPS), 210, 283
communication, of GIPS Advertising Guidelines, 273–274
completion, assurity of, 9
component returns, 260–261
composite construction
  in verification process, 279
  in wrap fee/SMA provisions, 269
Composite Construction (GIPS Section I.3), 235–245
  carve-out segments, 244–245
  defining investment strategies, 238–241
  excerpt of, 216
  implementation of, 236, 237, 240, 242, 245
  including and excluding portfolios, 241–244
  qualifying portfolios, 235–238
composite creation date, 247, 288
composite definition
  GIPS definition, 288
  GIPS provisions on, 238–241, 247n.23, 269–270
composite descriptions, 247, 288
composite return calculation provisions, 232–235
composites
  defined, 208n.2, 287
  disclosures related to, 247–248
  non-fee paying portfolios in, 256
concave strategies, 97–98
concentrated stock positions, monitoring portfolios with, 77–79
confidence band, quality control chart, 173
constant-mix strategies, 96
constant-proportion (CPPI) strategies, 97
consumer nondurables, Pure Sector Allocation return for, 158
continuous auction markets, 16
contracts, assurity of, 20
convenience, market liquidity and, 20
convex strategies, 97–98
core real estate strategies, 261
corporate governance, 71
corridors for asset classes, 91–93
costs
  delay, 23, 25
  explicit, 25
  "gaming" of cost measures, 23, 24
  missed trade opportunity, 23, 25
  nonfinancial, 84
  nonfinancial costs of portfolio rebalancing, 84
  of portfolio rebalancing, 88–89
  of trading, 21–32
    econometric models for costs, 30–32
    transaction cost components, 22–30
  in trading focus, 38–40
  transaction
    components of, 22–30
    econometric model for, 30–32
    of portfolio rebalancing, 88–89
costs-are-not-important trading focus, 38, 40
countercyclical premiums, 81
Country Version of GIPS (CVG), 211
coverage, benchmark, 143
CPPI strategies. *see* constant-proportion strategies
CPPS. *see* Committee for Performance Presentation Standards
cumulative composite returns, calculating, 258
custody fees, 232, 288
custom security-based benchmarks, 139–140
CVG. *see* Country Version of GIPS

D
data, quality of, 132–133
day traders, 34
dealer(s)
  defined, 10
  roles of, 18–19
  as type of trader, 34
dealer markets, 10–15
decimalization, 41
decision price, 24
default-risk-free yield curve, 81
delay costs, 23, 25
depth, market, 19
derivatives, portfolio rebalancing with, 99–100
Dietz, Peter, 131, 210, 283
differential returns, 146
direct market access (DMA), 36
Disclosure (GIPS Section I.4), 245–251
  excerpt of, 216
  implementation of, 248–249
disclosures
  in GIPS Valuation Principles, 271
  for real estate, 261–262
  Trade Management Guidelines on, 49
  for wrap fee/SMAs, 270
discretion
  of brokers, 18
  GIPS definition, 237
  for real estate investments, 261
  in verification process, 278–279
discretion strategies, 45
distinct business entity, 218, 288
distributions, 265, 288
DMA. *see* direct market access
documentation
  portfolio, 236
  in verification process, 280
do not initiate orders, 8
DPI, 265, 288
Duties to Clients [Standard III], 29

E
EC. *see* GIPS Executive Committee
ECNs. *see* electronic communications networks
econometric models for costs of trading, 30–32
economic changes. *see* markets, changes in
effective spread, 12–14
efficiency, tax, 70–71
efficient market hypothesis (EMH), 22
electronic communications networks (ECNs), 16
electronic crossing networks, 15–16, 21
electronic limit-order markets, 16
EMH. *see* efficient market hypothesis
equal probability rebalancing, 93
equal-weighted standard deviation, 253
error
  tracking, 139n.12, 142
  Type I, 181–182
  Type II, 181–182
ethics, as focus of portfolio decisions, 49
Euronext Amsterdam, 8–9
evergreen funds, 259, 288
excess return to nondiversifiable risk, 168
exchange fund, 78–79
exchanges, 8
execution of portfolio decisions, 5–63
  client's interests, 47–49
    importance of ethical focus, 49
    Trade Management Guidelines, 48–49
  costs of trading, 21–32
    econometric models for costs, 30–32
    transaction cost components, 22–30
  duties of portfolio managers, 6
  market microstructure, 7–21
    evaluating market quality, 19–21
    order types, 7–9
    roles of brokers and dealers, 18–19
    types of markets, 9–17
  practice problems, 52–57
  solutions to problems, 58–63
  trade execution decisions, 36–47
    automated trading, 40–47
    for handling of a trade, 36–37
    objectives in trading, 37–40
  traders, 32–36
    traders' selection of order types, 35–36
    types of traders, 33–35
execution uncertainty, 8
executive choices, portfolio rebalancing, 99–100
explicit costs, 25
ex post alpha, 168–169
ex post Capital Market Line, 169
ex post Security Market Line, 168–169
ex post Sharpe ratio, 169
ex post standard deviation, 251, 255

external cash flows
at beginning/end of evaluation period, 124–125
defined, 123
GIPS definition, 243n.20, 288
in GIPS provisions, 222, 226–229
intraperiod, 123–125
macro attribution, 149–150
and performance evaluations, 123–125
and rate-of-return calculations, 123–125
and TWR vs. MWR, 129–131
external valuations of real estate, 260

F
factor-model-based benchmarks, 137–138, 155
fair value
GIPS definition, 260, 289
in GIPS provisions, 221, 222, 260
in GIPS Valuation Principles, 271
Fair Value Definition (GIPS Section II.A), 271
FASB. *see* Financial Accounting Standards Board
fees
administrative, 257–258, 287
bundled, 232, 268–269, 287
custody, 232, 288
investment management, 223, 257, 289
fee schedule, 250, 289
final liquidation date, 265, 267, 289
Financial Accounting Standards Board (FASB), 270
Financial Analysts Federation, 208, 210, 283
firms
GIPS compliance for, 209, 214, 218–220
GIPS definition, 289
total firm assets, 219–220, 292
verification, 275–276
FIX communications technology, 41
fixed-income securities
performance attribution for, 161–167
total return of, 164–165
floor brokers, 8
forward curves, 81n.7
fourth market, 15n.6
fragmentation, order, 42
Frank Russell Company, 137
front-loaded strategies, 44
front-run (term), 17
fundamental factor model, 160–161
Fundamentals of Compliance (GIPS Section I.0), 216–220
excerpt of, 216
and GIPS compliance of firms, 209
implementation of, 219
funds of funds, 259, 289
fund sponsors, on performance evaluation, 121–122

G
GAAP. *see* US Generally Accepted Accounting Principles
gaming, of cost measures, 23, 24
General Electric (GE), 143
general partners, 266, 289
geometrical linking of returns, 224–225
GIPS. *see* Global Investment Performance Standards
GIPS Advertising Guidelines, 246n.22, 273–275
GIPS Council, 211, 212
GIPS Executive Committee (EC), 211–214, 280, 283
GIPS Guidance Statement for Country-Specific Taxation Issues, 280
GIPS Guidance Statement on Composite Definition, 237, 239, 240, 243–244
GIPS Guidance Statement on the Treatment of Carve-Outs, 245n.21
GIPS Guidance Statement on the Treatment of Significant Cash Flows, 243
GIPS Guidance Statement on the Use of Supplemental Information, 238, 280
GIPS Handbook. see Global Investment Performance Standards Handbook
GIPS Valuation Principles, 270–273
disclosure requirements in, 248
fair and market value calculations, 221
for private equity investments, 267
for real estate investments, 260, 262
Global Investment Performance Standards (GIPS), 205–313
advertising guidelines, 273–275
after-tax return calculations, 280–283
background, 207–215
development of performance presentation standards, 210–211
governance of GIPS, 212
need for standards, 207–210
overview of standards, 212–215
defined, 206–207
glossary of terms, 287–293
keeping current with, 283–284
practice problems, 294–304
provisions, 215–270
Calculation Methodology (Section I.2), 216, 223–235
Composite Construction (Section I.3), 216, 235–245
Disclosure (Section I.4), 216, 245–251
Fundamentals of Compliance (Section I.0), 209, 216–220
Input Data (Section I.1), 216, 220–223
overview, 215–217
Presentation and Reporting (Section I.5), 216–217, 251–259
Private Equity (Section I.7), 217, 259, 266–268
Real Estate (Section I.6), 217, 259–265
Wrap Fee/Separately Managed Account Portfolios (Section 1.7), 217, 268–270
solutions to problems, 305–313
TWR methodology for, 131
valuation principles, 270–273
disclosure requirements in, 248
fair and market value calculations, 221
for private equity investments, 267
for real estate investments, 260, 262
verification, 275–280
Global Investment Performance Standards (GIPS) Handbook, 211, 214
Global Performance Presentation Standards Subcommittee, 211
Google Inc., 53
governance
corporate, 71
of GIPS, 212
gross-of-fees return
GIPS definition, 250, 289
for real estate, 261

H
hedge funds, benchmarks for, 143–146
hedging strategies, 77–78
hidden order, 8–9
historical beta relative to the account, 142
Hotspot FX, 15, 42
hunter strategies, 45
hybrid markets, 17

I
IASB. *see* International Accounting Standards Board
iceberg order, 8–9
IFRS. *see* International Financial Reporting Standards
IMCA. *see* Investment Management Consultants Association
implementation shortfall, 24–28
implementation shortfall strategies, 43–44
income returns, 260, 289
indexes, types of, 136–137
index funds, efficient market hypothesis and, 22
inflation, portfolio monitoring and, 81–82
information
from brokers, 18
and market liquidity, 20
supplemental, 238, 292
information-motivated traders, 33–35
information ratio (IR), 170–171
Input Data (GIPS Section I.1), 220–223
excerpt of, 216
implementation of, 223
inside ask, 10–11
inside bid, 10
inside bid–ask spread, 11
inside quote, 11
inside spread, 11
Institute of Chartered Financial Analysts, 210
institutional investors, constraints for, 71
integrity, 20
interest, carried, 266, 287
interest rate management effect, 165
internal dispersion, 250–255, 289
internal rate of return, 128–131
linked, 131–132
money-weighted rate of return, 128–131
for real estate, 262–265
International Accounting Standards Board (IASB), 270
International Financial Reporting Standards (IFRS), 262

International Securities Exchange, 15, 42
Interpretations Subcommittee, 212
interquartile range, 254–255
intraperiod external cash flows, 123–125
investable benchmarks, 135, 140
Investment Management Consultants Association (IMCA), 210
investment management fees, 223, 257, 289
investment managers, on performance evaluation, 122
Investment Managers strategy, 153–154
Investment Manager Subcommittee, 212
investment multiple, 265, 290
Investment Performance Council (IPC), 211, 276
investment policy, performance evaluation in, 121
investment policy statements (IPSs)
  investment restrictions in, 236–237
  portfolio return calculation provisions in, 229–230
investment services, of brokers, 18
investment skill, 167
investment strategies, in composite construction, 238–241
investment style, returns due to, 134–135
investment style indexes, 137
Investor/Consultant Subcommittee, 212
investors
  active, 83–84
  changes in circumstances/constraints of, 67–79
    laws and regulations, 70–71
    liquidity requirements, 68
    tax circumstances, 70
    time horizons, 69–70
    unique circumstances, 71–79
    wealth, 68
  with concentrated stock positions, 77–79
  institutional, 71
  liquidity requirements of, 68, 72, 75–76
IPC. *see* Investment Performance Council
IPSs. *see* investment policy statements
IR. *see* information ratio

J
Jensen's alpha, 168
Jones, Alfred Winslow, 144

L
large cash flows, 222, 243n.20, 290
laws, portfolio monitoring and changes in, 70–71
Lehman AA Industrials Index, 163
Lehman Aggregate Bond Index, 136, 137
Lehman Brothers Government/Credit Bond Index, 137, 152
Lehman Brothers US Government Index, 162, 163
Lehman Mortgage Index, 137
limited partners, 266, 290
limited partnerships, 266, 290
limit order book, 10, 11
limit-order markets, electronic, 16
limit orders, 7–8
linear strategies, 97
linked internal rate of return, 131–132
linking of returns, geometrical, 224–225
links, GIPS definition of, 290
liquidity
  defined, 9
  of markets, 19–20
  natural, 11–12
  trade size relative to, 30
  and trading costs, 30
  in trading focus, 38–40
liquidity-at-any-cost trading focus, 38, 40
liquidity-motivated traders, 34, 35, 36
liquidity requirements, investors', 68, 72, 75–76
logical participation strategies, 42–47
London Stock Exchange (LSE)
  market orders at, 7
  price volatility of, 55, 61
  and SEAQ, 12
longevity risk, 77
loss
  realized, 25
  tax loss harvesting, 283
  unrealized, 23, 25
low-cost-whatever-the-liquidity trading focus, 39, 40
Loyalty, Prudence, and Care [Standard III(A)], 29
LSE. *see* London Stock Exchange

M
M^2 measure, 168–170
macro attribution
  conducting, 150–154
    Allocation Effects strategy, 154
    Asset Category strategy, 151–152
    Benchmarks strategy, 152–153
    Investment Managers strategy, 153–154
    Net Contributions strategy, 151
    Risk-Free Asset strategy, 151
  defined, 146
  inputs, 148–150
  overview, 148
making the market, 12
management commitment to GIPS, 215
management effect, 165
manager continuation policies (MCP), 178–182
  as filter, 181–182
  phases, 179–180
  purposes of, 179
manager monitoring, 179–180
manager review, 179–181
manager selection, criteria for, 176
manager universes, 136, 140–141
market-adjusted implementation shortfall, 25–26
market ask, 10–11
market bid, 8, 10
market bid–ask spread, 11
market cycles, portfolio monitoring and, 79–80
market fragmentation, 9
market impact, 12, 22–23
market mechanism, 18
market microstructure, 7–21
  evaluating market quality, 19–21
  order types, 7–9
  roles of brokers and dealers, 18–19
  types of markets, 9–17
    brokered markets, 17
    hybrid markets, 17
    order-driven markets, 15–16
    quote-driven (dealer) markets, 10–15
market model, 137–138
market-not-held order, 8
market-on-close algorithms, 45
market on close order, 9
market on open order, 9
market orders, 7
market quote, 11
markets
  changes in, 79–82
    central bank policy, 80
    changes in asset risk attributes, 79
    market cycles, 79–80
    yield curve and inflation, 81–82
  information from brokers about, 18
  quality of, 19–21
  types of, 9–17
    brokered markets, 17
    hybrid markets, 17
    order-driven markets, 15–16
    quote-driven markets, 10–15
market spread, 11
market value, 221, 290
matrix prices, 89n.11, 133
MCP. *see* manager continuation policies
measurable benchmarks, 135
micro attribution
  defined, 146
  fundamental factor model, 160–161
  overview, 154–156
  sector weighting/stock selection, 156–159
midquote (term), 11, 16
misfit return, 149n.19, 153
missed trade opportunity costs, 23, 25
Modified Dietz method, 225–228
Modified Internal Rate of Return (Modified IRR), 225–227
momentum, trading costs and, 30
monetary policy, 80
monetization strategies, 77–78
money-weighted rate of return (MWR), 128–131
monitoring, portfolio. *see* portfolio monitoring
Morgan Stanley Capital International (MSCI), 137
Morgan Stanley Capital International Europe Australasia and Far East (MSCI EAFE) Index, 136
must (term), 214, 290
MWR. *see* money-weighted rate of return

N
NASDAQ
  market quality of, 20–21
  quote-driven market, 11
  trade size on, 41
natural liquidity, 11–12
need-trustworthy-agent trading focus, 38–40
Net Contributions strategy, 151

net-of-fees return
GIPS definition, 250
for real estate, 261
net worth, changes in, 68
New York Stock Exchange (NYSE)
Archipelago Exchange merger, 42
cross-listing of stock with TSE, 31–32
as hybrid market, 17
market quality of, 20–21
and price volatility of LSE, 55, 61
Trade and Quote database, 52
trade size on, 41
noise, in performance evaluations, 177–178
Nominations Committee, 212
nondiversifiable risk, excess return to, 168
non-fee paying portfolios, in composites, 256
nonfinancial costs, of portfolio rebalancing, 84
normal beta, 138
normal portfolio, 138
NYSE. *see* New York Stock Exchange
NYSE Arca Exchange, 16
NYSE Fact Book, 41n.27

O
objective function, 45–46
objectives, trading, 37–40
OMS. *see* order management system
one-factor models, active returns relative to, 156
open-end funds, 259, 290
open outcry auction markets, 10
opportunistic participation strategies, 44–45
opportunistic real estate strategies, 261
opportunity costs, missed trade, 23, 25
Oracle Corporation, 42
order-driven markets, 15–16
order fragmentation, 42
order management system (OMS), 46
orders
representing, 18
types of, 7–9
Original Dietz method, 225–227
owned benchmarks, 135

P
paid-in capital, 265, 290
pairs trading, 42–43
Paris Bourse, 16
partial fills, 16
participate (do not initiate) orders, 8
partners
general, 266, 289
limited, 266, 290
passive traders, 34, 36
peer group comparisons. *see* manager universes
pegging strategies, 45
Pension Funds (Dietz), 210
percentage-of-portfolio rebalancing, 90–93
percentage-of-volume strategy, 43
performance appraisal, 167–175
defined, 123
quality control charts, 171–175
risk-adjusted measures, 168–171
performance attribution, 146–167
defined, 123
fixed-income, 161–167
macro attribution, 148–154
managers' impact on, 147
micro attribution, 154–161
performance evaluation, defined, 120
performance measurements, 123–133
annualized return, 132
data quality issues, 132–133
defined, 123
linked internal rate of return, 131–132
money-weighted rate of return, 128–131
time-weighted rate of return, 126–131
total rate of return, 126
without intraperiod external cash flows, 123–125
performance presentation standards
development of, 210–211
for private equity, 268
for real estate, 261–262
for wrap fee/SMA composites, 270
periodic auction markets, 16
Perold, Andre, 24
Perold-Sharpe analysis, 94–99
buy-and-hold strategies, 95–96
constant-mix strategies, 96
CPPI strategies, 97
linear, concave, and convex strategies, 97–98
summary of strategies, 98–99
PIC multiple, 265, 290
policy allocations, in macro attribution, 148–149
portability of past performance, 256
portfolio decisions, execution of. *see* execution of portfolio decisions
portfolio flows, 279
portfolio managers. *see also* manager continuation policies (MCP)
duties of, 6
impact of, 147
portfolio monitoring, 67–84
and investor circumstances/constraints, 67–79
laws and regulations, 70–71
liquidity requirements, 68
tax circumstances, 70
time horizons, 69–70
unique circumstances, 71–79
wealth, 68
and market/economic changes, 79–82
central bank policy, 80
changes in asset risk attributes, 79
market cycles, 79–80
yield curve and inflation, 81–82
process, 82–84
active managers in, 82–84
nonfinancial costs of revision, 84
portfolio performance evaluation, 119–201
benchmarks, 133–146
absolute, 136
broad market indexes, 136–137
custom security-based, 139–140
defined, 134–135
factor-model-based, 137–138
for hedge funds, 143–146
manager universes, 136, 140–141
returns-based, 138–139
style indexes, 137
tests of quality, 142–143
types, 136–139
valid, 135–136
components, 122–123
defined, 120
importance, 121–122
manager continuation policies, 178–182
noisiness of data, 177–178
performance appraisal, 167–175
quality control charts, 171–175
risk-adjusted measures, 168–171
performance attribution, 146–167
fixed-income, 161–167
macro attribution, 148–154
managers' impact on, 147
micro attribution, 154–161
performance measurement, 123–133
annualized return, 132
data quality issues, 133
linked internal rate of return, 131–132
money-weighted rate of return, 128–131
time-weighted rate of return, 126–131
total rate of return, 126
without intraperiod external cash flows, 123–125
practice, 176–182
practice problems, 186–192
solutions to problems, 193–201
portfolio rebalancing, 84–100
benefits and costs of rebalancing, 85–89
benefits of, 85–88
costs of, 88–89
executive choices, 99–100
nonfinancial costs of, 84
Perold-Sharpe analysis, 94–99
buy-and-hold strategies, 95–96
constant-mix strategies, 96
CPPI strategies, 97
linear, concave, and convex strategies, 97–98
summary of strategies, 98–99
rebalancing disciplines, 90–94
calendar rebalancing, 90
other strategies, 93
percentage-of-portfolio rebalancing, 90–93
setting optimal thresholds, 94
target weights vs. allowed range, 93–94
portfolio risk, 85
portfolios
adding, removing, and switching, 242
documentation of, 236
GIPS definition, 290
GIPS standards for, 210
including and excluding, in composites, 241–244
normal, 138
qualifying, for composites, 235–238
portfolio trades, 9
position a trade (term), 17

positive active positions, benchmark, 143
POSIT trading system, 15, 52, 58
post-trade transparency, 20
premiums, countercyclical, 81
Presentation and Reporting (GIPS Section I.5)
  excerpt of, 216–217
  recommendations, 257–259
  requirements, 251–259
presentation standards, performance. *see* performance presentation standards
pretrade transparency, 20
pre-verification procedures, 278
price(s)
  ask, 10
  bid, 10
  decision, 24
  matrix, 89n.11, 133
  stale, 27, 39
  volume-weighted average, 23–24, 27–28
price discovery, 16
price improvement, 12
price uncertainty, 7
primary fund vehicles, 259, 291
prime brokerage, 18
principal trades, 9
private equity
  GIPS definition, 259, 291
  GIPS Valuation Principles for, 272–273
Private Equity (GIPS Section I.7), 266–268
  excerpt of, 217
  and GIPS definition of private equity, 259
private exchange, 78, 79
processes, Trade Management Guidelines on, 49
professionally designated, certified, or licensed commercial property valuer/appraiser, 260, 291
profit
  realized, 25
  unrealized, 23, 25
prospective clients
  GIPS definition, 291
  GIPS provisions for, 213
prudence, 48
public market equivalents, 267, 291
Pure Sector Allocation return, 158

Q
quality, tests of, 142–143
quality control charts, 171–175
  assumptions underlying, 172
  confidence bands on, 173
  defined, 171
  interpreting, 174–175
quality effect, 165
QuantEX™, 42
quoted depth, 19
quote-driven (dealer) markets, 10–15

R
rate-of-return calculations
  annualized return, 132
  with external cash flows at beginning/end of evaluation period, 124–125
  money-weighted, 128–131
  subperiod, 127–128
  time-weighted (*see* time-weighted rate of return [TWR])
  total rate of return, 126
  without external cash flows, 124
Real Estate (GIPS Section I.6), 217, 259–265
real estate, GIPS Valuation Principles for, 272
real estate investment trusts (REITs), 259
real estate portfolio returns, 261
real estate securities, 259
realization multiples, 265, 291
realized profit/loss, 25
real yield, 82
rebalancing, portfolio. *see* portfolio rebalancing
recommendations, GIPS, 214, 262, 291
record keeping, 49
reflective of current investment opinions (benchmark property), 135
Regional Investment Performance Subcommittees (RIPS), 212
regulations, changes in, 70–71
REITs. *see* real estate investment trusts
remaindermen, 69
requirements, GIPS, 214, 262, 291
reserve order, 8–9
residual value, 265, 291
residue, 69
resilience, market, 19
return requirements, in IPSs, 72, 75
returns
  active, 156, 170–171
  and active management/investment style, 134–135
  after-tax return calculations, 280–283
  Allocation/Selection Interaction, 159
  annualized, 132
  capital, 260, 287
  component, 260–261
  differential, 146
  of fixed-income securities, 164–165
  geometrical linking of, 224–225
  gross-of-fees, 250, 261, 289
  income, 260, 289
  macro attribution, 149–150
  from market models, 138
  misfit, 149n.19, 153
  and monetary policy, 80
  net-of-fees, 250, 261
  Pure Sector Allocation, 158
  real estate portfolio, 261
  time-weighted total, 223–226
  Within-Sector Selection, 158–159
returns-based benchmarks, 138–139
revenue, impact and, 147
reward-to-variability. *see* Sharpe ratio
reward-to-volatility, 168
RIPS. *see* Regional Investment Performance Subcommittees
risk
  active, 171
  adverse selection, 19
  changes in asset risk attributes, 79
  longevity, 77
  nondiversifiable, 168
  portfolio, 85
  risk characteristics of benchmarks, 143
  systematic, 79, 85
  and trading costs, 30
risk-adjusted performance measures, 168–171
  criticisms, 171
  ex post alpha, 168–169
  information ratio, 170–171
  M^2, 168–170
  Sharpe ratio, 169
  Treynor, 169
Risk-Free Asset strategy, 151
risk–reward tradeoff, 79
risk tolerance, 72, 75
rules-based trading, 42–43
Russell 1000 Index, 187, 195–196
Russell 2000 Index, 188
Russell 3000 Index, 136, 187–188
Russell Large Value Index, 137
RVPI, 265, 291

S
Scope and Purpose of Verification (GIPS Section IV.A), 277
SEAQ market, 12
secondary fund vehicles, 259, 291
secrecy, broker, 18
sector effect, for fixed-income attribution, 165
sector exposures, portfolio monitoring for, 82–83
sector weighting, 156–159
security-based benchmarks, custom, 139–140
security exposures, portfolio monitoring for, 83
Security Market Line (SML), *ex post,* 168–169
security selection effect, 165
sellers, in liquid markets, 20
sell side, 19
sentimental holdings, 237
settlement, trade, 9
settlement-date accounting, 221, 291
"shadow accounting," 269n.46
Sharpe ratio, 169
  defined, 168
  ex post, 169
  of hedge funds, 145–146
should (term), 214, 291
significant cash flows, 243n.20
simple logical participation strategies, 43
since inception internal rates of return (SI-IRR)
  GIPS definition, 292
  for private equity, 267–268
  for real estate, 262–265
slippage (delay costs), 23, 25
smart routing, 40, 45
SML, *ex post. see* Security Market Line, *ex post*
socially responsible investing (SRI), 71
soft dollars, 28–29
Soft Dollar Standards, 28
S&P 500 Index. *see* Standard & Poor's 500 Index
specialists, NYSE, 17
specified in advance (benchmark property), 135
S&P Large Value Index. *see* Standard & Poor's Large Value Index

spread. *see* bid–ask spread
SRI. *see* socially responsible investing
stale prices, 27, 39
standard deviation
  asset-weighted, 253–254
  equal-weighted, 253
  ex post, 251, 255
Standard & Poor's, 137
Standard & Poor's (S&P) 500 Index
  in Assets Category strategy, 152
  as benchmark, 247
  as broad-market index, 136, 137
  long-only positions in, 144
  portfolio trades with, 9
  as surrogate, 171
Standard & Poor's (S&P) Large Value Index, 137
Standards of Professional Conduct, 29
stock
  concentrated stock positions, 77–79
  for micro attribution, 156–159
  monetary policy and returns for, 80
straight through processing (STP), 10
style bias, 149n.19, 153
style-defined composites, 270
style exposures, portfolio monitoring for, 82–83
style indexes, 137
style matrix, 239
subperiod rates of return, 127–128
sunshine trades, 38
supplemental information, 238, 292
survivor bias, 141
systematic biases, benchmark, 142
systematic risk, 79, 85

T
tactical rebalancing, 93
TAQ database. *see* Trade and Quote database
target weights, rebalancing to, 93–94
tax efficiency, 70
taxes
  after-tax return calculations and GIPS, 280–283
  and portfolio monitoring, 70
  tax costs of portfolio rebalancing, 89
tax loss harvesting, 283
technology sector
  Allocation/Selection Interaction return for, 159
  Within-Sector Allocation return for, 158–159
temporary new accounts, 292
+temporary new accounts, 243
tests of quality (benchmark), 142–143
thresholds, rebalancing, 94
time horizons
  changes in, 69–70
  in investment policy statements, 72, 76
time-weighted average price (TWAP) strategy, 43
time-weighted rate of return (TWR), 126–131
  about, 126–128
  GIPS definition, 292
  and linked internal rate of return, 131, 132
  MWR vs., 129–131
  as requirement of GIPS standards, 224
time-weighted total return, 223–226
Tokyo Stock Exchange, 16
tolerance bands, for asset allocation, 92–93
Toronto Stock Exchange (TSE), 15, 31–32
total firm assets, GIPS definition, 219–220, 292
total rate of return, 126
total return
  of fixed-income securities, 164–165
  time-weighted, 223–226
total value, in TVPI, 265, 292
tracking error, of benchmarks, 139n.12, 142
Trade and Quote (TAQ) database, 52
trade blotter, 46
trade date accounting, 221, 222, 292
trade execution decisions, 36–47
  automated trading, 40–47
    algorithmic trading, 40–47
    classification of algorithmic execution systems, 42–45
    reasoning for logical participation algorithmic strategies, 45–47
  for handling of a trade, 36–37
  and objectives in trading, 37–40
Trade Management Guidelines, 48–49
traders, 32–36
  preferred order types of, 35–36
  roles of, 41
  types of, 6, 33–35
trades
  handling of, 36–37
  opposite sides of, 18
  urgency of, 33
trade settlement, 9
trade size, relative to available liquidity, 30
trading
  costs of, 21–32
    econometric models for costs, 30–32
    transaction cost components, 22–30
  decisions related to handling of trades, 36–37
  objectives in, 37–40
trading activity, in fixed-income attribution, 165
"trading and other" factor, in micro attribution, 157–158
trading expenses, 231–232, 257, 292
trading style, 30
transaction costs
  components of, 22–30
  econometric model for, 30–32
  of portfolio rebalancing, 88–89
transaction expenses, 260, 266, 292
transparency, 9, 20
Treasury bills, 95, 230
Treynor, Jack, 24
Treynor measure, 168–169
Trust Universe Comparison Service (TUCS), 210
TSE. *see* Toronto Stock Exchange
turnover, benchmark, 143
TVPI, 265, 292
TWAP strategy. *see* time-weighted average price strategy
TWR. *see* time-weighted rate of return
Type I error, in MCP analysis, 181–182
Type II error, in MCP analysis, 181–182

U
unambiguous benchmarks, 135, 140
uncertainty, 7, 8
undisclosed limit order, 8–9
United States
  stock returns and monetary policy in, 80
  upstairs markets, 17n.8
  yield curve and inflation in, 81
US Federal Reserve Bank, policies of, 80
US Generally Accepted Accounting Principles (GAAP), 262
US Treasury bills, 230
US Treasury securities, 162
unrealized multiple, 265, 292
unrealized profit/loss, 23, 25
upstairs markets, 17n.8
urgency of the trade, 33
US BIG Bond Index. *see* Citigroup Broad Investment-Grade Bond Index

V
valuation, in macro attribution, 149–150
valuation principles, GIPS, 270–273
value-added real estate strategies, 261
value-motivated traders, 34, 35
variable prepaid forward strategy, 77
verification
  GIPS definition, 275n.48, 293
  GIPS provisions on, 275–280
  implementation of, 275–276, 278
  preparing for, 278
verification firms, selecting, 275–276
Verification/Practitioner Subcommittee, 212
verification report, 275–277, 293
vintage year, 265, 293
Volcker, Paul, 80
volume-weighted average price (VWAP), 23–24, 27–28
volume-weighted average price (VWAP) strategy, 43

W
wealth, changes in, 68, 72–77
wealth relative, 127–128
Wilshire 5000, 187, 195
  and adjustments to composite-specific minimum asset levels, 244
  as broad-market index, 136
Wilshire Associates, 210
Within-Sector Selection return, 158–159
Wrap Fee/Separately Managed Account (SMA) Portfolios (GIPS Section 1.8), 217, 268–270

Y
yield curves, portfolio monitoring and, 81–82

Z
zero-based budgeting process, 180
zero-premium collar, 77
zero-sum game, trading as, 49
Zweig, Martin, 80

WILEY END USER LICENSE AGREEMENT

Go to www.wiley.com/go/eula to access Wiley’s ebook EULA.